



Prepared for



City of San
Rafael

Prepared by

FEHR  **PEERS**

1650 Los Gamos Drive Kaiser Transportation Impact Analysis

SF15-0858

Draft
February 2017

Table of Contents

EXECUTIVE SUMMARY	1
1 INTRODUCTION	1
1.1 Study Purpose & Project Description.....	1
1.2 Project Study Area.....	5
1.3 Analysis Scenarios	5
1.4 Study Methodology.....	6
1.4.1 Analysis Methods.....	6
1.4.2 Significance Criteria	9
2 EXISTING CONDITIONS	13
2.1 Roadway Network.....	13
2.1.1 Regional Access.....	13
2.1.2 Local Access	13
2.2 Data Collection	14
2.3 Vehicle Operations.....	14
2.3.1 Intersection Operations.....	14
2.3.2 Freeway Operations.....	16
2.4 Bicycle & Pedestrian Network	18
2.5 Transit Network	21
3 PROJECT CONDITIONS	24
3.1 Project Description.....	24
3.1.1 Transportation Demand Management (TDM) Considerations	24
3.2 Project Trip Generation.....	25
3.3 Project Trip Distribution & Assignment	26
4 VEHICLE MILES TRAVELED EVALUATION.....	30
4.1 Assumptions & Methodology	30
4.1.1 Significance Criteria	31
4.2 Results.....	33

5 EXISTING PLUS PROJECT CONDITIONS	34
5.1 Assumed Roadway Improvements	34
5.2 Vehicle Operations.....	34
5.2.1 Traffic Volumes	34
5.2.2 Intersection Operations.....	36
5.2.3 Freeway Operations.....	38
5.2.4 On-Site Vehicle Access and Circulation	42
5.3 Bicycle and Pedestrian Impacts.....	42
5.4 Transit Impacts	43
5.5 Parking.....	43
6 BASELINE CONDITIONS	44
6.1 Assumed Roadway Improvements	44
6.2 Vehicle Operations.....	44
6.2.1 Traffic Volumes	44
6.2.2 Intersection Operations.....	47
6.2.3 Freeway Operations	52
6.3 Bicycle & Pedestrian Impacts.....	56
6.4 Transit Impacts	56
7 CUMULATIVE CONDITIONS	57
7.1 Assumed Roadway Improvements	57
7.2 Vehicle Operations.....	58
7.2.1 Traffic Volumes	58
7.2.2 Intersection Operations.....	61
7.2.3 Freeway Operations	66
7.3 Bicycle & Pedestrian Impacts.....	71
7.4 Transit impacts	71

Appendices

Appendix A: Peak Hour Intersection Counts

Appendix B: Detailed Intersection LOS Results

Appendix C: Peak Hour Signal Warrants

Appendix D: Detailed Freeway LOS Results

Appendix E: Detailed VMT Comparison Table

Appendix F: Detailed Intersection Queue Summary

List of Figures

Figure 1-1: Project Site & Analysis Locations.....	3
Figure 1-2: 1650 Los Gamos Drive Proposed Site Plan	4
Figure 2-1: Existing Peak Hour Intersection Control, Volumes, and Lane Configurations	15
Figure 2-2: Existing and Proposed Bicycle Facilities in Project Vicinity.....	20
Figure 2-3: Existing Transit Facilities in Project Vicinity.....	23
Figure 3-1: Project Trip Distribution	28
Figure 3-2: Project Trip Assignment Based on No Project (Planned Development Allowed).....	29
Figure 4-1: Employee Origin-Destination Residential Distribution	32
Figure 5-1: Existing Plus Project Peak Hour Intersection Control, Volumes, and Lane Configurations	35
Figure 6-1: Baseline No Project Peak Hour Intersection Control, Volumes, and Lane Configurations	45
Figure 6-2: Baseline Plus Project Peak Hour Intersection Control, Volumes, and Lane Configurations	46
Figure 6-3: Mitigation Measure TR-3 – Signalize and Reconfigure Intersection at Lucas Valley Road/Los Gamos Drive	50
Figure 7-1: Cumulative No Project Peak Hour Intersection Control, Volumes, and Lane Configurations	59
Figure 7-2: Cumulative Plus Project Peak Hour Intersection Control, Volumes, and Lane Configurations...	60
Figure 7-3: US 101 / Lucas Valley Interchange Improvement Project.....	64

List of Tables

Table ES-1: Project Trip Generation Estimates.....	ii
Table 1-1: 1650 Los Gamos Drive Land Use Assumptions.....	2
Table 1-2: Intersection LOS Criteria.....	7
Table 1-3: Freeway LOS Criteria.....	8
Table 2-1: Intersection LOS and Delay.....	16
Table 2-2: Existing Conditions Freeway Density and LOS.....	17
Table 2-3: Golden Gate Transit Service Summary.....	22
Table 3-1: Project Trip Generation Estimates.....	26
Table 3-2: Trip Distribution.....	27
Table 4-1: Kaiser Employees Moving from Existing Facilities to Proposed Project.....	30
Table 4-2: Average VMT per Employee Comparison.....	33
Table 5-1: Existing Intersection Level of Service and Delay Results.....	36
Table 5-2: Existing Conditions Freeway Density and LOS – AM Peak Hour.....	39
Table 5-3: Existing Conditions Freeway Density and LOS – PM Peak Hour.....	40
Table 5-4: Existing Conditions Volume to Capacity (v/c) Summary ¹ - AM Peak Hour.....	41
Table 6-1: Baseline Intersection Level of Service and Delay Results.....	47
Table 6-2: Baseline Conditions Freeway Density and LOS – AM Peak Hour.....	52
Table 6-3: Baseline Conditions Freeway Density and LOS – PM Peak Hour.....	53
Table 6-4: Baseline Conditions Volume to Capacity (v/c) Summary ¹ – AM Peak Hour.....	54
Table 7-1: Cumulative Intersection Level of Service and Delay Results.....	61
Table 7-2: Cumulative with Interchange Improvements Intersection Level of Service and Delay Results	65
Table 7-3: Cumulative Conditions Freeway Density and LOS – AM Peak Hour.....	67

Table 7-4: Cumulative Conditions Freeway Density and LOS – PM Peak Hour..... 68

Table 7-5: Cumulative Conditions Volume to Capacity (v/c) Summary¹ – AM Peak Hour..... 69

Table 7-6: Cumulative Conditions Volume to Capacity (v/c) Summary¹ – PM Peak Hour 70

EXECUTIVE SUMMARY

This Transportation Impact Analysis (TIA) analyzes the transportation impacts associated with Kaiser Permanente's proposal to add medical office as an allowed use at the existing 1650 Los Gamos Drive office building (henceforth referred to as the "Project") and related parking in a new parking structure and on an existing surface parking lot. The Project is considered an infill development because it does not require new construction on undeveloped land, as the existing office building will not be expanded and the proposed parking structure will be located on the existing parking lot. The Project is located in the City of San Rafael, just west of the US 101 / Lucas Valley Road interchange.

This study analyzes expected transportation conditions with the proposed Project condition in place under Existing, Baseline, and Cumulative conditions. The Project would result in transportation impacts at several intersections. Potential mitigation measures are proposed to reduce the Project's impacts to less than significant with mitigation incorporated, where feasible. Several traffic impacts would remain significant and unavoidable. Potential mitigation measures include improving the Lucas Valley Road/Los Gamos Drive intersection, consistent with the improvements identified in the San Rafael General Plan 2020, and a Transportation Demand Management (TDM) program to reduce peak hour employee single-occupant vehicle trips. Pedestrian, bicycle, and transit impacts were not identified, thus no mitigation measures were identified. However, the TDM mitigation measure may benefit these sustainable modes of transportation.

PROJECT DESCRIPTION

The proposed Project, located at 1650 Los Gamos Drive would permit the addition of medical office as an allowed use for the existing 148,000¹ square foot building (1650 Los Gamos Drive), in addition the currently allowed office uses. In addition, the proposed Project includes the construction of an up to 511-space parking structure on the west side of Los Gamos Drive, where there is an existing surface lot associated with the building, and the continued use of 42 parking spaces located on the adjacent property at 1600 Los Gamos Drive.

The building is part of a Planned Development (PD) District which allows up to 150,000 square feet of office uses at 1650 Los Gamos Drive. The Project sponsor does not plan to rebuild or construct the remaining 2,000 square feet; however, for the purpose of this analysis, we have assumed the Project building is 150,000 square feet. The existing 1650 Los Gamos Drive building is currently partially occupied by office uses; however, the Project plans to fully occupy (100-percent) the existing building with medical office.

¹ The existing building is 148,000 square feet; however, the Planned Development District allows up to 150,000 square feet of office space, so for the purpose of the analysis, we have assumed a 150,000 square-foot building. The Project does not plan to rebuild or construct the remaining 2,000 square foot balance.

STUDY APPROACH

The Project analysis evaluated three scenarios: Existing, Baseline, and Cumulative. Existing conditions represents present conditions based on recently collected traffic data. Information for the Baseline volumes, which represents existing traffic, assumes 100% occupancy at existing buildings, plus approved projects, and the Cumulative volumes, which represent traffic estimates consistent with development patterns proposed in the *San Rafael General Plan 2020*, were provided by the City of San Rafael. Intersection analysis included five study intersections and two freeway segments in the Project vicinity which were evaluated during the weekday AM and PM peak hour.

PROJECT TRAVEL CHARACTERISTICS

Table ES-1 displays the project's expected AM and PM peak hour trip generation for the Project. This table indicates that the Project would generate approximately 150 additional AM peak hour trips and 300 additional PM peak hour trips. Refer to Chapter 2 for a detailed discussion of reasons this occurs.

TABLE ES-1: PROJECT TRIP GENERATION ESTIMATES						
Building	Land Use	ITE Code	Size (KSF) ¹	Daily	AM Peak Hour	PM Peak Hour
Planned Development (PD) Allowed at 1650 Los Gamos Drive	General Office	710	150	1,655	234	224
Proposed Project	Medical Office	720	150	5,420	359	536
NET NEW PROJECT TRIPS				3,765	161	312

Notes:

1. ksf = 1,000 square-feet

Source: Trip Generation (9th Edition), ITE, 2012; Fehr & Peers, 2017.

PROJECT IMPACTS UNDER EXISTING CONDITIONS

The following summarizes key findings from this analysis scenario.

The Lucas Valley Road / Los Gamos Drive intersection would degrade below the LOS D threshold, resulting in a significant impact. However, mitigation measures identified reduce the Project's impact to less-than-significant for the intersection.

In contrast, the US 101 southbound corridor operates under congested conditions and as a result, the Project would contribute 1-percent or more of Project related traffic triggering a significant impact. Feasible

mitigation measures were not identified so the Project's impact was concluded as significant and unavoidable.

PROJECT IMPACTS UNDER BASELINE CONDITIONS

Under Baseline conditions, the following two intersections would degrade and result in a significant impact:

- Lucas Valley Road / Las Gallinas Avenue
- Lucas Valley Road / Los Gamos Drive

The mitigation measure identified for the Lucas Valley Road / Los Gamos Drive intersection would reduce the Project's impact to less-than-significant. A feasible mitigation measure was not identified at the Lucas Valley / Las Gallinas Avenue intersection. Thus, the Project's impact to the Lucas Valley / Las Gallinas Avenue intersection was concluded as significant and unavoidable.

The US 101 southbound corridor would continue to operate under congested conditions and as a result, the Project would contribute 1-percent or more of Project related traffic triggering a significant impact. Feasible mitigation measures were not identified so the Project's impact was concluded as significant and unavoidable.

PROJECT IMPACTS UNDER CUMULATIVE CONDITIONS

Under Cumulative conditions, no study intersection triggers a significant impact during the AM and PM peak hours, except the Lucas Valley Road / Las Gallinas Avenue intersection. Like the Baseline conditions, a feasible mitigation measure was not identified. Thus, the Project's impact to the intersection analysis concluded the impact from this one intersection is significant and unavoidable.

Under the Cumulative scenario, the Southbound US 101 freeway segments would continue to operate unacceptably; however, the Project's contribution to the cumulative traffic is less than 1-percent of the capacity. Therefore, the Project does not result in a significant impact in the southbound direction. In the northbound direction, the Cumulative No Project traffic grows such that mainline freeway operations begin to degrade under Cumulative No Project conditions. As a result, the addition of Project traffic under the Cumulative PM peak hour results in a significant impact because the Project contributes 1-percent or more of traffic. Like the Existing and Baseline conditions, a feasible mitigation measure was not identified so the Project's impact to the freeway study segments is significant and unavoidable.

1 INTRODUCTION

This report presents the results of a transportation impact analysis (TIA) for including medical office as an allowed use by Kaiser Permanente at 1650 Los Gamos Drive in the City of San Rafael, construction of a new parking structure, and the continued use of parking spaces on the adjacent property at 1600 Los Gamos Drive (henceforth referred to as the "Project"). This chapter discusses the TIA purpose, Project area, analysis scenarios, methodology, and criteria to identify significant impacts.

1.1 STUDY PURPOSE & PROJECT DESCRIPTION

The purpose of this analysis is to evaluate the transportation impacts of the Project. The Project site is located at 1650 Los Gamos Drive in San Rafael, California, and is bound by Lucas Valley Road to the north, 1600 Los Gamos Drive to the south, US 101 to the east, and the hillsides to the west of Los Gamos Drive, as illustrated on **Figure 1-1**. The Project site is owned by Kaiser and includes an existing 148,000² gross square foot office building, including an open lobby and underground utility space, surrounding surface parking lot, and surface parking lot on the west side of Los Gamos Drive which abuts an undeveloped hillside slope. Kaiser also has the right to use 42 parking spaces at 1600 Los Gamos Drive.

1650 Los Gamos Drive was originally constructed pursuant to a Planned Development (PD) District which allows up to 150,000 square feet of office uses at 1650 Los Gamos Drive and up to 340,000 square feet of office uses at the neighboring property at 1600 Los Gamos Drive. 1600 Los Gamos Drive includes an existing office building, currently owned and partially occupied by the County of Marin. The County currently uses the building for both office and non-office uses, such as staging emergency vehicles, and also leases a portion of the building to other office and warehousing uses. However, for the purpose of this Project, it is assumed that 1600 Los Gamos Drive is 100-percent (340,000 square feet) occupied by office space. Thus, the traffic generated as part of the Project is based on changes to 1650 Los Gamos Drive (no changes to 1600 Los Gamos Drive are evaluated). A potential amendment to the existing PD district would separate 1600 Los Gamos Drive and 1650 Los Gamos Drive into separate PD districts.

The Project would maintain the existing three-story building footprint, which is approximately 150,000 square feet in total. At the time of data collection (November 2015), the building was 34-percent occupied (50,000 square feet) with office and now it is 7-percent occupied with two-office tenants. However, since the building was constructed, in the late 1970's, through 2006, the building was 100-percent occupied by office. From

² The existing building is 148,000 square feet; however, the Planned Development District allows up to 150,000 square feet of office space so for the purpose of the analysis, we have assumed a 150,000 square-foot building, though the Project does not plan to rebuild or construct the remaining 2,000 square foot balance.

2006 to 2016 the building occupancy ranged from 25-percent to 40-percent. The Great Recession and building purchase for re-use contributed to a lower occupancy rate than usual in the last ten years. As part of the Project, the Project Sponsor is proposing to add medical office as an allowed use to 100-percent of the 150,000 square feet of allowed building space at 1650 Los Gamos Drive. The two remaining tenants will remain temporarily in the building through the term of their leases. Eventually, Kaiser anticipates occupying the remaining portion of the building to medical office, for a total of up to 150,000 square feet of total medical office use.

Table 1-1 summarizes the land use assumptions described above.

TABLE 1-1: 1650 LOS GAMOS DRIVE LAND USE ASSUMPTIONS		
Scenario	Land Use Size (KSF) ¹ ²	
	General Office	Medical Office
Planned Development Allowed	150	--
Proposed Project	--	150

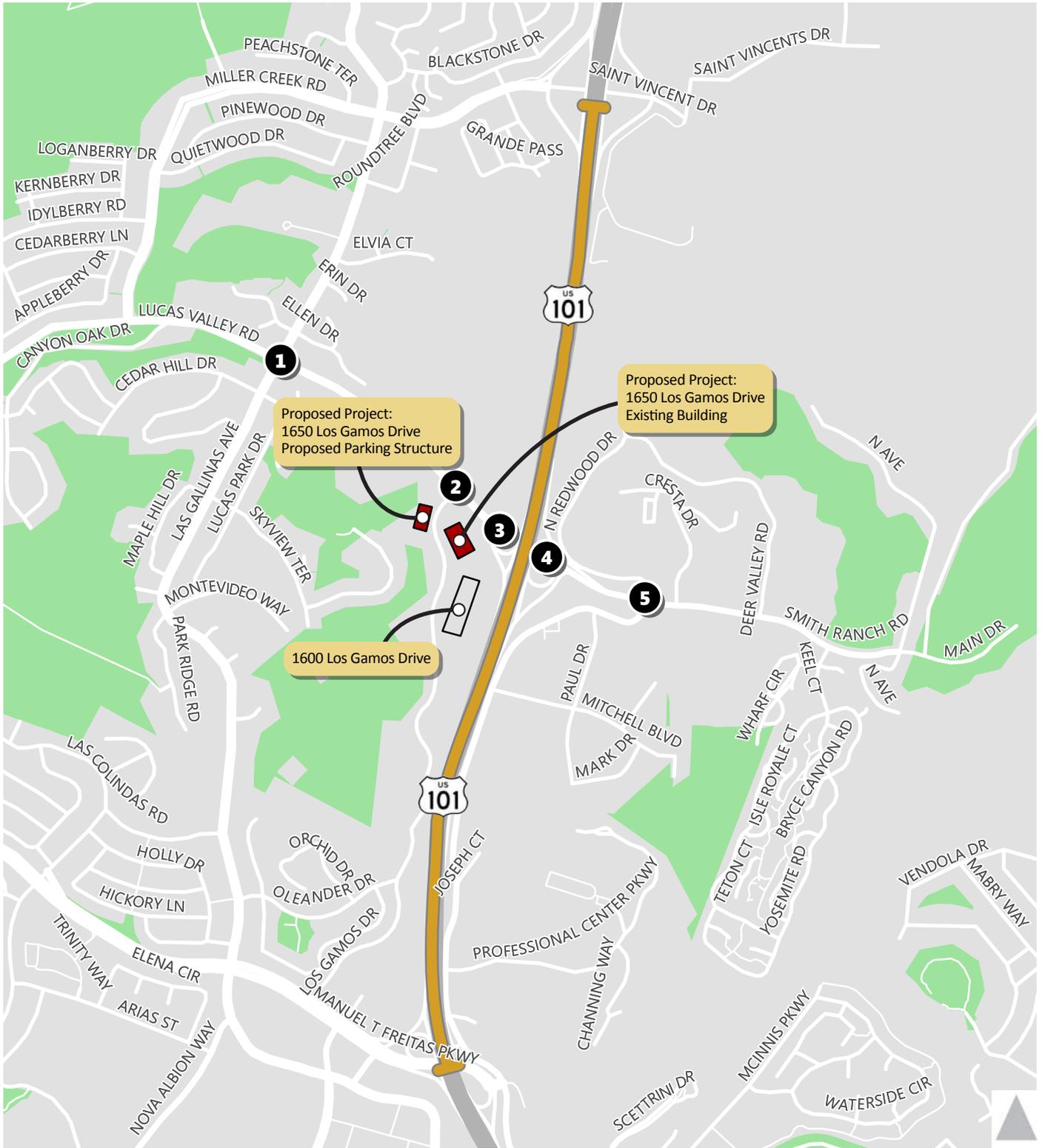
Notes:

1. ksf= 1,000 square-feet
2. 1650 Los Gamos Drive was originally constructed pursuant to a Planned Development (PD) District for 1650 Los Gamos Drive and 1600 Los Gamos Drive. 1600 Los Gamos Drive is currently owned by the County of Marin. The building is permitted to contain up to 340,000 square feet of general office; however, the County of Marin currently uses the building for a mixture of uses, such as emergency services. Although the County's current uses generate significantly less travel than the 340,000 square feet of permitted office use would, the analysis conservatively assumes use of the allowable 340,000 square feet to ensure maximum potential impacts are identified.

Fehr & Peers, 2017

The purpose of this analysis is to evaluate the transportation impacts of the Project. The Project site is located at 1650 Los Gamos Drive in San Rafael, California, and is bound by Lucas Valley Road to the north, 1600 Los Gamos Drive to the south, US 101 to the east, and the hillside to the west of Los Gamos Drive, as illustrated on **Figure 1-1**.

The proposed Project, located at 1650 Los Gamos Drive, would permit the addition of medical office as an allowed use, in addition to the currently allowed office use for the existing building at 1650 Los Gamos Drive. In addition, the proposed Project includes the construction of an up to 511-space parking structure on the west side of Los Gamos Drive, where there is an existing surface lot associated with the building, as well as the continued use of 42 parking spaces located on the adjacent property at 1600 Los Gamos Drive. **Figure 1-2** shows the proposed site plan with the existing building and proposed parking garage.

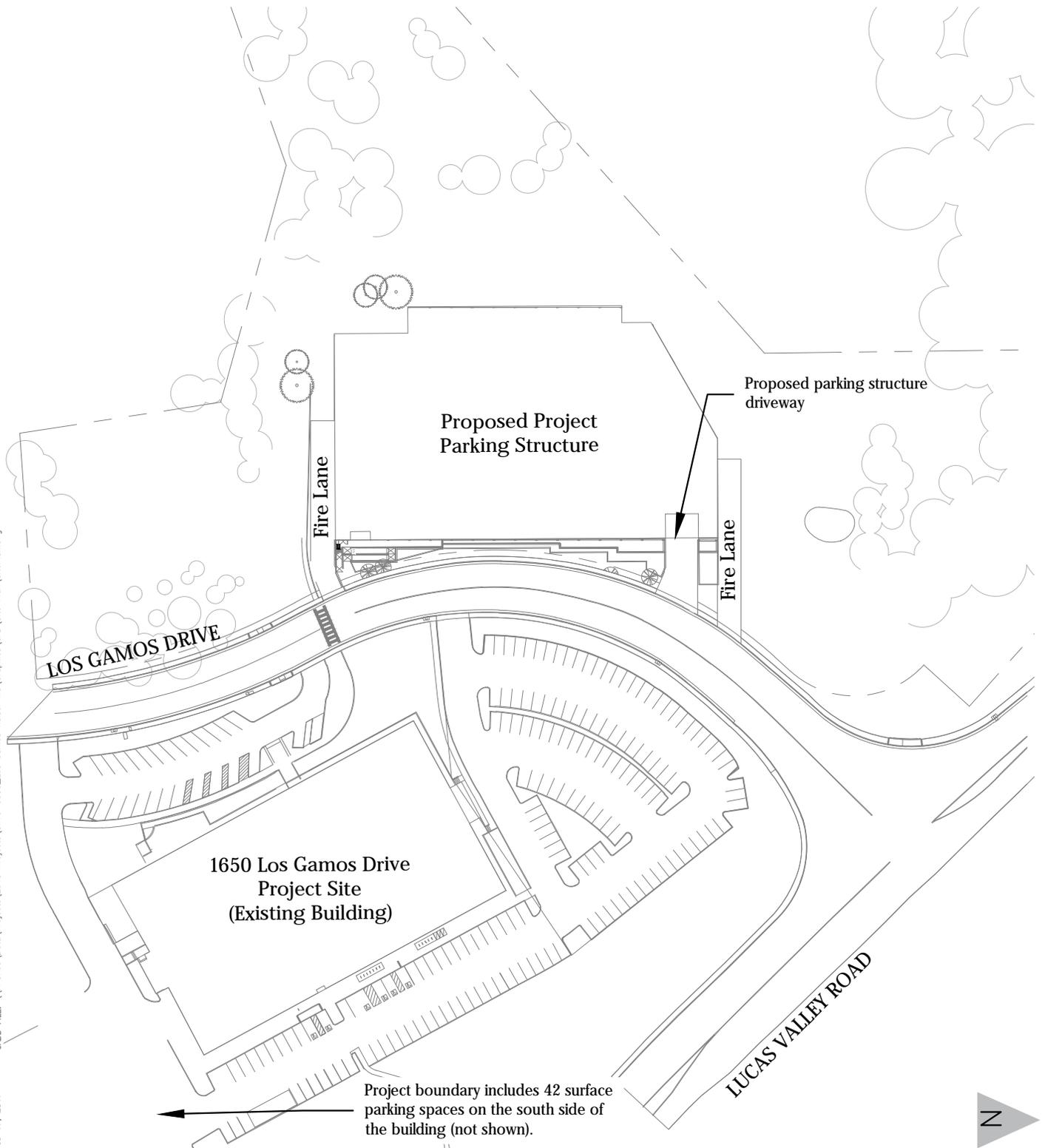


-  Study Intersections
-  Freeway Analysis Segment
-  Project Site



Figure 1-1
Project Site & Analysis Locations

CADD FILE: \\FPS03\Data\Projects\2015 Projects\SF15-0688_Los Gamos Kaiser TIS\Graphics\CAD\Site Plan\SitePlan.dwg
Feb 17, 2017



Note: The Project applicant proposes to occupy the existing building located at 1650 Los Gamos Drive and construct a three-level parking garage structure on the west side of Los Gamos Drive.



Figure 1-2

1650 Los Gamos Drive Proposed Site Plan

1.2 PROJECT STUDY AREA

Intersections are generally the critical capacity-controlling elements of suburban roadway networks. Therefore, the operations of critical intersections surrounding the project site are used as indicators of the adequacy of the vehicular circulation system. Five intersections were selected by City of San Rafael staff as those most likely to be affected by the project and thus warranting analysis.

An analysis for the proposed project focused on the AM and PM peak hour operations at the following intersections (**Figure 1-1**):

1. Lucas Valley Road and Las Gallinas Avenue
2. Lucas Valley Road and Los Gamos Drive
3. Lucas Valley Road and US 101 Southbound Ramps
4. Lucas Valley Road and Smith Ranch Road and US 101 Northbound Ramps
5. Smith Ranch Road and N Redwood Drive and Redwood Highway

Freeways provide regional access connecting different cities and communities. Near the Project site, US 101 serves as a major regional freeway system and its operations are critical to provide access to the Project site. Two freeway segments were selected as the most likely to be affected by the Project: US 101 between Miller Creek and Lucas Valley Road and US 101 between Lucas Valley Road and Manuel T Freitas Parkway.

Freeway segments are typically divided into four sections: merge, diverge, weave, and basic:

- Merge and diverge segments extend 1,500 feet downstream and upstream, respectively, from the ramp gore (where the freeway mainline and ramp split)
- Weave segments must have a continuous auxiliary lane connecting the on-ramp and the downstream off-ramp
- All other freeway segments not covered by the above are considered basic segments

Additionally, existing pedestrian, bicycle, and transit facilities within the Project study area were identified and the Project's impacts to these existing facilities were evaluated.

1.3 ANALYSIS SCENARIOS

The analysis includes an evaluation of transportation conditions during a typical weekday AM and PM peak hour, occurring between 7:00 to 9:00 AM and 4:00 to 6:00 PM, when the surrounding transportation network is at its most congested. This report presents the analysis of the following scenarios:

- Existing No Project– Based on recently collected traffic counts (in order to calibrate micro-simulation model).
- Existing Plus Project– Traffic volumes from existing conditions plus traffic volume estimates for the proposed Project.
- Baseline No Project– Existing conditions volumes plus traffic estimates for approved, but not yet constructed, developments; background traffic increases due to regional growth expected prior to the proposed Project opening; and approved/funded transportation system improvements expected to be in place when the Project opens.
- Baseline Plus Project– Traffic volumes from Baseline conditions plus traffic volume estimates for the proposed Project.
- Cumulative No Project– Traffic estimates for development patterns as proposed in the *San Rafael General Plan 2020*; background traffic increases due to regional growth expected through year 2020; and approved/funded/proposed transportation system improvements.
- Cumulative Plus Project– Traffic volumes from *San Rafael General Plan 2020* conditions plus traffic volume estimates for the proposed Project

As described in the Project description above since the building was constructed in the late 1970's, through 2006, the building was 100-percent occupied by office. From 2006 to 2016 the building occupancy ranged from 25-percent to 40-percent. The Great Recession and building purchase for re-use contributed to a lower occupancy rate than usual in the last ten years; however, historically, the building has been 100-percent occupied. Thus for the purpose of this analysis the Baseline No Project and Cumulative No Project assumes 100-percent office occupancy.

1.4 STUDY METHODOLOGY

This section describes the study methodology for evaluating intersection operations, freeways, and vehicle-miles-traveled (VMT); and describes the significance criteria for identifying significant project impacts.

1.4.1 Analysis Methods

Intersection and freeway results will be summarized by Level of Service (LOS). LOS is a qualitative description of operations ranging from LOS A, when the roadway facility has excess capacity and vehicles experience little or no delay, to LOS F, where the volume of vehicles exceeds the capacity, resulting in long queues and excessive delays. Typically, LOS E represents "at-capacity" conditions and LOS F represents "over-capacity" conditions. Intersection and freeway LOS were established based on traffic analysis of the study intersections, conducted using a method documented by the Transportation Research Board (TRB) in the 2010 Highway Capacity Manual (HCM).

1.4.1.1 Study Intersections

The traffic analysis software Synchro/SimTraffic 9.0 was used for this study and was based on the City's existing traffic model. For purposes of modeling the entire network as a "system", micro-simulation (SimTraffic) was used. The primary difference between SimTraffic and HCM is that the HCM analyzes intersections in isolation and does not include the effects of upstream or downstream intersections, which directly affect traffic flow. SimTraffic provides measures of effectiveness that are consistent with the HCM such as movement delay and weighted average delay.

For signalized intersections, the LOS is based on the average delay experienced by all vehicles passing through the intersection. This methodology uses various intersection characteristics (such as traffic volumes, lane geometry, and signal phasing) to estimate the delay per vehicle. The delay is the portion of the total delay attributed to the signal operations and includes initial deceleration, queue move up time, time stopped, and acceleration.

At unsignalized intersections, operations are defined by the average control delay per vehicle (measured in seconds) for each stop-controlled movement. This incorporates delay associated with deceleration, acceleration, stopping, and moving up in the queue. For side-street stop-controlled intersections, LOS is not defined for the intersection as a whole. Instead, the average delay and associated LOS reported in this study is for the worst-case controlled approach. For all-way stop-controlled intersections, the LOS is represented by the average control delay for the whole intersection.

Table 1-2 shows the correlation of average control delays and LOS designations for signalized and unsignalized intersections.

TABLE 1-2: INTERSECTION LOS CRITERIA		
Level of Service	Average Control Delay (seconds/vehicle)	
	Signalized	Unsignalized
A	< 10.0	< 10.0
B	> 10.0 to 20.0	> 10.0 – 15.0
C	> 20.0 to 35.0	> 15.0 – 25.0
D	> 35.0 to 55.0	> 25.0 – 35.0
E	> 55.0 to 80.0	> 35.0 – 50.0
F	> 80.0	> 50.0

Source: 2010 Highway Capacity Manual.

1.4.1.2 Freeways

Similar to intersection, the operating characteristics of freeway basic, merge, and diverge segments are evaluated using the concept of LOS. Freeway section LOS is based on vehicle density (passenger cars per lane per mile). **Table 1-3** shows the correlation of density and LOS. Freeway ramp density was calculated using the methods described in Chapter 13 of the HCM. The inputs to calculate freeway segment densities would be obtained through Caltrans data and field observations.

The purpose of the freeway analysis is to determine the Project's contribution to the available capacity on the freeway; therefore, the Highway Capacity Software (HCS) was used to complete this analysis. HCS is an appropriate analysis tool because it applies the freeway methodologies in the HCM by accounting for the volume demand and available capacity by segment. The HCS tool is a static model which does not account for downstream queues. However, since the purpose of this analysis is to determine the Project's contribution to the regional network, and not to determine or mitigate existing bottlenecks or queues, the static model approach was the most appropriate to account for the Project's contribution. To supplement for existing queues as a result of downstream bottlenecks, field observations were completed and included in analysis findings.

TABLE 1-3: FREEWAY LOS CRITERIA

LOS	Density (pc/mi/ln) ¹
A	< 11
B	> 11 – 18
C	> 18 – 26
D	> 26 – 35
E	> 35 – 45
F	> 45

Notes:

1. pc/mi/ln = passenger car per mile per lane

Source: 2010 Highway Capacity Manual.

1.4.1.3 Vehicle Miles Traveled Analysis

The VMT analysis forecasted the Project employee VMT and compared them to future projected VMT based on the regional transportation and land use model provided by the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG). The proposed Project will move employees from existing compressed Kaiser facilities in Marin County, to the building at 1650 Los Gamos Drive. As such, the Project is not expected to generate significant additional regional trips, rather, redistribute them to a new location within the region. The VMT analysis is be based on the California

Environmental Quality Act (CEQA) Guidelines on VMT developed by the Governor's Office of Planning and Research per SB 743 (Steinberg, 2013). SB 743 mandates a change in the way that public agencies evaluate the transportation impacts of projects under CEQA, away from LOS. The proposed changes to the CEQA Guidelines are not yet adopted; when they are, VMT will be the new metric for transportation analysis.

1.4.2 Significance Criteria

The following transportation and circulation significance criteria based on the CEQA Guidelines and the *San Rafael General Plan 2020* (City of San Rafael, 2004) are presented below.

The CEQA Guidelines specify that a project would have a significant traffic and circulation impact if it:

- Conflicts with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit.
- Conflicts with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways.
- Results in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks³
- Substantially increases hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).
- Conflicts with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.

1.4.2.1 Signalized Intersections

The *San Rafael General Plan 2020* includes traffic LOS standards for signalized intersections and arterials. These criteria and interpretations consistent with the *San Rafael General Plan 2020* Environmental Impact Report (City of San Rafael, 2004), are presented below.

The citywide LOS standard from the *San Rafael General Plan 2020* is LOS D except as noted below:

³ Air traffic pattern analysis is not part of the scope of work for this Transportation Impact Study and will be addressed elsewhere in the CEQA process.

- LOS E
 - Downtown
 - Irwin Street and Grand Avenue between 2nd Street and Mission Avenue
 - Andersen Drive and West Francisco Boulevard
 - Andersen Drive and Bellam Boulevard
 - Freitas at Civic Center/Redwood Highway
 - Merrydale at Civic Center Drive
- LOS F
 - Mission Avenue and Irwin Street

The *San Rafael General Plan 2020* defines the following as significant impacts:

- If a signalized intersection with baseline traffic volumes is operating at an acceptable LOS and deteriorates to an unacceptable operation with the addition of project traffic
- If a signalized intersection with baseline traffic volumes is at an unacceptable LOS and project traffic causes an increase in the delay of five seconds or more

The *San Rafael General Plan 2020* states that signalized intersections along US 101 and Interstate 580 are exempt from LOS standards because delay at these locations are affected by regional traffic and not significantly impacted by local measures.

1.4.2.2 Unsignalized Intersections

The *San Rafael General Plan 2020* does not provide significance thresholds for unsignalized intersections. Therefore, this analysis utilizes the commonly accepted methodology provided in the Highway Capacity Manual (2010) as documented by the Transportation Research Board. For the purposes of this analysis, a significant impact at an unsignalized intersection would be identified based on the following:

- If an unsignalized intersection with baseline traffic volumes is operating at an acceptable LOS (LOS A, B, C, D, or E) and deteriorates to an unacceptable operation (LOS F) with the addition of Project traffic; or
- If an unsignalized intersection with baseline traffic volumes is already operating at LOS F and Project traffic causes an increase in the delay of five seconds or more.

1.4.2.3 Freeway

The *San Rafael General Plan 2020* and *Transportation Authority of Marin Congestion Management Plan (CMP)* do not provide significance thresholds for freeway segments. Therefore, this analysis utilizes the commonly accepted methodology consistent with other traffic impact studies completed in the surrounding

area. For the purposes of this analysis, a significant impact at a freeway segment would be identified based on the following:

- If operations on US 101 deteriorate from LOS E or better under conditions without the project to LOS F during the AM or PM peak hour; or
- If operations on US 101 operating at unacceptable LOS F under conditions without the project by causing the freeway volume over capacity ratio (v/c) to increase by 0.01 or more (i.e. 1 percent of the freeway segment capacity) during the AM or PM peak hour.

1.4.2.4 Bicycle/Pedestrian

The *San Rafael General Plan 2020* includes the following goals for pedestrian and bicycle conditions:

Goal 16: Bikeways. It is the goal of San Rafael to have safe, convenient and attractive bikeways and amenities.

Goal 17: Pedestrian Paths. It is the goal of San Rafael to have safe, convenient and pleasurable pedestrian amenities.

Consistent with these goals, bicycle/pedestrian impacts would be significant if the project:

- Caused a substantial inconvenience or substantial reduction in quality of service for users of existing bicycle or pedestrian travel
- Substantially reduced bicycle or pedestrian access
- Substantially reduced safety for bicyclists or pedestrians

1.4.2.5 Transit

The *San Rafael General Plan 2020* includes the following goals related to the transit network:

C-14 Transit Network. Encourage the continued development of a safe, efficient, and reliable regional and local transit network to provide convenient alternatives to driving.

Consistent with this goal, transit impacts would be significant if the project:

- Induced substantial growth or concentration of population beyond the capacity of existing or planned public transit facilities.
- Increased demand for public transit service to such a degree that accepted service standards are not maintained.
- Reduced availability of public transit to users, or interfered with existing transit users.

1.4.2.6 Parking

While parking is not considered a parking an environmental impact, a parking analysis was completed for information purposes. The *San Rafael General Plan 2020* includes the following goal related to vehicle parking:

Goal 18: Adequate Parking. It is the goal of San Rafael to provide parking that is adequate and accessible, with attention to good design.

2 EXISTING CONDITIONS

The existing conditions scenario includes present day transportation conditions based on field observations and data collected in the Project vicinity in November 2015. The existing scenario includes quantitative and qualitative analysis for vehicle, pedestrian, bicycle, and transit conditions.

2.1 ROADWAY NETWORK

This section describes the regional and local roadway network in the vicinity of the Project site.

2.1.1 Regional Access

US 101 is the major north-south freeway in Marin County and provides regional access to the project site. The freeway is located less than a half mile east of the project site and extends southward to San Francisco and beyond and northward to Sonoma County and beyond. The freeway provides three travel lanes in each direction, a high occupancy vehicle (HOV) lane in each direction, and occasionally an auxiliary lane in both the northbound and southbound directions. An interchange at Lucas Valley Road/Smith Ranch Road provides access from US 101 to the project site.

Lucas Valley Road is primarily a two-lane road west of US 101 that provides east-west access between US 101 and Lucas Valley to the west. Near the US 101 interchange, Lucas Valley Road becomes a four-lane road, with two lanes in each direction and entrance and exit ramps to US 101. East of US 101, Lucas Valley Road becomes Smith Ranch Road.

2.1.2 Local Access

The local circulation system serving the project vicinity is shown on **Figure 1-1**. The project site is located north of downtown San Rafael and just west of US 101. The following roadways provide local access to the proposed project site.

Los Gamos Drive is a two lane north-south facility with on-street parking and sidewalk on a majority of the corridor and is designated as a Class III bicycle route. The north-south street bisects Lucas Valley Road, just west of US 101, at an unsignalized intersection. The Los Gamos Drive corridor provides access to several buildings fronting the west side of US 101 including the Project site.

Smith Ranch Road is a four-lane road with on-street parking is a major access route from US 101 to the project site. In addition to the unsignalized crosswalk at Silveira Parkway/Smith Ranch Road intersection, there is a marked crosswalk at the Yosemite Road/Smith Ranch Road intersection.

Las Gallinas Avenue is a two-lane road with on-street parking runs north-south, west of US 101. Las Gallinas Avenue also has bicycle lanes running from Nova Albion Way to Miller Creek Road. South of Northgate Drive, Las Gallinas becomes Los Ranchitos Road.

2.2 DATA COLLECTION

Weekday morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) peak period intersection turning movement counts were collected at the study intersections, including separate counts of pedestrians and bicyclists, supplemented with field observations within the Project study area in November 2015. Intersection count data was analyzed to identify, the single hour with the highest traffic volumes during the count periods. The weekday AM peak hour in the study area is generally 7:45 to 8:45 AM and the weekday PM peak hour is generally from 5:00 to 6:00 PM. Peak hour intersection volumes are summarized on **Figure 2-1** along with existing lane configuration and traffic control. The traffic counts for existing conditions are provided in **Appendix A**.

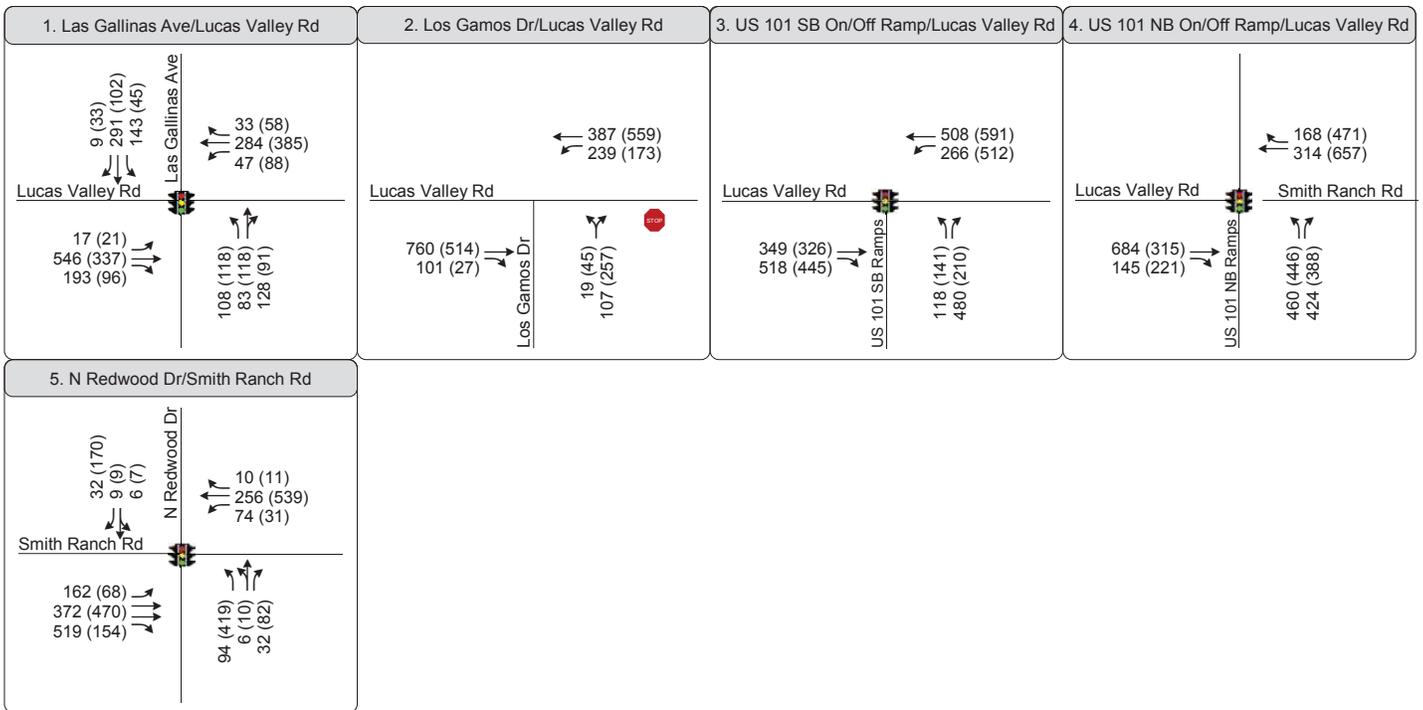
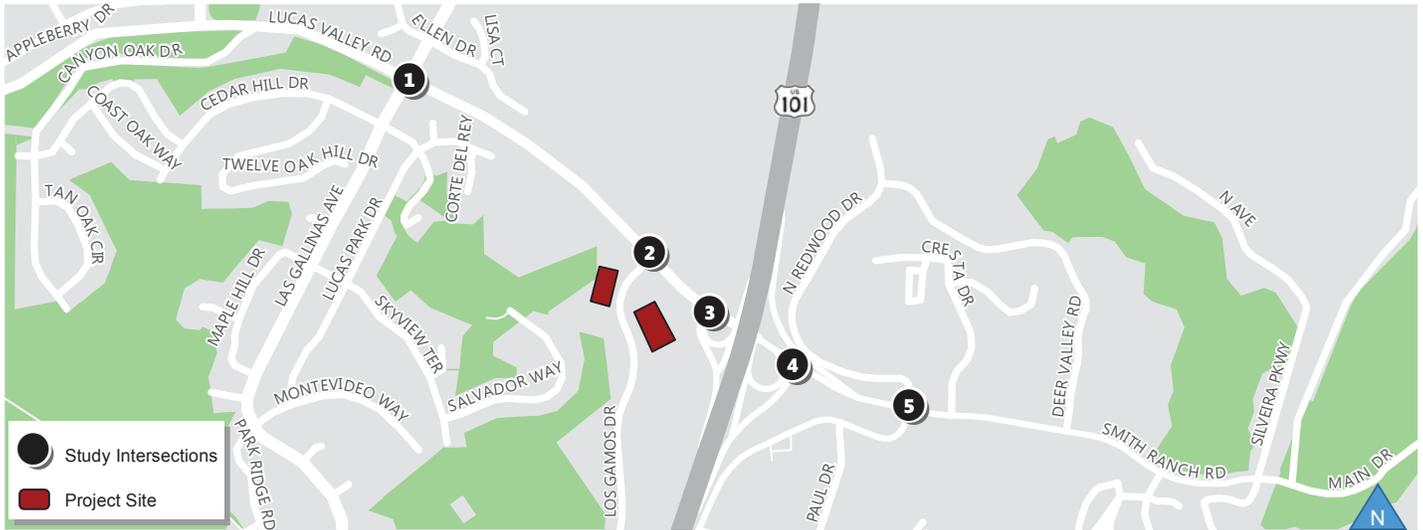
2.3 VEHICLE OPERATIONS

This section describes existing vehicle operations in the Project vicinity.

2.3.1 Intersection Operations

Existing intersection operations were evaluated using the method described in Chapter 1 for the weekday AM and PM peak hours at all study intersections. The existing levels of service of study intersections can be seen in **Table 2-1**. The existing lane configurations and peak hour traffic volumes are shown on **Figure 2-1**. Observed global peak hour factors were used at all intersections for the existing analysis. Pedestrian and bicycle activity was also factored into the analysis.

All intersections are operating at an acceptable level of service C or better during the AM and PM peak hour conditions, consistent with field observations conducted in November 2015. **Appendix B** presents all LOS calculations.



Legend

XX(YY) AM (PM) Peak Hour Traffic



Signalized Intersection



Stop Controlled Approach



Figure 2-1
Existing Peak Hour
Intersection Control, Volumes, and Lane Configuration

TABLE 2-1: INTERSECTION LOS AND DELAY

Intersection	Intersection Control¹	Time Period	LOS^{2,3}	Delay^{2,3}
1. Lucas Valley Road and Las Gallinas Avenue	Signal	AM PM	C B	22 14
2. Lucas Valley Road and Los Gamos Drive	SSSC	AM PM	A (C) A (A)	<10 (17) <10 (<10)
3. Lucas Valley Road and US 101 Southbound Ramps	Signal	AM PM	B C	16 22
4. Lucas Valley Road / Smith Ranch Road and US 101 Northbound Ramps	Signal	AM PM	B B	20 12
5. Lucas Valley Road / Smith Ranch Road and Redwood Drive / Redwood Highway	Signal	AM PM	A B	10 12

Notes:

1. SSSC = Side-Street Stop Control
2. Worst approach is noted for side street stop controlled intersections.
3. **Bold** denotes unacceptable level of service and delay.

Sources: Fehr & Peers, 2017

2.3.1.1 Signal Warrants

The Manual of Uniform Traffic Control (MUTCD) (Federal Highway Administration 2012) presents eight signal warrants to assess if existing stop-controlled intersections warrant signalization. The Peak Hour Volume Warrant (Warrant 3) was used in this study as a supplemental analysis tool to assess operations at the unsignalized intersection of Los Gamos Drive and Lucas Valley Road. Based on this analysis, existing conditions currently fulfill the peak hour warrant for a signalized intersection, therefore a signal should be considered at this intersection. Signal warrant worksheets are provided in **Appendix C**.

2.3.2 Freeway Operations

Under the guidelines detailed in Chapter 1, the on-ramp merge, off-ramp diverge, and basic segments located near the Project site were analyzed. **Table 2-2** summarizes the freeway segment density and LOS results and detailed calculations are included in **Appendix D**. As shown, all segments operate at acceptable levels during the AM and PM peak hour which is consistent with existing field observations with the exception of the southbound segments during the AM peak hour which operates over capacity and under congested conditions. As described in Chapter 1, the analysis software does not account for downstream bottlenecks and as a result, the software accounts for the number of vehicles that are able to use the facility, not the number of vehicles that want to use the facility and are in queue (demand). Additionally, the methodology accounts for the free-flow speed and does not account for the observed or congested speed based on downstream bottlenecks. The southbound AM peak hour queue through the study area is a result

of a downstream bottleneck located between the San Pedro on-ramp and Mission Avenue off-ramp near Downtown San Rafael.

TABLE 2-2: EXISTING CONDITIONS FREEWAY DENSITY AND LOS

Segment	Segment Type	AM Peak Hour		PM Peak Hour	
		Density (pc/mi/ln) ¹	LOS ²	Density (pc/mi/ln) ¹	LOS
Northbound					
Manuel T Freitas Off / Manuel T Freitas On	Basic	19.4	C	28.6	D
Manuel T Freitas On / Redwood Highway On	Basic	15.9	B	33.7	D
Redwood Highway On	Merge	18	B	25.5	C
Smith Ranch Road Off	Basic	16.4	B	24.7	C
Smith Ranch Road Off / Lucas Road EB On	Basic	18	B	21.7	C
Lucas Road EB On / Smith Ranch Road WB On	Basic	14	B	22.4	C
Smith Ranch Road WB On	Merge	16.7	B	25.5	C
Miller Creek Off	Basic	14.5	B	24.1	C
Miller Creek On	Basic	18.7	C	32.9	D
Southbound					
Miller Creek Off	Basic	19.8	F³	21.1	C
Miller Creek On	Merge	28.8	F³	24.7	C
Lucas Valley Road Off	Basic	18.3	F³	16.5	B
Lucas Valley Road Off / Lucas Valley Road On	Basic	21.9	F³	20.5	C
Lucas Valley Road On	Merge	28.6	F³	28.5	D
Lucas Valley Road On / Manuel T Freitas Off	Basic	25.5	F³	24.8	C
Manuel T Freitas Off	Diverge	31.1	F³	30.4	D
Manuel T Freitas Off / Manuel T Freitas On	Basic	21.4	F³	21.4	C

Notes:

1. pc/mi/ln = passenger car per mile per lane
2. **Bold** = unacceptable LOS
3. The LOS results were revised to match existing observations.

Sources: Fehr & Peers, 2017

2.4 BICYCLE & PEDESTRIAN NETWORK

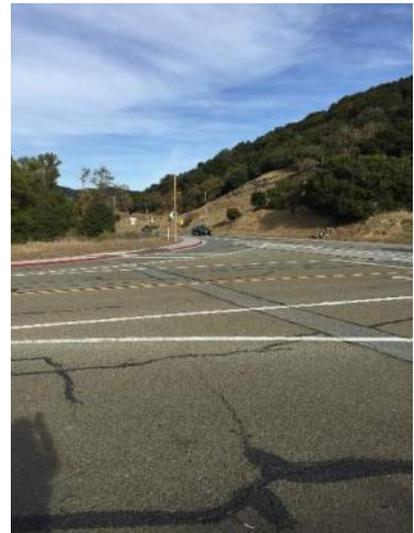
Bicycle facilities are typically described by four classes:

- Class I (Bicycle Path): These facilities are located off-street and can serve both bicyclists and pedestrians
- Class II (Bicycle Lanes): These facilities provide a dedicated area of bicyclists within the paved street width through the use of striping and appropriate signage.
- Class III (Bicycle Routes): These facilities are found along streets that do not provide sufficient width for dedicated Class II bicycle lanes. The street is designated as a bicycle route through the use of signage informing drivers to expect bicyclists.
- Class IV (Cycletrack): These facilities are for the exclusive use of bicycles and requires a vertical element that separates the bikeway and adjacent vehicular traffic.

Currently, Class II bicycle lanes are provided along Las Gallinas Avenue and Lucas Valley Road, west of Los Gamos Drive. Class III facilities are provided along Los Gamos Drive and Frontage Road. **Figure 2-2** illustrates the existing and proposed bicycle facilities in the study area.

Sidewalks are present along Los Gamos Drive and Lucas Valley Road, two roads adjacent to the project site. At the intersection of Los Gamos Drive and Lucas Valley Road there is a crosswalk across Los Gamos Drive serving the east / west direction. Along Lucas Valley Road there is a sidewalk along the south side of the corridor providing access to nearby transit stops; however, there are no pedestrian facilities provided on the north side from Las Gallinas Avenue to North Redwood Drive.

There is a midblock crosswalk on Los Gamos Drive serving the surface parking lot (which is the location of the future parking structure) and 1650 Los Gamos Drive building, as well as sidewalks serving both east and west sides of Los Gamos Drive. Additionally, a narrow sidewalk is provided from the 1650 Los Gamos Drive surface parking lot directly to the Lucas Valley / Southbound US 101 intersection.



*Los Gamos Drive at Lucas Valley Road
east-west crosswalk*

Based on field observations, there are two narrow foot paths located on the south side of Lucas Valley Road to the northbound and southbound transit stops on US 101. The field visit accounted for several pedestrians using the foot path as an alternate route to and from the transit stop to decrease their walk distance.

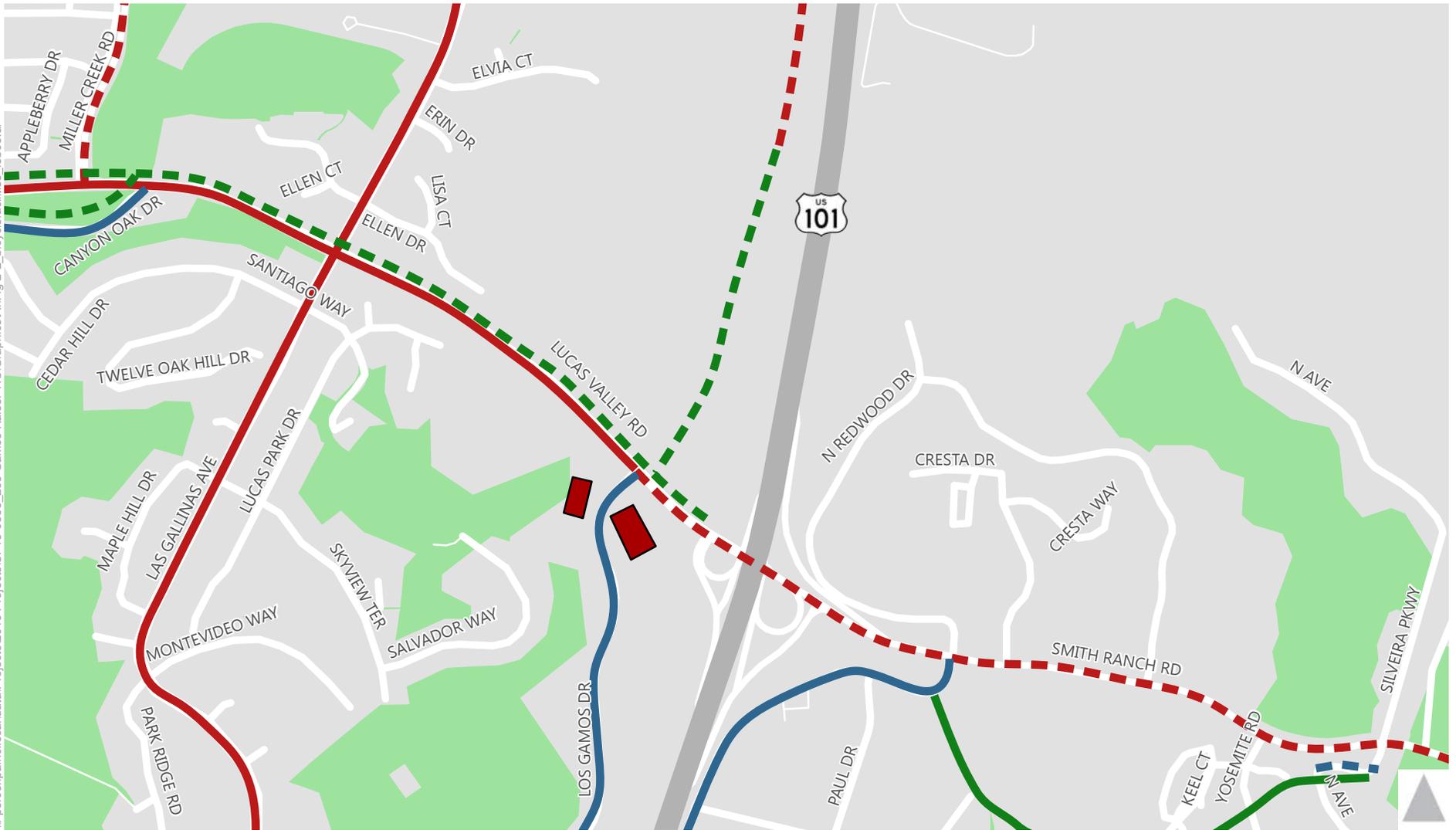


Sidewalk from Lucas Valley Road to Southbound US 101 Transit Stop



Footpath from Lucas Valley Road to Southbound US 101 Transit Stop

\\fpost03.fpainc.local\data\Projects\2015 Projects\SF15-0858_Los Gamos Kaiser TIS\Graphics\MapFig 2-2_bicyclefacilities_feb03.ai



- | | | | | |
|----------|----------|--------------------------------|--|--------------|
| Existing | Proposed | | | |
| | | Class I Bikeway/Multi-Use Path | | Project Site |
| | | Class II Bikeway | | |
| | | Class III Bikeway | | |



Figure 2-2

Existing and Proposed Bicycle Facilities in Project Vicinity

2.5 TRANSIT NETWORK

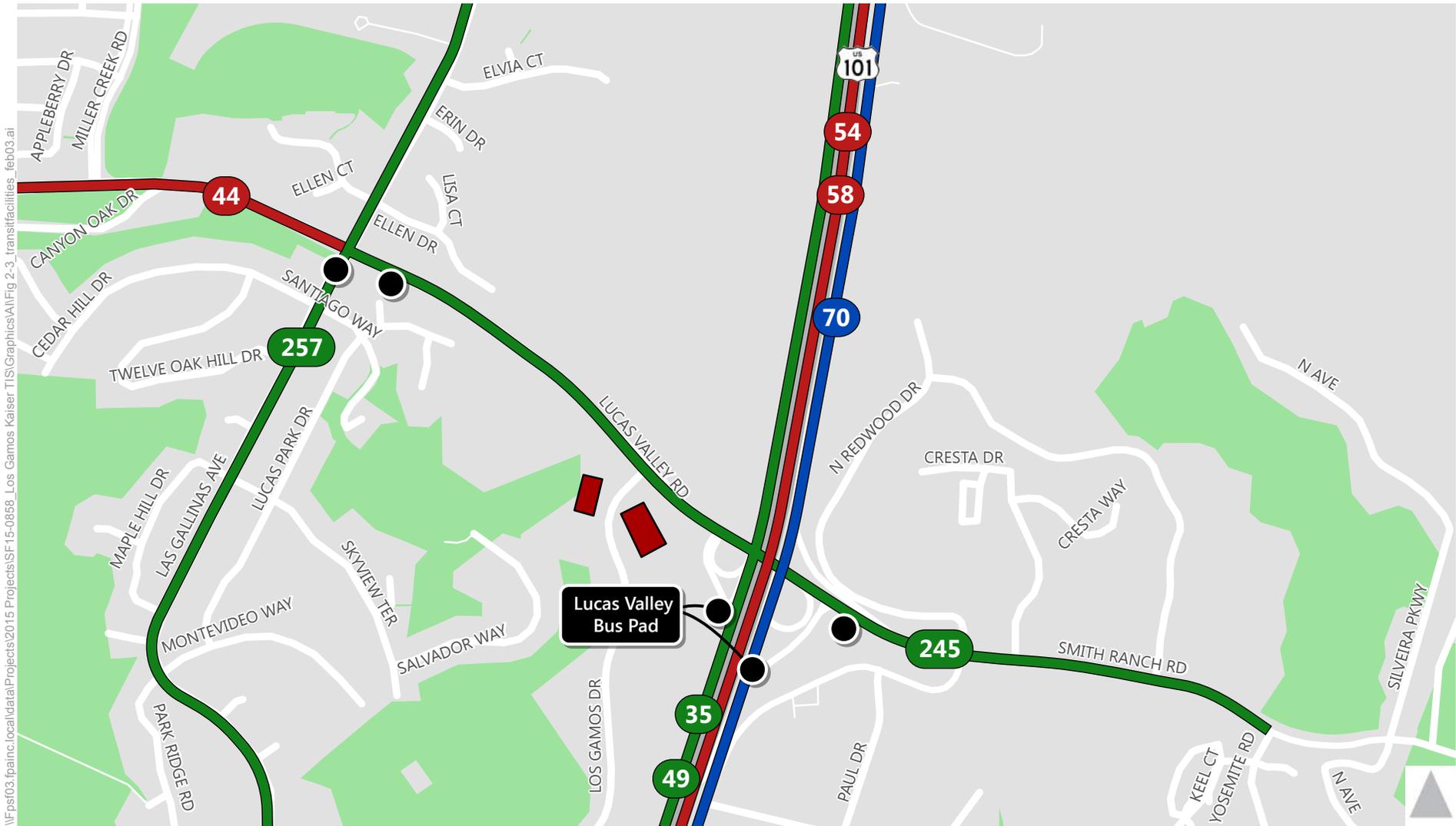
Golden Gate Transit is the primary regional transit provider within Marin and Sonoma Counties. Golden Gate Transit provides extensive bus service to the San Rafael Transit Center in Downtown San Rafael from Marin and Sonoma counties, San Francisco, and Contra Costa County. Marin Transit provides local bus service within Marin County. Bus service in the Project vicinity is provided along Lucas Valley, Smith Ranch Road, Las Gallinas Avenue, and along US 101. **Figure 2-3** illustrates the existing Golden Gate Transit and Marin Transit routes in the vicinity of the Project site. **Table 2-3** describes the service provided on these routes and the nearest stops to the site. The nearest bus stop is at the US 101 / Lucas Valley Road interchange.

US 101 is an active bus corridor, particularly for regional bus travel. The bus stops at the US 101 / Lucas Valley Road interchange, referred to as the Lucas Valley Bus Pad, allows for nearby access and serves both local and regional routes serving people with origins or destinations outside the immediate vicinity. A Park & Ride surface lot is provided just east of the US 101 / Lucas Valley Road interchange. Two bus stops located near the Lucas Valley Road and Las Gallinas Avenue intersection, located 0.6 miles west of the Project site, serves routes including the 44, 245, and 257. Commute routes including route 44, 54, and 58 offer transportation to San Francisco though do not offer weekend services. Marin transit routes including route 35, 49, and 245 offer local service operating each day of the week.

TABLE 2-3: GOLDEN GATE TRANSIT SERVICE SUMMARY

Line ¹	Route	Nearest Stop	Weekday Operations		Weekend Operations	
			Hours of Operation	Frequency	Hours of Operation	Frequency
35	Canal-Novato	Lucas Valley Bus Pad	6:05 AM – 8:11 PM (SB) 6:41 AM – 11:12 PM (NB)	30 minutes	6:49 AM – 7:41 PM (SB) 7:11 AM – 11:05PM (NB)	30 minutes
44	Marinwood-San Francisco	Lucas Valley and Las Gallinas	6:41 AM – 9:04 AM (SB) 5:05 PM – 7:29 PM (NB)	60 minutes	-	-
49	San Rafael-Novato	Lucas Valley Bus Pad	6:11 AM – 8:10 PM (SB) 6:15 AM – 9:01 PM (NB)	30 minutes	8:20 AM – 10:55 PM (SB) 7:15 AM – 9:41 PM (NB)	60 minutes
54	Marin-San Francisco	Lucas Valley Bus Pad	4:40 AM – 10:02 AM (SB) 2:27 PM – 8:29 PM (NB)	30 minutes	-	-
58	Novato-San Francisco	Lucas Valley Bus Pad	6:06 AM – 9:06 AM (SB) 4:26 PM – 6:57 PM (NB)	30 minutes	-	-
70	Novato-San Francisco	Lucas Valley Bus Pad	5:00 AM – 12:38 AM (SB) 5:00 AM – 1:26 AM (NB)	60 minutes	5:00 AM – 12:28 PM (SB) 5:55 AM – 1:28 AM (NB)	60 minutes
245	Gallinas-San Rafael	Las Gallinas Ave/Cedar Hill Dr	7:28 AM – 6:55 PM (SB) 7:00 AM – 6:26 PM (NB)	60 minutes	7:30 AM – 6:55 PM (SB) 7:00 AM – 6:26 PM (NB)	60 minutes
257	San Rafael/Ignacio	Las Gallinas Ave/Cedar Hill Dr	6:00 AM - 10:25 PM (SB) 7:30 AM – 9:22 PM (NB)	60 minutes	-	-

Source: Golden Gate Transit and Marin Transit, 2017



Existing



Local Routes (35, 49, 257)

Commuter Routes (44, 54, 58)



Regional Routes (70)



Bus Stop



Project Site



Figure 2-3

Existing Transit Facilities in Project Vicinity

3 PROJECT CONDITIONS

This chapter provides an overview of the proposed Project components and summarizes the proposed Project trip generation, distribution, and assignment characteristics, allowing for an evaluation of Project impacts on the surrounding roadway network. The amount of traffic associated with the Project was estimated using a three-step process:

- 1) **Trip Generation** – The *amount* of vehicle traffic entering/exiting the Project site was estimated.
- 2) **Trip Distribution** – The *direction* of trips would use to approach and depart the site was projected.
- 3) **Trip Assignment** – Trips were then *assigned* to specific roadway segments and intersection turning movements.

3.1 PROJECT DESCRIPTION

As described in Chapter 1, the Project site is located at 1650 Los Gamos Drive in San Rafael, California, and is bound by Lucas Valley Road to the north, 1600 Los Gamos Drive to the south, US 101 to the east, and the hillside to the west of Los Gamos Drive, as illustrated on **Figure 1-1**.

The proposed Project is part of an existing office complex. The Project would permit the addition of medical office as an allowed use for the existing 150,000⁴ square foot building located at 1650 Los Gamos Drive. The Project applicant also proposes to construct an up to 511-space parking garage structure on the west side of Los Gamos Drive, where there is an existing surface lot associated with the building. The project will also continue to use 42 existing parking spaces located on the adjacent property at 1600 Los Gamos Drive. For purposes of the transportation analysis, the building was assumed to be 150,000 square feet, the maximum amount of development allowed under the existing zoning.

3.1.1 Transportation Demand Management (TDM) Considerations

Transportation Demand Management (TDM) are programs or tools that incentivize users to change their transportation mode choice from a single occupant vehicle. As a result, a TDM program can reduce impacts to a transportation system by reducing trip generation, air quality, energy use, and travel costs, while still

⁴ The existing building is 148,000 square feet; however, the Planned Development District allows up to 150,000 square feet of office space so for the purpose of the analysis, we have assumed a 150,000 square-foot building, though the Project does not plan to rebuild or construct the remaining 2,000 square foot balance.

preserving mobility options. As part of the PD District approval, the building and Project is subject to participating in a TDM program that includes:

- A TSM manager who is responsible for but not limited to: developing and disseminating transportation information, aiding employees in the selection of transportation options, communicating available transit alternatives, and informing tenants of the benefits of flexible work schedules;
- A transit information center that describes current public transit, buspools, vanpools, carpools and shuttle services serving the area;
- A carpool and vanpool matching program

In addition to the above program, the Project developer is considering additional TDM program strategies which are currently implemented at nearby Kaiser Permanente facilities, including:

- Commuter subsidy for transit or vanpool use
- Pre-tax community spending accounts
- Guaranteed Ride Home program
- Internal website that provides information on San Rafael Kaiser Permanente TDM and alternative modes of transportation
- Designated bicycle parking on-site

The Project applicant applies similar strategies at other Bay Area locations to reduce trip generation. However, for the purpose of this analysis, TDM strategies were not applied and trip generation reductions were not assumed; therefore, the Project trip generation is conservative.

3.2 PROJECT TRIP GENERATION

Trip generation refers to the process of estimating the amount of vehicular traffic a project would add to the surrounding roadway system. Estimates are created on a daily basis and for the peak one-hour periods during the morning and evening commute periods when traffic volumes on the adjacent streets are the highest. The Project trip generation was estimated using rates from the Institute of Transportation Engineers *Trip Generation* (9th Edition) land use numbers 710 (office building) and 720 (medical office building).

The net new project trips represent the increase in vehicular trips that the building would generate after the 150,000 square feet building is occupied by medical office instead of general office. **Table 3-1** shows the Project's daily, weekday AM peak hour, and weekday PM peak hour contribution. . As shown, the Project would contribute 3,765 daily, 125 AM and 312 PM peak hour trips.

TABLE 3-1: PROJECT TRIP GENERATION ESTIMATES										
Scenario	Land Use	ITE Code ₁	Size (KSF) ^{2, 3}	Daily	AM Peak Hour			PM Peak Hour		
					In	Out	Total	In	Out	Total
Planned Development (PD) Allowed	General Office	710	150	1,655	206	28	234	38	186	224
Proposed Project	Medical Office	720	150	5,420	284	75	359	150	386	536
NET NEW PROJECT TRIPS				3,765	78	47	125	112	200	312

Notes:

1. Trip generated based on Institute of Transportation Engineers (ITE), Trip Generation (9th Edition) equations for:

General Office (Land Use Code 710):

Daily: 11.03

AM Peak Hour: 1.56; Enter = 88%; Exit = 12%

PM Peak Hour: 1.49; Enter = 17%; Exit = 83%

Medical Office (Land Use Code 720):

Daily: 36.13

AM Peak Hour: 2.39; Enter= 79% Exit= 21%

PM Peak Hour: 3.57; Enter= 28% Exit= 72%

2. ksf = 1,000 square-feet

3. The existing building is 148,000 square feet; however, the Planned Development District allows up to 150,000 square feet of office space so for the purpose of the analysis, we have assumed a 150,000 square-foot building, though the Project does not plan to rebuild or construct the remaining 2,000 square foot balance.

Source: Trip Generation (9th Edition), ITE, 2012; Fehr & Peers, 2017.

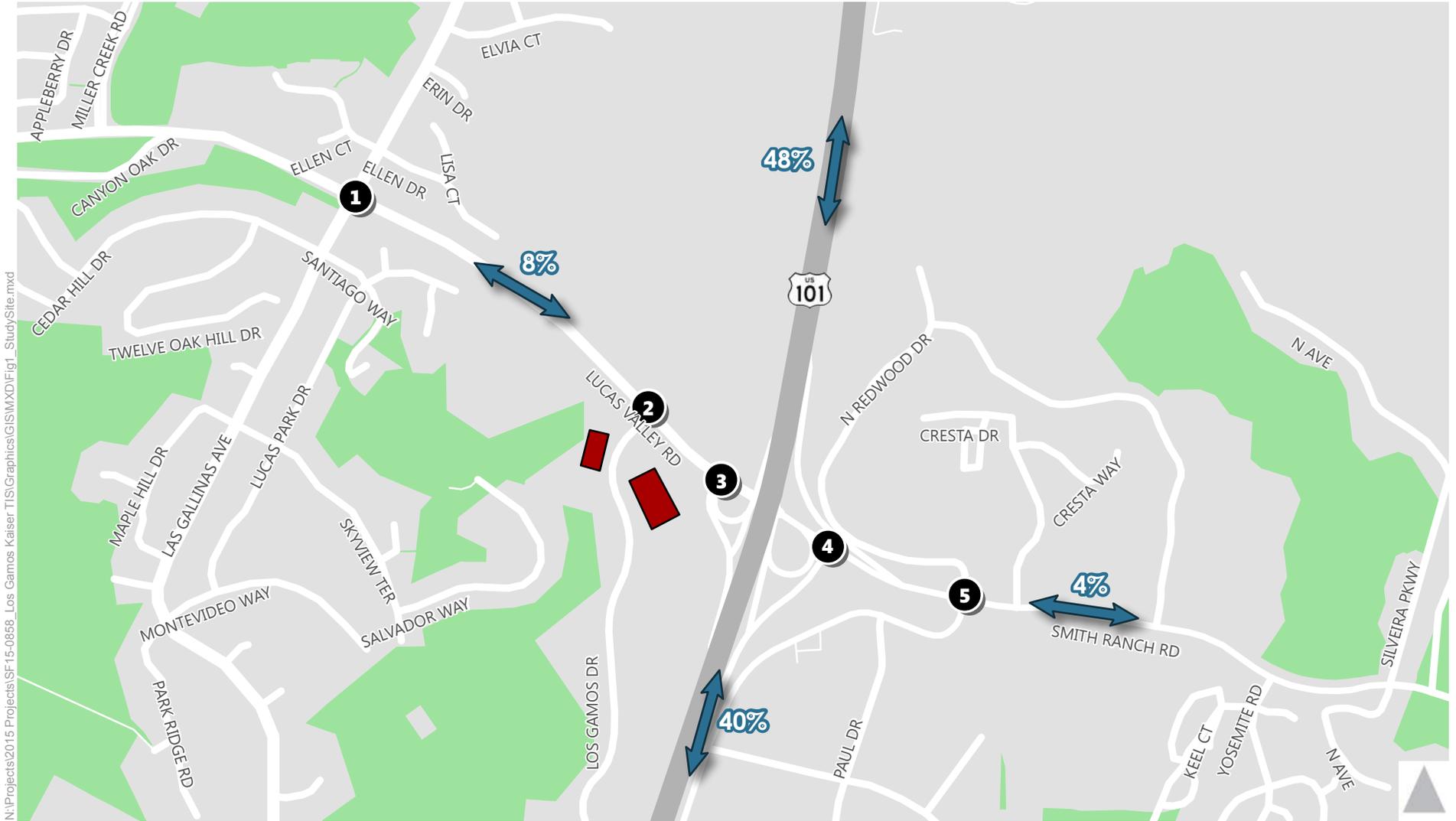
3.3 PROJECT TRIP DISTRIBUTION & ASSIGNMENT

Trip distribution percentages, as shown in **Table 3-2** and **Figure 3-1**, were developed based on the Project site location, anonymous existing Kaiser Permanente employee and membership data, existing intersection counts, and surrounding land uses. Net new Project-generated trips, as summarized in **Table 3-1**, were assigned to the roadway system based on the trip distribution patterns shown below. **Figure 3-2** illustrates the net new Project trip assignments at the five study intersections compared to the No Project.

TABLE 3-2: TRIP DISTRIBUTION

Origin/Destination	Percentage
US 101 North	48%
US- 101 South	40%
Lucas Valley Road	8%
Redwood Highway	4%
Total	100%

Source: Fehr & Peers, 2017.



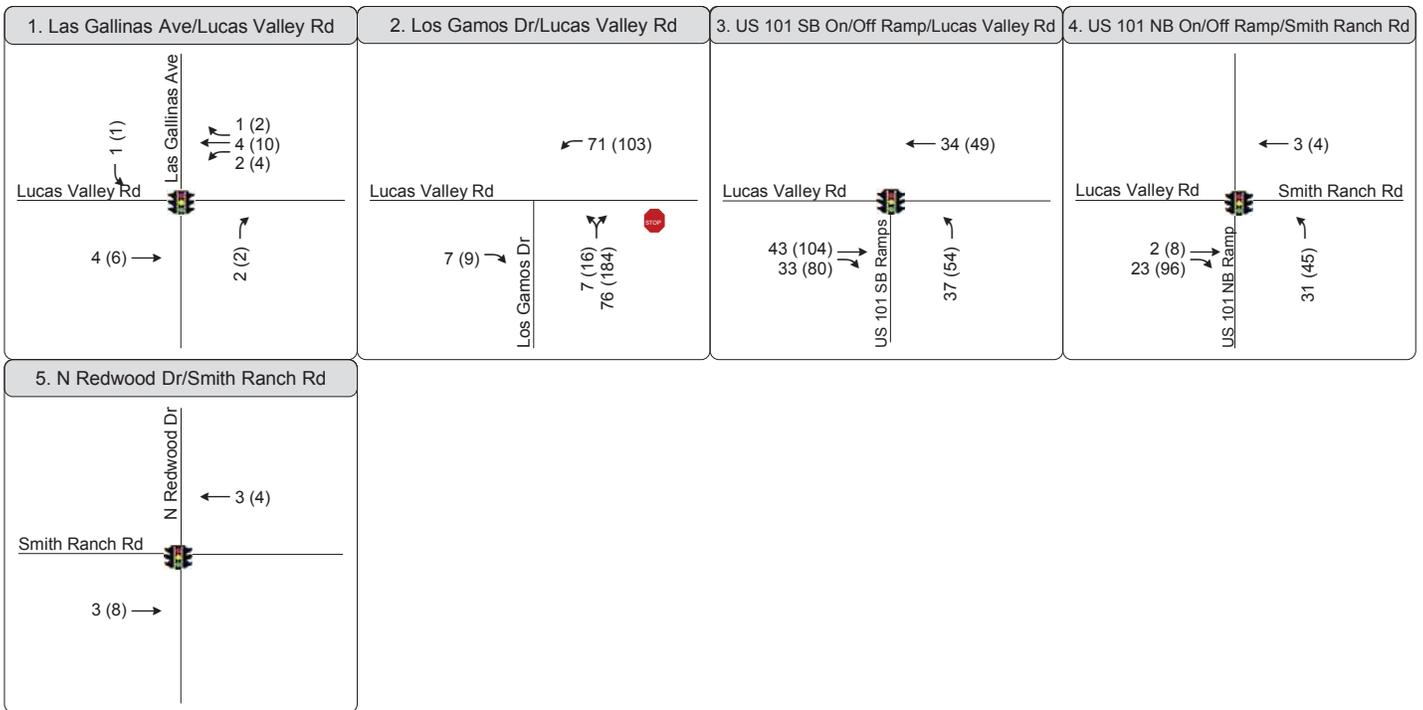
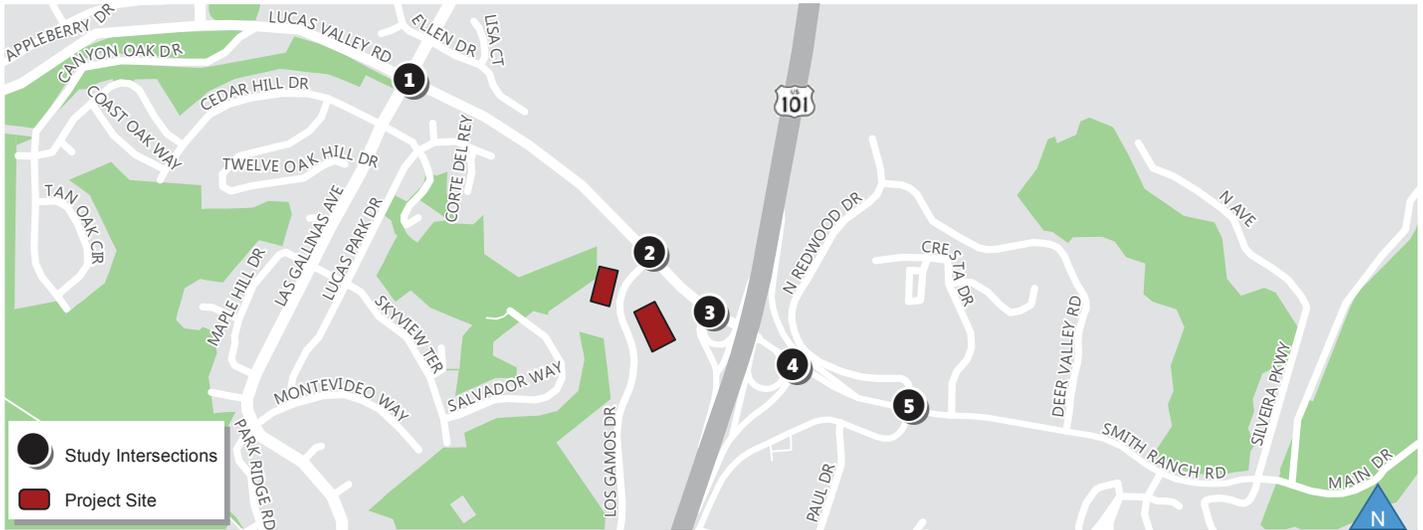
N:\Projects\2015 Projects\SF15-0868_Los Gamos Kaiser TIS\Graphics\GISMXD\Fig1_StudySite.mxd

● Study Intersections

■ Project Site



Figure 3-1
Project Trip Distribution



Legend

XX(YY) AM (PM) Peak Hour Traffic



Signalized Intersection



Stop Controlled Approach

Note: Project Trip Assignment based on project trips added on top of Planned Development District Allowed (100% office)



Figure 3-2
Project Trip Assignment

4 VEHICLE MILES TRAVELED EVALUATION

A Vehicle Miles Traveled (VMT) analysis was completed for the Project. Although not currently required, the applicant anticipates the CEQA Guidelines will be revised to include VMT analysis in the near future. Caltrans has released new internal interim intergovernmental review (IGR) guidance to its districts which accepts VMT analysis. While the results of this analysis are for informational purposes only, the methodology and analysis summary is consistent with Caltrans procedures.

This section explains the methodology used to calculate the daily VMT per Kaiser Permanente Employee. The results are presented along with a short discussion below.

4.1 ASSUMPTIONS & METHODOLOGY

Kaiser Permanente is planning to staff the Project site with 315 employees at full build out. Approximately 75-percent (245) of the staff at the Proposed Project will be relocated from three existing Kaiser Permanente facilities in Marin County: Downtown San Rafael, San Rafael medical Center, and Novato. The remaining 25-percent (70) are expected to be new employees. The number of existing Kaiser staff at other facilities that are estimated to move to the Proposed Project are presented in **Table 4-1**.

TABLE 4-1: KAISER EMPLOYEES MOVING FROM EXISTING FACILITIES TO PROPOSED PROJECT			
Existing Facility Name	Existing Facility Location	Estimated Number of Employees Planned to Relocate to 1650 Los Gamos Drive	
		Number	Percent
Downtown San Rafael	1033 3rd St, San Rafael	53	22%
San Rafael Medical Center	99 Montecillo Rd, San Rafael	171	70%
Novato	97 San Marin Dr, Novato	5	2%
Other sites	Mill Valley & Paul Drive (San Rafael)	16	6%
Total		245	100%

Source: Kaiser Permanente, 2017

Kaiser Permanente provided anonymous employee zip code data for existing employees that work at the three main locations which employees are to transfer from nearby Kaiser facilities. **Figure 4-1** illustrates the existing employee residential distribution.

VMT per employee was calculated, consistent with methodologies outlined in the IGR for office developments. Using Kaiser Permanente employee data above, the distance between existing employee zip

codes and the three existing Kaiser Permanente facilities near the Project site. The average VMT per employee by existing facility was calculated by using the weighted average of distances between each site and zip based on the number of employees residing in each zip code. The weighted average of the VMT per existing employee was calculate to/from the existing facilities based on the number of staff that are planned to move to the Proposed Project from the existing facilities in order to determine the average VMT per employee at the proposed Project.

The main limitation of this approach are that distances were calculated based on zip codes, which provides an approximate estimate of distance traveled. Additionally, zip code data was available for only three of the five existing Kaiser facilities that plan to move employees to the Proposed Project. However, approximately 93-percent of the 245 existing employees that would move to the Proposed Project currently work at the three sites. As shown in **Figure 4-1**, the distribution of home locations for the three sites used to estimate average VMT were similar; therefore the analysis assumes that the distribution of home locations for existing Kaiser Permanente employees at the Mill Valley and Paul Drive (San Rafael) site, and new Kaiser Permanente employees as part of the proposed Project would parallel the existing distribution and would not fundamentally alter the results.

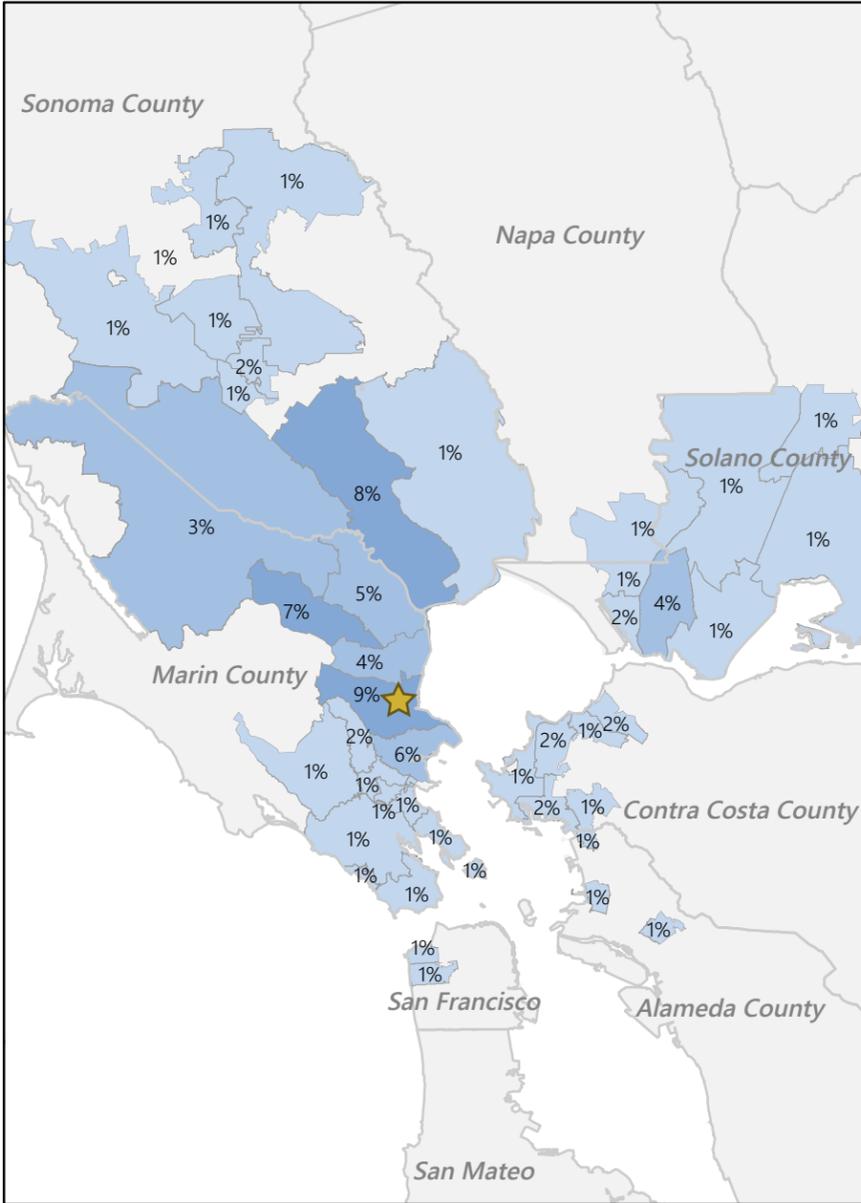
Since many of the existing facilities are overcrowded, not all of the employees that will be relocated to 1650 Los Gamos Drive will be backfilled at their current location. However, for a conservative VMT analysis, it was assumed that all of the Project employees will result in new VMT and off-sets from a reduction of trips at the existing Kaiser sites were not incorporated in the analysis. As a result, the actual VMT generated by the Project would likely be less than assumed in the following analysis.

4.1.1 Significance Criteria

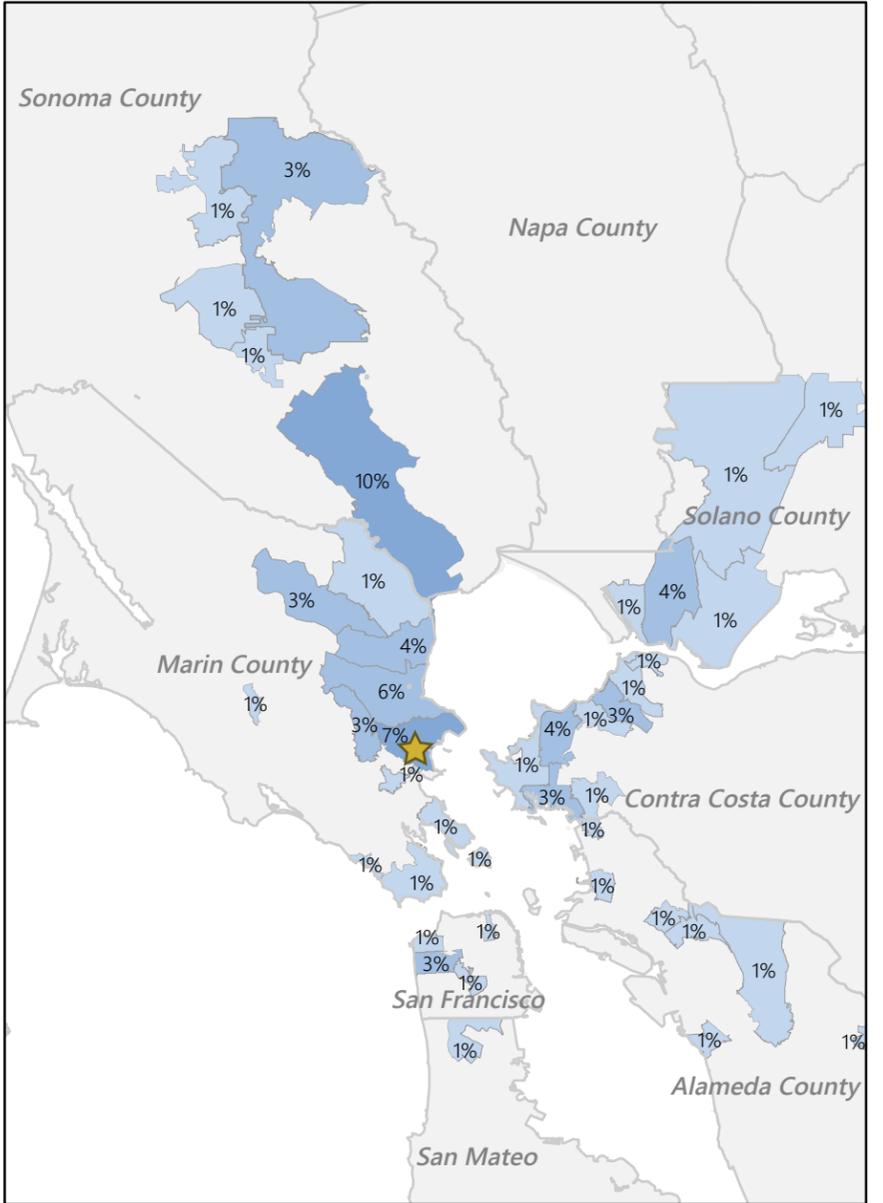
As noted above, the results of this analysis are for informational purposes because the local agency has yet to adopt VMT thresholds; therefore, there is no formal significance criteria set for the VMT analysis. However, in order to understand the Project's contribution to the transportation network, the Governor's Office of Planning and Research (OPR) Technical Advisory recommendations, consistent with guidance presented in Caltrans IGR, were used. In summary, OPR's Technical Advisory states that office developments that would generate vehicle travel exceeding 15-percent below existing VMT per employee for the region may indicate a significant transportation impact.

For this analysis, VMT per employee results were compared to the Project Transportation Analysis Zone (TAZ) from the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG) regional model. Existing VMT data by TAZ was not available, so the Projected VMT estimates for Year 2020 were used.

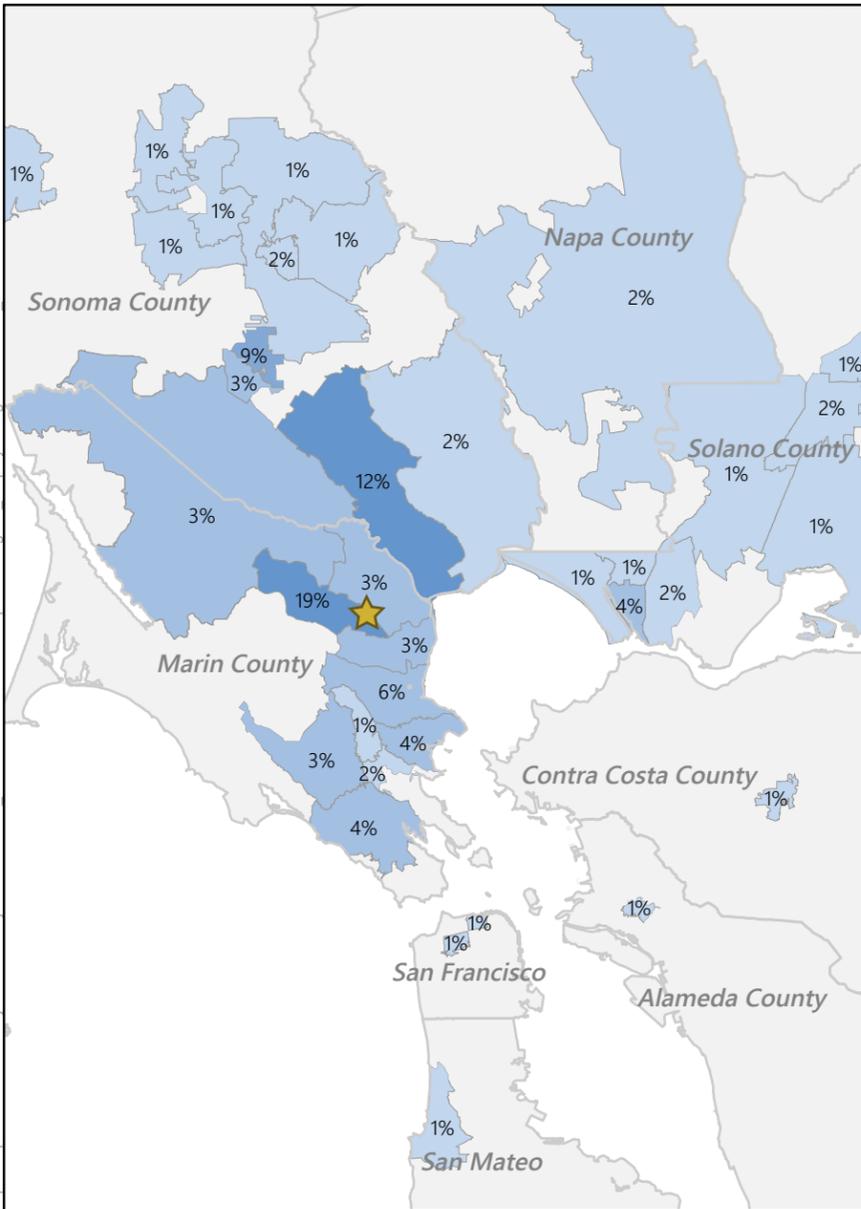
Los Gamos Medical Office



Downtown San Rafael Medical Office



Novato Medical Office



San Rafael Medical Center

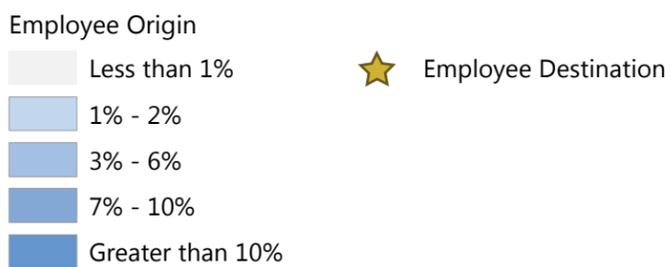
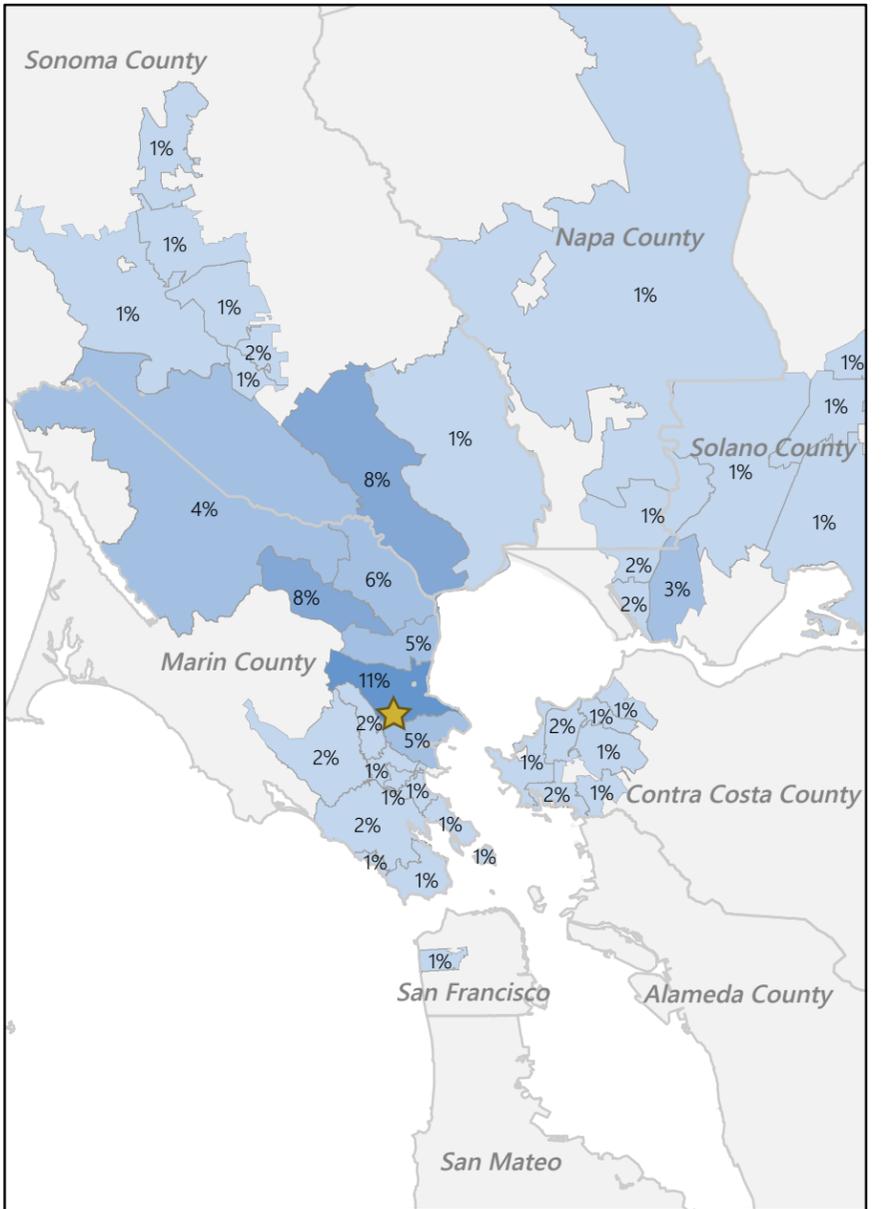


Figure 4-1
Employee Origin-Destination

4.2 RESULTS

The results of the analysis described above are presented in **Table 4-2**. A detailed summary of the analysis results and information gathered from the MTC/ABAG model for Baseline (2020) and Cumulative (2040) conditions is presented in **Appendix E**.

The MTC/ABAG model projects that the 2020 VMT per employee for the Project site TAZ is 32 VMT per employee. A 15-percent reduction of the project VMT per employee would result in 27 VMT per employee. As shown, the average trip length for employees at the proposed Project is estimated to be 20 miles, 40-percent under the 2020 projected VMT per employee. Therefore, based on the OPR's Technical Advisory, the Project would not result in a significant impact.

TABLE 4-2: AVERAGE VMT PER EMPLOYEE COMPARISON			
2020 MTC/ABAG Model		Kaiser Permanente	
Estimated Average VMT / Employee ¹	Maximum Average VMT/Employee ²	Empirically Derived Estimated Average VMT / Employee ^{3,4}	Below Maximum Average VMT / Employee?
32	27	20	Yes

Notes:

1. 2020 VMT/Employee estimates are determined by the MTC regional travel model for the TAZ zone where the facility is located.
2. Maximum average VMT/Employee based on 15-percent reduction from baseline per OPR's Technical Advisory.
3. Average VMT/Kaiser Employee at existing facilities is based on anonymous employee home zip code data provided by Kaiser Permanente.
4. Average VMT/Kaiser Employee at Proposed Project is based on Average VMT/Kaiser Employee at existing facilities and the planned number of employees to be moved to the Proposed Project from each existing facility.

Source: Fehr & Peers, 2017

5 EXISTING PLUS PROJECT CONDITIONS

This chapter evaluates potential traffic impacts under Existing Plus Project conditions.

5.1 ASSUMED ROADWAY IMPROVEMENTS

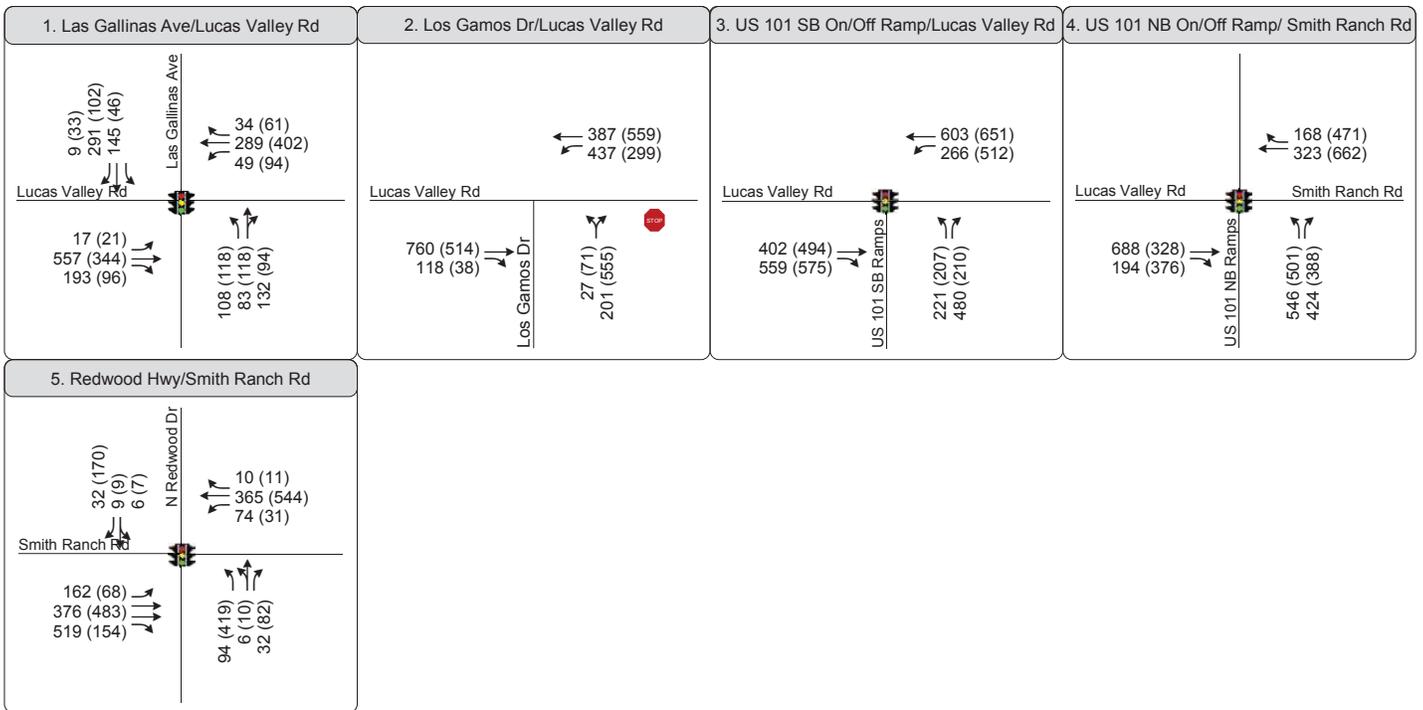
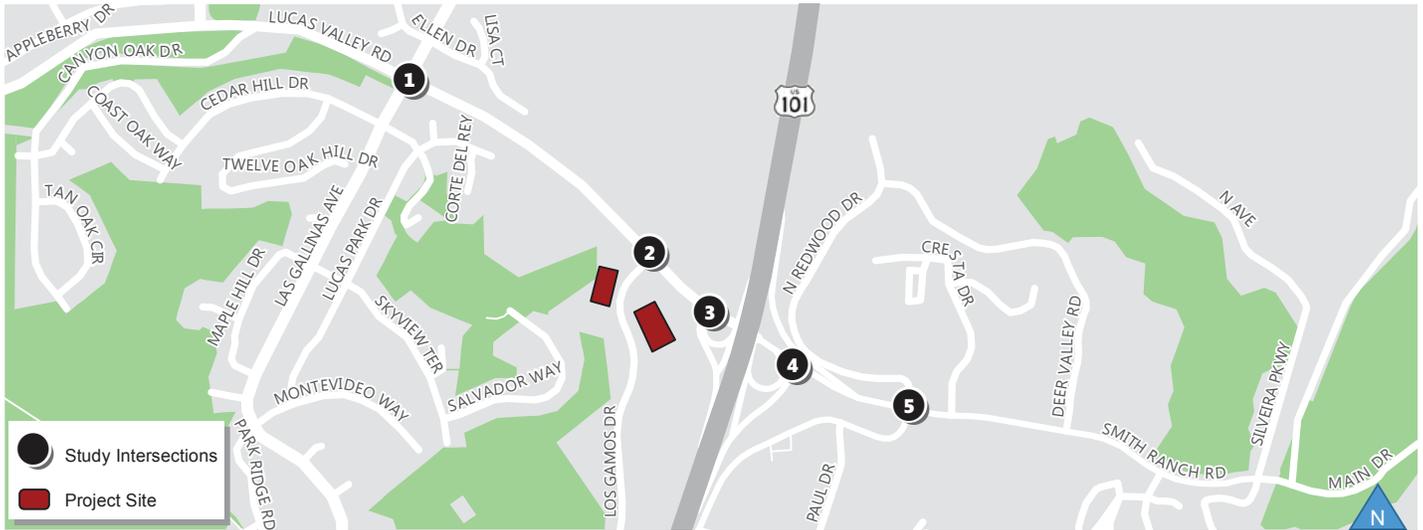
No roadway improvements are anticipated as part of the Project. As such, no additional improvements were included as part of the Existing Plus Project analysis.

5.2 VEHICLE OPERATIONS

This section describes the Project's impacts to the transportation network under the Existing Plus Project scenario.

5.2.1 Traffic Volumes

Project-generated traffic volumes were added to the existing peak hour traffic volumes to estimate the Existing Plus Project peak hour traffic volumes as shown on **Figure 5-1**. No roadway improvements were assumed as part of the Project.



Legend

XX(YY) AM (PM) Peak Hour Traffic



Signalized Intersection



Stop Controlled Approach



Figure 5-1
Existing Plus Project
Peak Hour Intersection Control, Volumes, and Lane Configurations

5.2.2 Intersection Operations

Existing Plus Project conditions were evaluated using the methods described in Chapter 1. The Existing Plus Project analysis results are presented in **Table 5-1** and are based on the traffic volumes shown on **Figure 5-1**.

TABLE 5-1: EXISTING INTERSECTION LEVEL OF SERVICE AND DELAY RESULTS						
Intersection	Intersection Control ¹	Time Period	Existing No Project		Existing Plus Project	
			LOS ^{2,3}	Delay ^{2,3}	LOS ^{2,3}	Delay ^{2,3}
1. Lucas Valley Road and Las Gallinas Avenue	Signal	AM PM	C B	22 14	C B	22 14
2. Lucas Valley Road and Los Gamos Drive	SSSC	AM PM	A (C) A (A)	<10 (17) <10 (<10)	B (E) D (F)	15 (37) 30 (>50)
3. Lucas Valley Road and US 101 Southbound Ramps	Signal	AM PM	B C	16 22	C D	24 51
4. Lucas Valley Road / Smith Ranch Road and US 101 Northbound Ramps	Signal	AM PM	B B	20 12	E B	56 12
5. Lucas Valley Road / Smith Ranch Road and Redwood Drive / Redwood Highway	Signal	AM PM	A B	10 12	A B	10 12

Notes:

1. SSSC = Side-Street Stop Control
2. Worst approach is noted for side street stop controlled intersections.
3. **Bold** denotes unacceptable level of service and delay.

Sources: Fehr & Peers, 2016

As shown on **Table 5-1**, signalized intersections would continue to operate at LOS D or better with the exception of the Lucas Valley Road/Smith Ranch Road/US 101 Northbound Ramps intersection. The intersection operating conditions would worsen from LOS B to LOS E with the Project during the AM peak hour and would continue to operate at the acceptable LOS B during the PM peak hour. The Project's contribution during the AM peak hour would worsen the intersection operations below the LOS D threshold during the AM peak hour which triggers a significant impact. However, the *San Rafael 2020 General Plan* exempts US 101 interchange intersections from LOS standards because delay at these locations are affected by regional traffic and not significantly impacted by local measures. Therefore, the Project's contribution to the Lucas Valley Road/Smith Ranch Road/US 101 intersection is not considered a significant impact. Though the Project does not result in an impact, a potential improvement was identified for informational purposes. Signal timings should be adjusted at the Lucas Valley Road/Smith Ranch Road/US 101 Northbound Ramps intersection to account for the new intersection demand. With implementation,

operations at the Lucas Valley Road / Smith Ranch Road / US 101 Northbound Ramps would reduce the Project's impact to less than significant, if the intersection were subject to the significance criteria, similar to other intersections included in this study.

The addition of Project traffic at the Lucas Valley Road/Los Gamos Drive side street stop controlled intersection would increase vehicle delay during the AM and PM peak hour. Although the intersection would continue to operate at LOS D or better during Existing Plus Project conditions, average delay and associated LOS for the side-street stop-controlled intersection is reported for the worst-case controlled approach in this study, as defined in **Section 1.4.1.1**. During Existing Plus Project conditions, Project traffic would worsen the side street stop controlled approach from LOS C to LOS E during the AM peak hour and LOS A to LOS F during the PM peak hour. As a result, the Project's contribution during the PM peak hour would result in a **significant impact** because the Project's contribution would worsen the intersection operations to an unacceptable LOS. Mitigation Measure TR-1, described below, has been identified to address the impact.

Mitigation Measure TR-1. Signalize Lucas Valley Road / Los Gamos Drive

The Lucas Valley Road / Los Gamos Drive intersection should be signalized to mitigate poor operating conditions. Signalizing the intersection is consistent with improvements identified in the *San Rafael 2020 General Plan* and as discussed in **Chapter 2**, the Lucas Valley Road / Los Gamos Drive intersection fulfills the peak hour signal warrant under existing conditions. The Project sponsor would pay their fair share cost to the City of San Rafael to design and implement the proposed mitigation measure. Signalizing the intersection would mitigate the project impact to a **less-than-significant impact**.

5.2.2.1 Queue Summary

The traffic analysis was completed using SimTraffic software which accounts for vehicle queues and the relationship between adjacent intersections within the study area. A queue summary narrative is provided below to supplement the intersection operations analysis; however, results are not part of the significance criteria and the narrative provided is for informational purposes only. Detailed queue results tables are included in **Appendix F**.

During Existing Plus Project Conditions, vehicle queues through the study area remain the same or increase as a result of the Project's traffic contribution. During the AM peak period, the average queue for westbound left turning vehicles at the Lucas Valley / Los Gamos Drive intersection, exceed the existing storage capacity and occasionally blocks westbound through vehicles from continuing east on Lucas Valley Road.

At the Lucas Valley Road/US 101 Southbound Ramps intersection, the queue for vehicles traveling from the US 101 Southbound off-ramp increases with the Project during both the AM and PM peak periods. The

southbound off-ramp queue exceeds the available storage length during both the Existing No Project and Existing Plus Project AM peak periods. During the PM peak period, the addition of the Project increases the eastbound queue on Lucas Valley Road such that the queue spills back to the adjacent Lucas Valley Road/US 10 Northbound Ramp intersection.

At the Lucas Valley Road/US 101 Northbound Ramps intersection, queues from the intersection remain within the available storage length during the AM and PM peak hour. Vehicles queues at this intersection do not change substantially under Existing Plus Project conditions during the AM or PM peak period.

In addition, vehicles queues do not change substantially at the Lucas Valley Road/Las Gallinas Avenue and Smith Ranch Road/N Redwood Drive/Redwood Highway intersections during AM and PM peak periods with the addition of Project-related traffic.

5.2.2.2 Signal Warrants

As mentioned in Chapter 2, the existing volumes fulfill the peak hour signal warrants, therefore a signal should be considered at the Lucas Valley Road/Los Gamos Drive intersection. The addition of Project traffic would further qualify the intersection for a signal based on Peak Hour Warrant (Warrant 3). Furthermore, implementation of Mitigation Measure TR-2: Signalize Lucas Valley Road/Los Gamos Drive would mitigate the project impact during Existing Conditions to a less-than-significant level.

5.2.3 Freeway Operations

Existing Plus Project conditions were evaluated using the methods described in Chapter 1. As described in Chapter 4, the Project plans to shift existing employees from existing Kaiser Permanente facilities in Marin County to the proposed Project site; however, the freeway analysis methodology assumes that all Project trips are added to the No Project freeway volumes. Therefore, the approach is conservative and may be double counting vehicle trips that are already accounted for in the No Project volume.

The Existing Plus Project analysis results are presented in **Table 5-2** and **Table 5-3**, for the AM and PM peak hours, respectively. Detailed freeway level of service calculation sheets are provided in **Appendix D**.

TABLE 5-2: EXISTING CONDITIONS FREEWAY DENSITY AND LOS – AM PEAK HOUR

Segment	Segment Type	Existing No Project		Existing Plus Project	
		Density (pc/mi/ln) ¹	LOS ²	Density (pc/mi/ln) ¹	LOS
Northbound					
Manuel T Freitas Off / Manuel T Freitas On	Basic	19.4	C	20.3	C
Manuel T Freitas On / Redwood Highway On	Basic	15.9	B	16.6	B
Redwood Highway On	Merge	18	B	18.5	B
Smith Ranch Road Off	Basic	16.4	B	17	B
Smith Ranch Road Off / Lucas Road EB On	Basic	18	B	18.5	C
Lucas Road EB On / Smith Ranch Road WB On	Basic	14	B	14.4	B
Smith Ranch Road WB On	Merge	16.7	B	17	B
Miller Creek Off	Basic	14.5	B	15	B
Miller Creek On	Basic	18.7	C	19.3	C
Southbound					
Miller Creek Off	Basic	19.8	F³	20.2	F³
Miller Creek On	Merge	28.8	F³	29.2	F³
Lucas Valley Road Off	Basic	18.3	F³	18.6	F³
Lucas Valley Road Off / Lucas Valley Road On	Basic	21.9	F³	21.9	F³
Lucas Valley Road On	Merge	28.6	F³	28.8	F³
Lucas Valley Road On / Manuel T Freitas Off	Basic	25.5	F³	25.6	F³
Manuel T Freitas Off	Diverge	31.1	F³	31.2	F³
Manuel T Freitas Off / Manuel T Freitas On	Basic	21.4	F³	21.6	F³

Notes:

1. pc/mi/ln = passenger car per mile per lane
2. **Bold** = unacceptable LOS
3. The LOS results were revised to match existing observations. (add language from other similar footnote that explains why revised.)

Sources: Fehr & Peers, 2017

TABLE 5-3: EXISTING CONDITIONS FREEWAY DENSITY AND LOS – PM PEAK HOUR

Segment	Segment Type	Existing No Project		Existing Plus Project	
		Density (pc/mi/ln) ¹	LOS	Density (pc/mi/ln) ¹	LOS
Northbound					
Manuel T Freitas Off / Manuel T Freitas On	Basic	28.6	D	28.9	D
Manuel T Freitas On / Redwood Highway On	Basic	33.7	D	34.1	D
Redwood Highway On	Merge	25.5	C	25.6	C
Smith Ranch Road Off	Basic	24.7	C	24.9	C
Smith Ranch Road Off / Lucas Road EB On	Basic	21.7	C	21.7	C
Lucas Road EB On / Smith Ranch Road WB On	Basic	22.4	C	23	C
Smith Ranch Road WB On	Merge	25.5	C	25.9	C
Miller Creek Off	Basic	24.1	C	24.7	C
Miller Creek On	Basic	32.9	D	34.1	D
Southbound					
Miller Creek Off	Basic	21.1	C	20.8	C
Miller Creek On	Merge	24.7	C	24.4	C
Lucas Valley Road Off	Basic	16.5	B	16.3	B
Lucas Valley Road Off / Lucas Valley Road On	Basic	20.5	C	20	C
Lucas Valley Road On	Merge	28.5	D	28.8	D
Lucas Valley Road On / Manuel T Freitas Off	Basic	24.8	C	24.8	C
Manuel T Freitas Off	Diverge	30.4	D	30.4	D
Manuel T Freitas Off / Manuel T Freitas On	Basic	21.4	C	21.4	C

Notes:

1. pc/mi/ln = passenger car per mile per lane

Sources: Fehr & Peers, 2017

During the weekday AM and PM peak hours, all of the freeway segments would operate at LOS D or better, except southbound segments during the AM peak hour. As mentioned in **Section 2.3.2** the southbound segments are currently in queue due to a downstream bottleneck between the San Pedro on-ramp and Mission Avenue off-ramp. The addition of Project trips would contribute to the existing failing condition, as such, to understand the Project's impact, the Project's volume-to-capacity (v/c) ratio contribution calculation was completed and is summarized in **Table 5-4**. The purpose of calculating a v/c ratio is to understand the Project's contribution to an existing facility. The v/c ratio is based on the estimated or counted volume over the study segment capacity. Segments with a v/c ratio greater than 1.0 means the number of vehicles that want to use the facility exceed the available capacity and as a result, delays and queuing are anticipated.

TABLE 5-4: EXISTING CONDITIONS VOLUME TO CAPACITY (V/C) SUMMARY¹ - AM PEAK HOUR

Segment	Segment Capacity ¹	Existing No Project		Existing Plus Project	
		Volume ²	v/c	Volume ²	v/c ³
Southbound					
Miller Creek Off / Miller Creek On	6,600	3,616	0.55	3,694	0.56
Miller Creek On / Lucas Valley Road Off	8,100	4,454	0.55	4,532	0.56
Lucas Valley Road Off / Lucas Valley Road On	6,600	4,002	0.61	4,002	0.61
Lucas Valley Road On / Manuel T Freitas Off	6,600	4,595	0.70	4,615	0.70
Manuel T Freitas Off / Manuel T Freitas On	6,600	3,916	0.59	3,936	0.60

Notes:

1. Summary based on mixed flow lanes only. High Occupancy Vehicles lane not included in analysis.
2. v/c calculation assumes the following capacities:
 - Mixed Flow Lanes: 2,200 vehicles per lane
 - Auxiliary Lanes: 1,500 vehicles per lane
3. The total volume reported does not account for the HOV volume.
4. **Bold** = Project contributes greater than at least 0.01 v/c to the No Project condition resulting in a significant impact

Sources: Fehr & Peers, 2016

As summarized in Chapter 4, the Project's expected VMT / employee is less than the expected VMT / employee for the TAZ. However, because the Project adds less than 2-percent of traffic to the existing corridor, the Project's contribution increases the corridor's v/c ratio by 0.01, resulting in a **significant impact**, at the following locations:

- Between Miller Creek Off-Ramp and Miller Creek On-Ramp
- Between Miller Creek On-Ramp and Lucas Valley Road Off-Ramp
- Between Manuel T. Freitas parkway Off-Ramp and Manuel T. Freitas Parkway On-Ramp

Within the Project vicinity, US 101 roadway improvements are neither planned nor funded. Thus, it is infeasible for the Project Sponsor to contribute its fair-share contribution to the regional network. However, Caltrans IGR states that implementation of a TDM program could reduce VMT and the Project's impact to the regional network. The Project description already includes TDM elements based on the TDM program that Project Sponsor already provides at its nearby facilities. The Project Sponsor proposed TDM goes beyond what is required under the existing PD District. In order to further reduce the Project's impact to the regional network and ensure the implementation of the Project Sponsor proposed TDM, Mitigation Measure TR-2 would have the Project Sponsor implement TDM measures which go beyond those already included in the PD District.

Mitigation Measure TR-2. Project Sponsor shall identify and implement additional TDM measures

The Project Sponsor shall implement TDM measures currently under consideration and implemented at other nearby facilities, as described in the Project Description. These TDM elements would go beyond what is already required as part of the PD District with the goal of reducing employee vehicle trips and reducing the Project's impact on the regional network. The program will be submitted to the City of San Rafael for review, comment, and approval. If coordination is required, the Project Sponsor will work with the City of San Rafael to implement the program.

Since details of the ultimate TDM program have not yet been defined, a quantitative analysis of the TDM program's effectiveness of reducing vehicle trips was not completed. Thus it is unknown if the reduction in vehicle trips would mitigate the Project's contribution to US 101 to less than significant. Therefore, even with implementation, the impact would remain **significant and unavoidable**.

5.2.4 On-Site Vehicle Access and Circulation

While not required under CEQA to avoid a significant impact, on-site vehicle access and circulation were evaluated. Access to the Project would be provided from four unsignalized driveways as well as two additional driveways on either side of the proposed parking structure for fire access, as indicated in **Figure 1-2**. Three driveways on the east side of Los Gamos Drive, which are existing driveways, would lead to surface parking lots adjacent to the Project building. The existing northern most driveway, located on the west side of Los Gamos Drive, would be moved 100 feet south and provide direct access to the proposed parking garage structure. The relocated driveway would provide a longer storage length between the driveway and vehicles traveling north to the Los Gamos Drive / Lucas Valley Road intersection. The Project is not expected to substantially increase hazards due to a design feature since the Project will use existing driveways, where feasible, and does not propose to change the roadway alignment.

5.3 BICYCLE AND PEDESTRIAN IMPACTS

Bicycling and pedestrian trips in the study area may increase as a result of the proposed Project. Bicycle travel would likely occur along Lucas Valley Road and Los Gamos Drive since they provide direct connections to the Project site and are designated bicycle facilities. Pedestrian travel would likely occur on Lucas Valley Road as it provides direct access to nearby transit facilities. The projected increase in vehicles at the intersections in the vicinity of the Proposed Project may result in an increase in vehicle-bicycle-pedestrian conflicts at intersections in the study area. However, the proposed Project would not create potentially hazardous conditions for bicycles, pedestrians, or otherwise interfere with bicycle and pedestrian

accessibility to the site and adjoining areas because the Project does not remove existing facilities and does not prohibit the construction of proposed future facilities in the Project vicinity. Therefore, the Project's impact to bicycle and pedestrian facilities are considered **less than significant** and mitigations are not required under Existing Plus Project conditions.

5.4 TRANSIT IMPACTS

Transit trips in the study area may increase as a result of the Project. However, Project related transit trips would have no foreseeable impacts to transit operations because the Project would not likely generate enough transit demand to exceed the capacity of existing or planned transit service nor does it interfere with existing or future transit users. Therefore, the Project impacts to transit facilities are considered **less than significant** and mitigations are not required.

5.5 PARKING

While parking is not considered an environmental impact, a parking analysis was completed for information purposes only.

The City of San Rafael parking requirements for off-street parking were reviewed. For medical office uses, 1 space is required for every 225 gross building square feet, resulting in a code requirement of 657 spaces (assuming 148,000 sf medical office building). The Project sponsor is proposing a higher parking ratio based on existing parking demand at nearby medical facilities. The proposed parking plan includes 753 parking spaces which exceeds the City's requirements by 96 spaces. Of the 753 parking spaces, there are 23 ADA parking spaces (10 spaces in the parking structure and 13 in the surface lot) which meets the minimum ADA parking requirements from the United States Access Board; and 155 compact spaces, which is under the City's 30-percent compact parking maximum.

The *City of San Rafael Bicycle/Pedestrian Master Plan Update (2011)* includes an objective to provide bicycle parking in employment and commercial areas; and the City of San Rafael Code of Ordinances requires a minimum number of short term and long term bicycle parking spaces equivalent to 5-percent of the requirement for automobile parking spaces, with a minimum of one two-bike capacity rack; therefore, the ordinance requires 38 short term bicycle parking spaces (based on 148,000 sf medical office building). Based on the proposed parking plan, the Project will provide 34 short term parking spaces and 33 long term parking spaces, thereby meeting the minimum number of bicycle parking spaces required.

Based on this review, the total number of parking spaces the Project provides is sufficient and meets the City of San Rafael's parking requirements.

6 BASELINE CONDITIONS

The baseline scenario includes existing transportation conditions plus traffic generated from approved developments that are not yet constructed.

6.1 ASSUMED ROADWAY IMPROVEMENTS

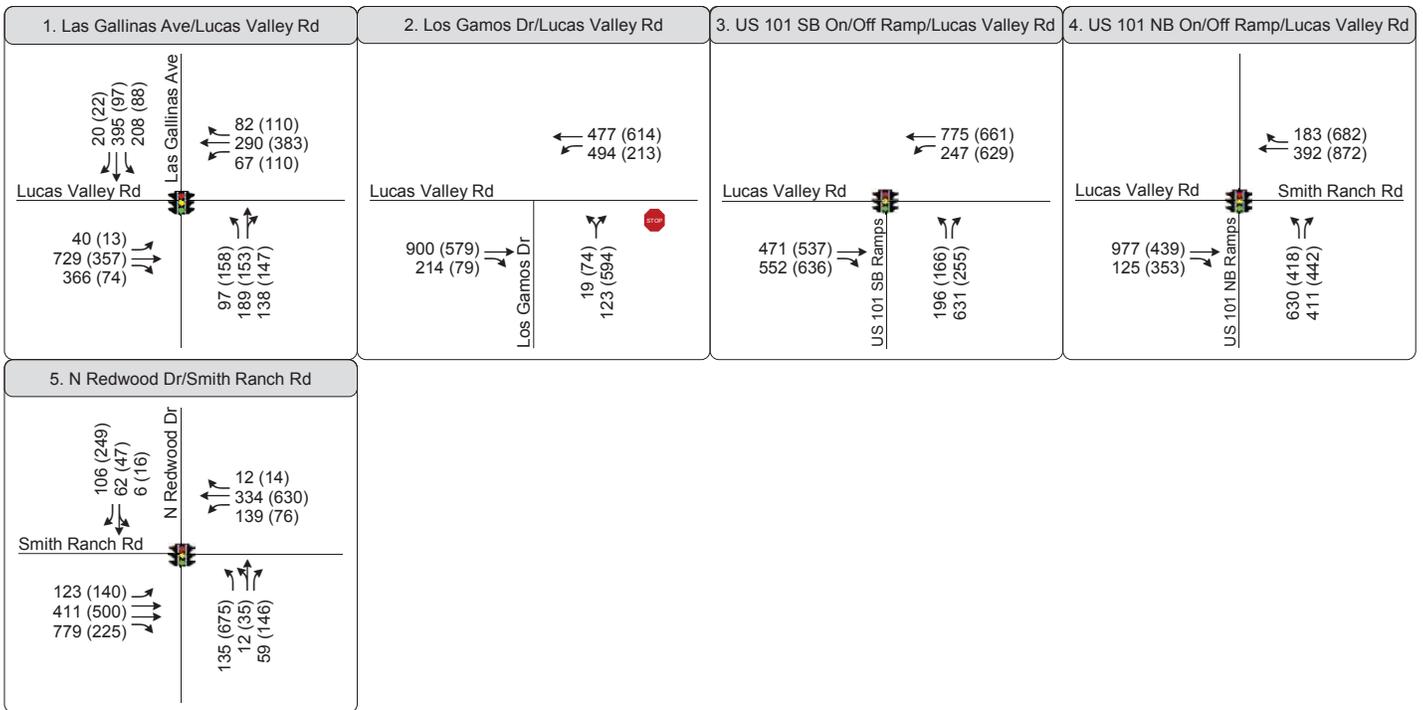
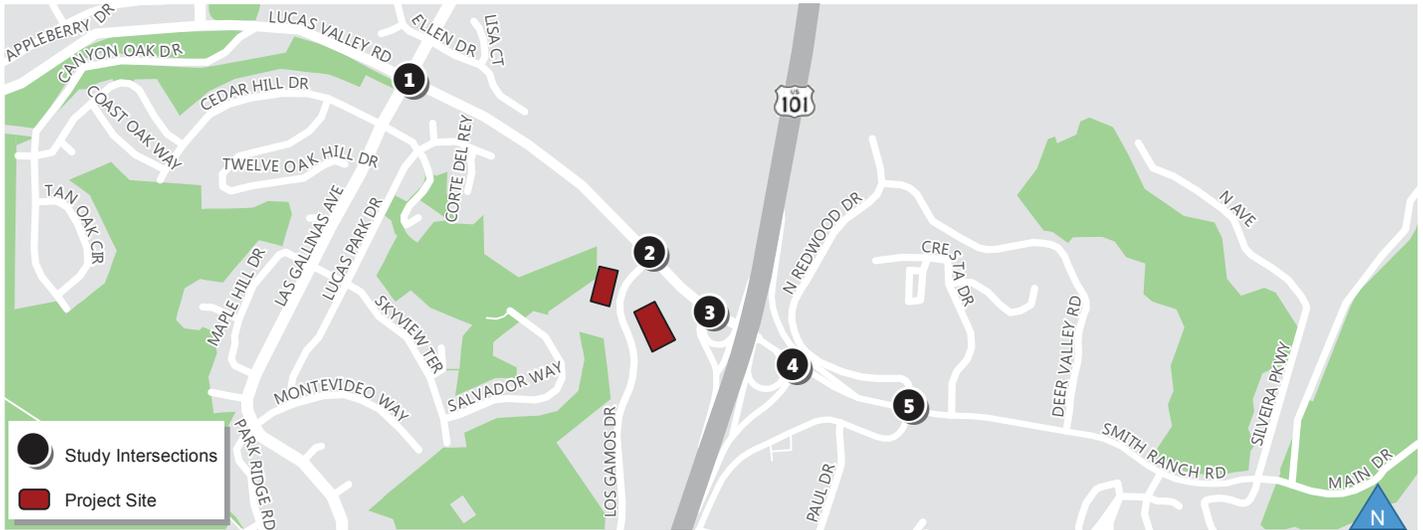
No roadway improvements are anticipated as part of the Project. As such, no additional improvements were included as part of the Baseline Plus Project analysis.

6.2 VEHICLE OPERATIONS

This section describes the Project's impacts to vehicles under the Baseline No Project and Baseline Plus Project scenarios.

6.2.1 Traffic Volumes

The City of San Rafael maintains a database of baseline traffic volumes, which assumes the 100-percent occupied building at 1650 Los Gamos Drive, and provided Synchro files for use in this traffic study. The baseline peak hour intersection volumes, lane configurations, and traffic controls at each intersection for the AM and PM peak hours is summarized on **Figure 6-1**. Similar to Existing Plus Project conditions, Project traffic volumes were added to the baseline peak hour traffic volumes to estimate the Baseline Plus Project peak hour traffic volumes, summarized on **Figure 6-2**.



Legend

XX(YY) AM (PM) Peak Hour Traffic



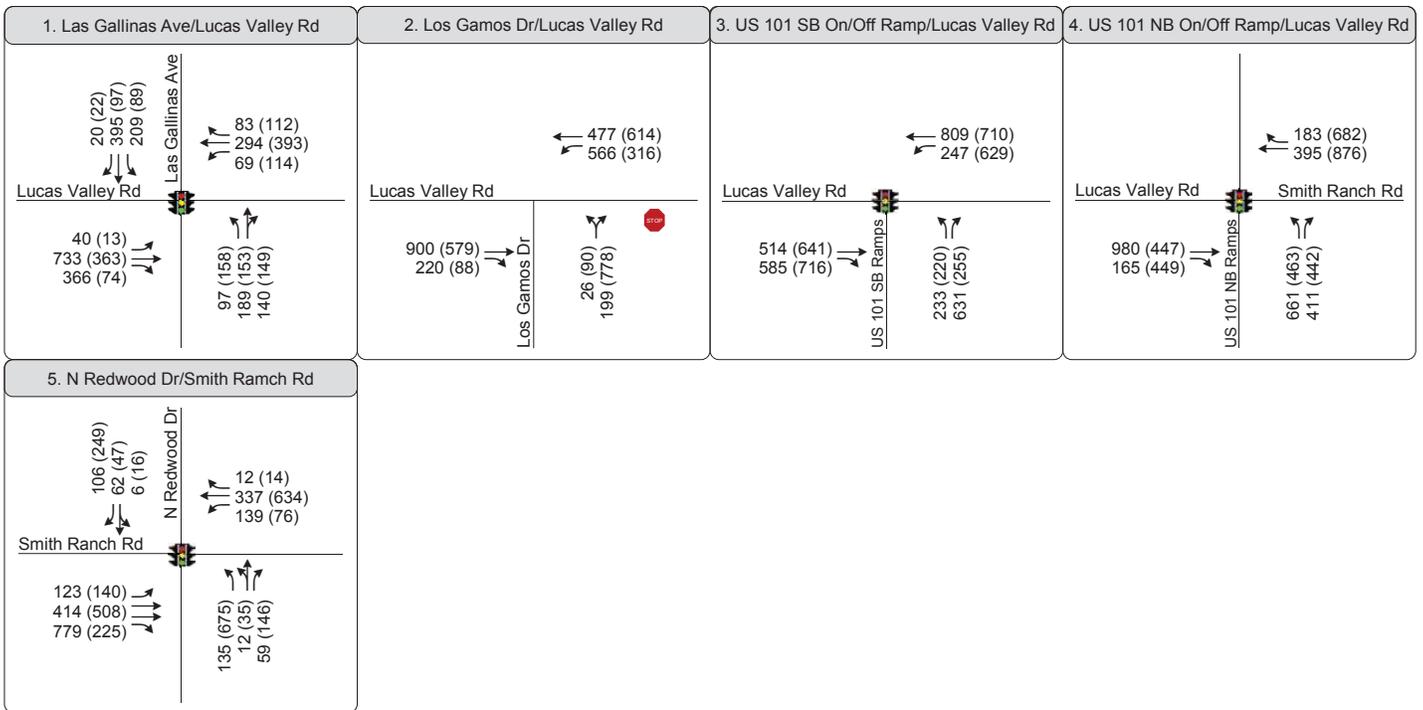
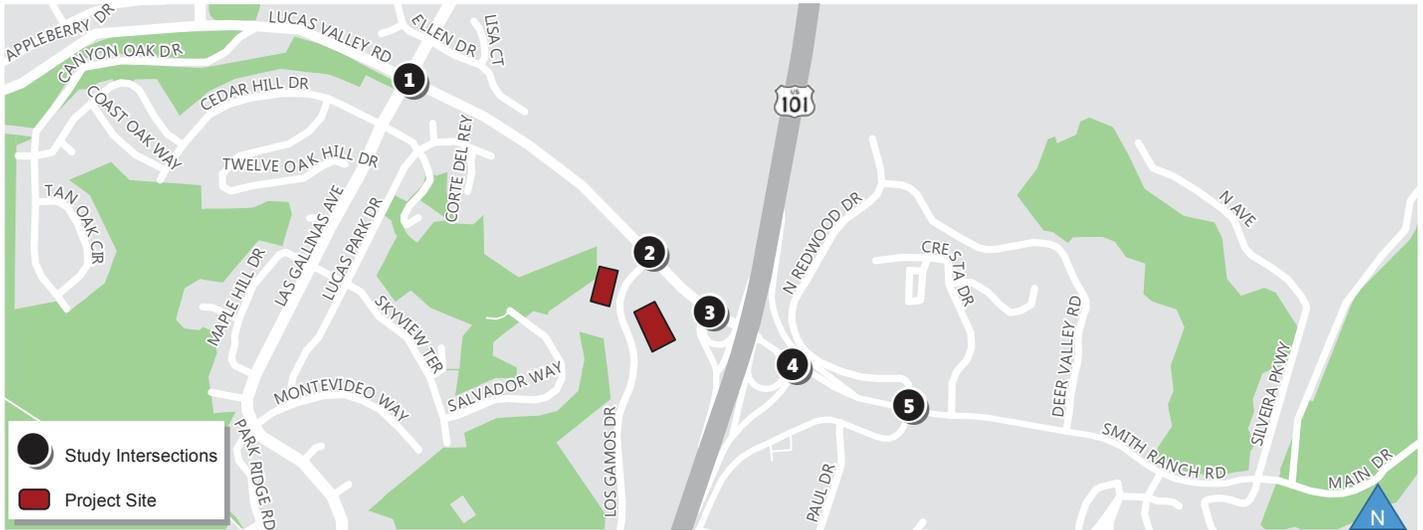
Signalized Intersection



Stop Controlled Approach



Figure 6-1
Baseline No Project
 Peak Hour Intersection Control, Volumes, and Lane Configuration



Legend

XX(YY) AM (PM) Peak Hour Traffic



Signalized Intersection



Stop Controlled Approach



Figure 6-2
Baseline Plus Project
 Peak Hour Intersection Control, Volumes, and Lane Configurations

6.2.2 Intersection Operations

Baseline No Project and Baseline Plus Project conditions were evaluated using the same methods described in Chapter 1. The Baseline analysis results are presented in **Table 6-1**, based on the traffic volumes presented in **Figure 6-1** and **Figure 6-2**, respectively.

TABLE 6-1: BASELINE INTERSECTION LEVEL OF SERVICE AND DELAY RESULTS						
Intersection	Intersection Control ¹	Time Period	Baseline No Project		Baseline Plus Project	
			LOS ^{2,3}	Delay ^{2,3, 4}	LOS ^{2,3}	Delay ^{2,3, 4}
1. Lucas Valley Road and Las Gallinas Avenue	Signal	AM PM	F C	94 34	F D	182 38
2. Lucas Valley Road and Los Gamos Drive	SSSC	AM PM	E (F) F (F)	44 (67) >80(375)	E (F) F (F)	41 (>80) >80 (364)
3. Lucas Valley Road and US 101 Southbound Ramps	Signal	AM PM	E F	58 156	F F	87 156
4. Lucas Valley Road / Smith Ranch Road and US 101 Northbound Ramps	Signal	AM PM	D B	44 15	F B	84 16
5. Lucas Valley Road / Smith Ranch Road and Redwood Drive / Redwood Highway	Signal	AM PM	B C	15 35	B D	13 51

Notes:

1. SSSC = Side-Street Stop Control
2. Worst approach is noted for side street stop controlled intersections.
3. **Bold** denotes unacceptable level of service and delay.
4. Standard industry practice is to summarize delay greater than 80 seconds (LOS F) as ">80". However, in some instances, the ">80" was over written with the estimated delay to better under the Project's impact to the No Project conditions and its relationship to the significance criteria.

Sources: Fehr & Peers, 2017

As shown on **Table 6-1**, the Lucas Valley Road / Smith Ranch Road / Redwood Drive/Redwood Highway signalized intersection operates at LOS D or better during the No Project and Plus Project scenarios, therefore the Project's contribution to this intersection is considered **less than significant**. However, two intersections trigger a significant impact, as described below.

The Lucas Valley Road/Las Gallinas Avenue intersection operates below LOS D during the weekday AM and/or PM peak hour, under Baseline No Project and Baseline Plus Project conditions. The proposed Project would contribute to deficient operations by increasing the average delay by more than five seconds, thus resulting in a **significant impact** and would require mitigation as described in Mitigation Measure TR-3.

With the addition of Project traffic, the side street stop controlled intersection at Lucas Valley Road/Los Gamos Drive would experience increased vehicle delay during the AM peak hour. The Project would add 102 trips to the stop-controlled northbound approach during the AM peak period, which would contribute to deficient operations and increase average delay by more than five seconds at the stopped controlled approach compared to Baseline No Project conditions. Therefore, the Project impact to this intersection is **significant** and would require mitigation, as described in Mitigation Measure TR-4.

The Lucas Valley Road/US 101 Southbound Ramp intersection operates below LOS D during the weekday AM and/or PM peak hour, under Baseline No Project and Baseline Plus Project conditions. The proposed Project would contribute to deficient operations by increasing the average delay by more than five seconds, triggering a significant impact. However, the *San Rafael 2020 General Plan* exempts US 101 interchange intersections from LOS standards because delay at these locations are affected by regional traffic and not significantly impacted by local measures. Therefore, the Project's contribution to the Lucas Valley Road/Smith Ranch Road/US 101 intersection is not considered a significant impact. Though the Project does not result in an impact, a potential improvement was identified for informational purposes only. Signal timings should be adjusted at the Lucas Valley Road/Smith Ranch Road/US 101 Northbound Ramps intersection to account for the new intersection demand. With implementation, operations at the Lucas Valley Road / Smith Ranch Road / US 101 Northbound Ramps would reduce the Project's impact to less than significant, if the intersection were subject to the significance criteria, similar to other intersections included in this study.

The Lucas Valley Road/Smith Ranch Road/US 101 Northbound Ramps intersection operates below the LOS D threshold with the Project during the weekday AM peak hour, thus would result in a significant impact. However, as explained above, the intersection is part of the US 101 interchange, therefore the intersection is exempt from the significance criteria and the Project's impact is not considered a significant impact. A potential improvement was identified for information purposes only. The intersection should reconfigure the eastbound approach to provide two through lanes, which is consistent with improvements identified in the City of San Rafael General Plan 2020. Implementing these intersection improvements would improve intersection operations and reduce the Project's impact to less than significant, if the intersection were subject to the significance criteria, similar to other intersections included in this study.

Mitigation Measure TR-3. Improve Intersection Operations at Lucas Valley Road/Las Gallinas Avenue

Intersection improvements have yet to be identified through the City of *San Rafael's General Plan 2020*; however, several vehicle capacity improvements (such as reconfiguring the intersection or roundabouts) may be considered by the City of San Rafael to mitigate poor operating conditions

at the intersection. Capacity increasing improvements include their fair share of trade-offs, for example adding capacity would facilitate more vehicular traffic; however, could have an adverse impact to pedestrians and bicyclists and result in the diversion of more pass-through traffic along Las Gallinas Avenue and an increase in VMT. The feasibility of potential mitigations will require further study and coordination with the City of San Rafael and local community. Ultimately, the City of San Rafael would be responsible for implementing improvements which the Project Sponsor would pay their fair share; however, since the intersection is not part of a traffic fee program and intersection improvements have yet to be identified, the Project would result in a ***significant and unavoidable impact***.

Mitigation Measure TR-4. Signalize and Reconfigure Intersection at Lucas Valley Road/Los Gamos Drive

The San Rafael General Plan 2020 identifies improvements at the Lucas Valley Road / Los Gamos Drive intersection including signalizing the intersection, adding dual westbound left turn lanes, reconfiguring the northbound approach, and removing existing striped channelized islands, as illustrated in **Figure 6-3**. Implementing these improvements would mitigate the Project's impact to ***less than significant***. Therefore, the Project sponsor will coordinate with the City of San Rafael to pay their fair share cost to implement Mitigation Measure TR-5.

Feb. 15, 2017 CADD FILE: \\FFSF03\Data\Projects\2015 Projects\SF15-0658_Los Gamos Lucas Valley\Fig 6-3_Mitigation Measure TR-5.dwg



Note: Conceptual illustration not to scale.
Source: BKF, Kaiser Permanente (2017)



Figure 6-3
Mitigation Measure TR-4
Signalize and Reconfigure Intersection at Lucas Valley Road / Los Gamos Drive

6.2.2.1 Queue Summary

A queue summary narrative is provided below to supplement the intersection operations analysis; however, results are not part of the significance criteria and the narrative provided is for informational purposes only. Detailed queue results tables are included in **Appendix F**.

Under Baseline Conditions queue lengths at the Lucas Valley Road/Los Gamos Drive intersection during the AM peak period increase as a result of the Project for the following movements going into and out of the site. The 95-percentile vehicle queue for westbound left movements into the project site at the Lucas Valley Road/Los Gamos Drive intersection exceeds the queue storage length under both No Project and Plus Project conditions, which impacts vehicles continuing westbound on Lucas Valley Road during the AM peak period.

During the PM peak period, the queue for vehicles traveling northbound left at the Lucas Valley Road/Los Gamos Drive intersection extends beyond the proposed parking structure driveway during both the No Project and Plus Project conditions; however, the addition of the Project does not result in a substantial increase in queue lengths. As recommended in Chapter 5, the Project Sponsor should consider striping a "Keep Clear" pavement legend to help accommodate vehicle egress from the proposed parking structure.

At the Lucas Valley Road/US 101 Southbound Ramps intersection, the addition of Project traffic generally contributes to longer queues compared to the No Project. The queue for vehicles traveling from the US 101 Southbound off-ramp increases substantially under Plus Project conditions during the AM peak period and as a result, exceeds the available storage length. During the PM peak period, the addition of Project traffic contributes to longer queues; however, the queue does not spillback past the available storage length. In the eastbound direction of Lucas Valley Road, queue lengths extend past the upstream intersection at Los Gamos Drive during the PM peak hour for both the No Project and Plus Project condition.

At the Lucas Valley Road/US 101 Northbound Ramps intersection, the AM peak hour and PM peak hour queues remain within the available storage length during both the No Project and Plus Project conditions.

At the Lucas Valley Road/Las Gallinas Avenue intersection, the queue lengths for vehicles traveling eastbound and southbound exceed storage capacity under both No Project and Plus Project conditions during the AM peak period; Plus Project conditions exacerbate these conditions. Vehicles queues do not change substantially at the Lucas Valley Road/Las Gallinas Avenue during the PM peak period.

Vehicles queues do not change substantially at Smith Ranch Road/N Redwood Drive/Redwood Highway intersections during AM and PM peak periods under plus project conditions.

6.2.2.2 Signal Warrants

As mentioned in Chapter 2, the existing volumes fulfill the peak hour signal warrants, therefore a signal should be considered at the Lucas Valley Road/Los Gamos Drive intersection. The addition of Baseline growth and Project traffic would further qualify the intersection for a signal based on Peak Hour Warrant (Warrant 3). Furthermore, implementation of Mitigation Measure TR-2: Signalize Lucas Valley Road/Los Gamos Drive would mitigate the project impact during Baseline Plus Project conditions to a less-than-significant level.

6.2.3 Freeway Operations

Baseline freeway conditions were evaluated using the same methods described in Chapter 1. The Baseline conditions analysis results are presented in **Table 6-2** and **Table 6-3**, for the AM and PM peak hours, respectively. Detailed freeway level of service calculation sheets are provided in **Appendix D**.

TABLE 6-2: BASELINE CONDITIONS FREEWAY DENSITY AND LOS – AM PEAK HOUR					
Segment	Segment Type	Baseline No Project		Baseline Plus Project	
		Density (pc/mi/ln) ¹	LOS ²	Density (pc/mi/ln) ¹	LOS ²
Northbound					
Manuel T Freitas Off / Manuel T Freitas On	Basic	20.6	C	20.7	C
Manuel T Freitas On / Redwood Highway On	Basic	16.9	B	17	B
Redwood Highway On	Merge	18.8	B	18.9	B
Smith Ranch Road Off	Basic	17.4	B	17.4	B
Smith Ranch Road Off / Lucas Road EB On	Basic	18.9	C	19.1	C
Lucas Road EB On / Smith Ranch Road WB On	Basic	14.7	B	14.9	B
Smith Ranch Road WB On	Merge	17.3	B	17.5	B
Miller Creek Off	Basic	15.3	B	15.5	B
Miller Creek On	Basic	19.6	C	19.9	C
Southbound					
Miller Creek Off	Basic	21.7	F ³	21.9	F ³
Miller Creek On	Merge	30.9	F ³	31.0	F ³
Lucas Valley Road Off	Basic	19.9	F ³	20.0	F ³
Lucas Valley Road Off / Lucas Valley Road On	Basic	23.2	F ³	23.2	F ³

TABLE 6-2: BASELINE CONDITIONS FREEWAY DENSITY AND LOS – AM PEAK HOUR

Segment	Segment Type	Baseline No Project		Baseline Plus Project	
		Density (pc/mi/ln) ¹	LOS ²	Density (pc/mi/ln) ¹	LOS ²
Lucas Valley Road On	Merge	29.9	F³	30.0	F³
Lucas Valley Road On / Manuel T Freitas Off	Basic	27.0	F³	27.1	F³
Manuel T Freitas Off	Diverge	32.2	F³	32.3	F³
Manuel T Freitas Off / Manuel T Freitas On	Basic	22.5	F³	22.6	F³

Notes:

1. pc/mi/ln = passenger car per mile per lane
2. **Bold** = unacceptable LOS
3. This segment operates in queue; however, the results reported in the analysis software does not match existing condition observations because the methodology accounts for the number of vehicles that are able to use the facility, not the number of vehicles that want to use the facility and are in queue (demand). The LOS results were revised to match existing observations.

Sources: Fehr & Peers, 2017

TABLE 6-3: BASELINE CONDITIONS FREEWAY DENSITY AND LOS – PM PEAK HOUR

Segment	Segment Type	Baseline No Project		Baseline Plus Project	
		Density (pc/mi/ln) ¹	LOS ²	Density (pc/mi/ln) ¹	LOS
Northbound					
Manuel T Freitas Off / Manuel T Freitas On	Basic	30.6	D	31.8	D
Manuel T Freitas On / Redwood Highway On	Basic	36.7	E	38.3	E
Redwood Highway On	Merge	26.6	C	27	C
Smith Ranch Road Off	Basic	26.1	D	26.9	D
Smith Ranch Road Off / Lucas Road EB On	Basic	22.8	C	23.3	C
Lucas Road EB On / Smith Ranch Road WB On	Basic	23.8	C	24.5	C
Smith Ranch Road WB On	Merge	26.7	C	27.2	C
Miller Creek Off	Basic	25.8	C	26.5	D
Miller Creek On	Basic	36.1	E	37.7	E

TABLE 6-3: BASELINE CONDITIONS FREEWAY DENSITY AND LOS – PM PEAK HOUR

Segment	Segment Type	Baseline No Project		Baseline Plus Project	
		Density (pc/mi/ln) ¹	LOS ²	Density (pc/mi/ln) ¹	LOS
Southbound					
Miller Creek Off	Basic	22	C	22.6	C
Miller Creek On	Merge	25.5	C	26.1	C
Lucas Valley Road Off	Basic	17.2	B	17.7	B
Lucas Valley Road Off / Lucas Valley Road On	Basic	21.3	C	21.8	C
Lucas Valley Road On	Merge	29.8	D	30.4	D
Lucas Valley Road On / Manuel T Freitas Off	Basic	26.2	D	26.9	D
Manuel T Freitas Off	Diverge	31.5	D	32	D
Manuel T Freitas Off / Manuel T Freitas On	Basic	22.4	C	23	C

Notes:

1. pc/mi/ln = passenger car per mile per lane
2. **Bold** = unacceptable LOS

Sources: Fehr & Peers, 2017

During the weekday AM and PM peak hours, all of the freeway segments operate at LOS E or better during the No Project and Plus Project Baseline scenarios, except southbound segments during the AM peak hour. As described in the sections above, the southbound segments operate in congestion under existing conditions due to a downstream bottleneck between the San Pedro on-ramp and Mission Avenue off-ramp. The addition of Project trips would contribute to the existing failing operations. The v/c ratio calculations are summarized in **Table 6-4**.

TABLE 6-4: BASELINE CONDITIONS VOLUME TO CAPACITY (V/C) SUMMARY¹ – AM PEAK HOUR

Segment	Segment Capacity ¹	Baseline No Project		Baseline Plus Project	
		Volume ²	v/c	Volume ²	v/c ³
Southbound					
Miller Creek Off / Miller Creek On	6,600	3,966	0.60	3,994	0.61
Miller Creek On / Lucas Valley Road Off	8,100	4,847	0.60	4,875	0.60
Lucas Valley Road Off / Lucas Valley Road On	6,600	4,221	0.64	4,221	0.64

TABLE 6-4: BASELINE CONDITIONS VOLUME TO CAPACITY (V/C) SUMMARY¹ – AM PEAK HOUR

Segment	Segment Capacity ¹	Baseline No Project		Baseline Plus Project	
		Volume ²	v/c	Volume ²	v/c ³
Lucas Valley Road On / Manuel T Freitas Off	6,600	4,826	0.73	4,840	0.73
Manuel T Freitas Off / Manuel T Freitas On	6,600	4,112	0.62	4,126	0.63

Notes:

1. Summary based on mixed flow lanes only. High Occupancy Vehicles lane not included in analysis.
2. v/c calculation assumes the following capacities:
 - Mixed Flow Lanes: 2,200 vehicles per lane
 - Auxiliary Lanes: 1,500 vehicles per lane
3. The total volume reported does not account for the HOV volume.
4. **Bold** = Project contributes greater than 0.01 v/c to the No Project condition resulting in a significant impact

Sources: Fehr & Peers, 2017

Similar to the existing conditions, the Project's expected VMT per employee is less than the expected VMT per employee for the TAZ. However, because the Project contribution, less than 2-percent of Project-related traffic to the US 101 southbound corridor, increases the Baseline No Project's v/c ratio by 0.01, in the Project results in a significant impact, along the following segments:

- Miller Creek Off / Miller Creek On
- Manuel T Freitas Off / Manuel T Freitas On

Roadway improvements along US 101, within the Project vicinity, are neither planned nor funded. Thus, it is infeasible for the Project Sponsor to contribute its fair-share contribution. Caltrans IGR states that implementation of a TDM program could reduce VMT and the Project's impact to the regional network. Therefore, the Project Sponsor could implement a TDM Program, to be reviewed and approved by the City of San Rafael, with the goal of reducing the Project's employee vehicle trips and reducing the Project's impact on the regional network.

Mitigation Measure TR-5. Project Sponsor shall identify and implement additional TDM measures (MM TR-2).

Implement MM TR-2: The Project Sponsor shall implement TDM measures currently under consideration and implemented at other nearby facilities, as described in the Project Description. These TDM elements would go beyond what is already required as part of the PD District with the goal of reducing employee vehicle trips and reducing the Project's impact on the regional network. The program will be submitted to the City of San Rafael for review, comment, and approval. If

coordination is required, the Project Sponsor will work with the City of San Rafael to implement the program.

Since details of the ultimate TDM program have not yet been defined, a quantitative analysis of the TDM program's effectiveness of reducing vehicle trips was not completed. Thus it is unknown if the reduction in vehicle trips would mitigate the Project's contribution to US 101 to less than significant. Therefore, even with implementation, the impact would remain **significant and unavoidable**.

6.3 BICYCLE & PEDESTRIAN IMPACTS

Bicycling and pedestrian trips in the study area may increase as a result of the proposed Project and Baseline growth; however, in this scenario bicycle and pedestrian impacts are typically site-specific and generally do not contribute to impacts from other development projects. As indicated in Chapter 5, there is a projected increase in vehicles at the intersections in the vicinity of the Proposed Project, which may result in an increase in vehicle-bicycle-pedestrian conflicts at intersections in the study area. However, the proposed Project would not create potentially hazardous conditions for bicycles, pedestrians, or otherwise interfere with bicycle and pedestrian accessibility to the site and adjoining areas because the Project does not remove existing facilities and does not prohibit the construction of proposed facilities in the Project vicinity. Therefore, the Project's impact to bicycle and pedestrian facilities are considered **less than significant** and mitigations are not required under Baseline Plus Project conditions.

6.4 TRANSIT IMPACTS

Transit trips in the study area may increase as a result of the Project. However, Project related transit trips would have no foreseeable impacts to transit operations because the Project would not likely generate enough transit demand to exceed the capacity of existing or planned transit service nor does it interfere with existing or future transit users. Therefore, the Project impacts to transit facilities are considered **less than significant** and mitigations are not required.

7 CUMULATIVE CONDITIONS

The cumulative scenario includes traffic estimates and transportation infrastructure improvements as proposed in the San Rafael General Plan 2020.

7.1 ASSUMED ROADWAY IMPROVEMENTS

The *San Rafael General Plan 2020* identifies proposed roadway improvements along Lucas Valley Road and Smith Ranch Road near the Project. Capital improvements include:

- Widening Lucas Valley Road to provide two westbound and two eastbound lanes between Redwood Highway and Los Gamos Drive
- Widening the US 101 northbound and southbound off-ramps with additional right and left turn lanes
- Signalizing the Los Gamos Drive / Lucas Valley Road intersection and coordinating the new signal with adjacent intersections
- Providing the westbound Lucas Valley Road approach at Los Gamos Drive two left turn lanes and two southbound receiving lanes on Los Gamos Drive

The improvements listed above were included in the Cumulative No Project and Cumulative Plus Project scenarios.

The *City of San Rafael Bicycle/Pedestrian Master Plan Update (2011)* proposes to continue Class II bicycle lanes along Lucas Valley Road and Smith Ranch Road, to the east. Additionally, a Class I facility is proposed to extend north of Los Gamos Drive and connect to Marinwood Avenue.

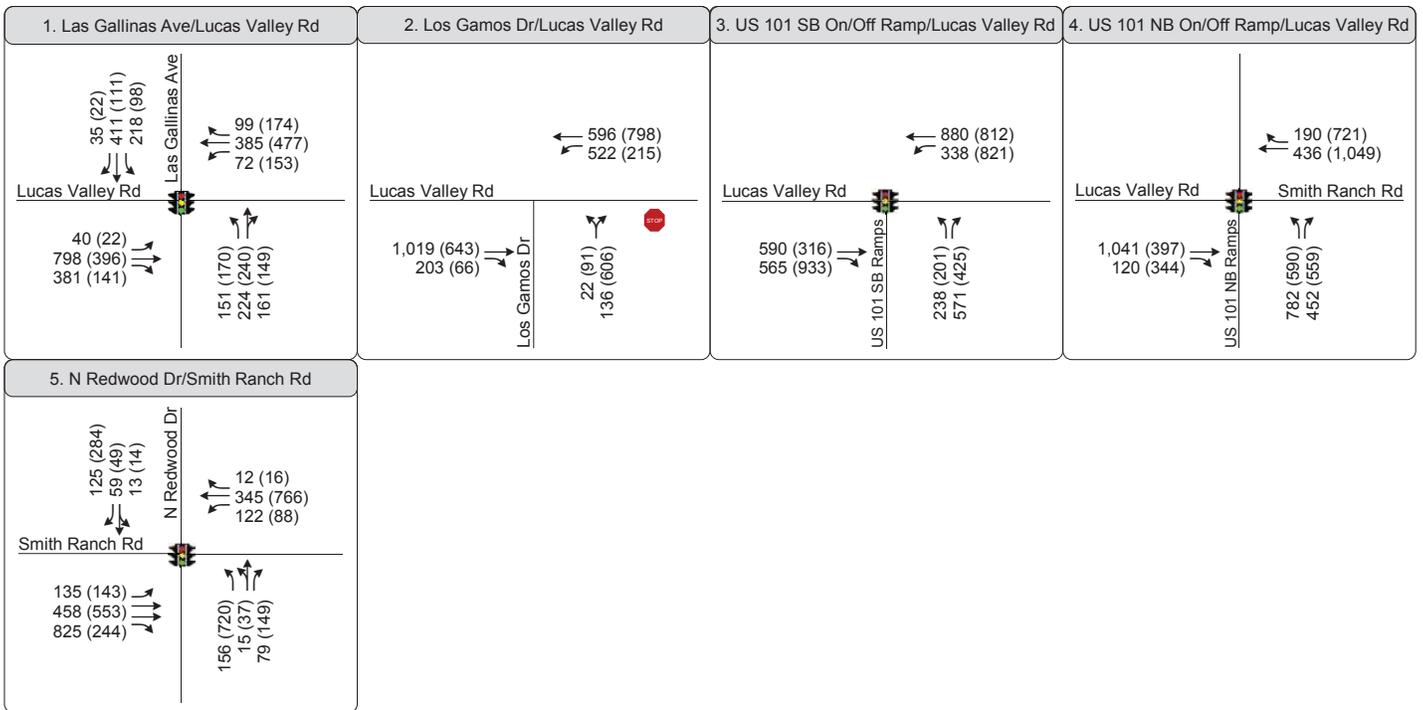
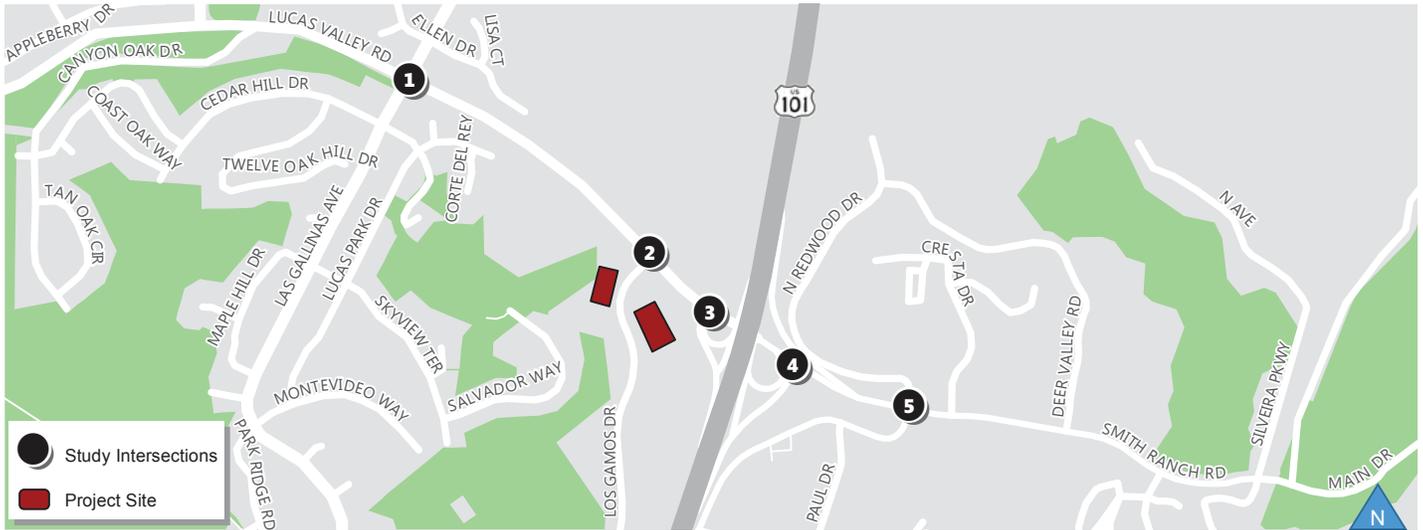
The Caltrans approved the Project Study Report (Project Development Support) [PSR(PDS)] for the Route 101/Lucas Valley Interchange Improvement Project in 2003. Caltrans prepared the PSR (PDS) at the request of the City of San Rafael through the Marin County Congestion Management Agency. The PSR/PDS documents consensus between Caltrans and City of San Rafael on the purpose-and-need, scope, and schedule of a project. As part of the PSR(PDS) project development and capital costs are estimated. The next phase of project development is not yet funded. Improvements for this interchange was not identified in the San Rafael General Plan 2020; However, a supplementary cumulative analysis was completed for informational purposes and is summarized in **Section 7.2.2.2**.

7.2 VEHICLE OPERATIONS

This section describes the Project's impacts to vehicles under the Cumulative and Cumulative Plus Project scenario.

7.2.1 Traffic Volumes

Similar to the Baseline Condition, the analysis used cumulative traffic volumes from the City of San Rafael's traffic database which is consistent with assumptions developed in the City of San Rafael General Plan 2020. The Cumulative No Project and Cumulative Plus Project peak hour intersection volumes, lane configurations, and traffic controls at each Project intersection is summarized on **Figure 7-1** and **Figure 7-2**, respectively.



Legend

XX(YY) AM (PM) Peak Hour Traffic



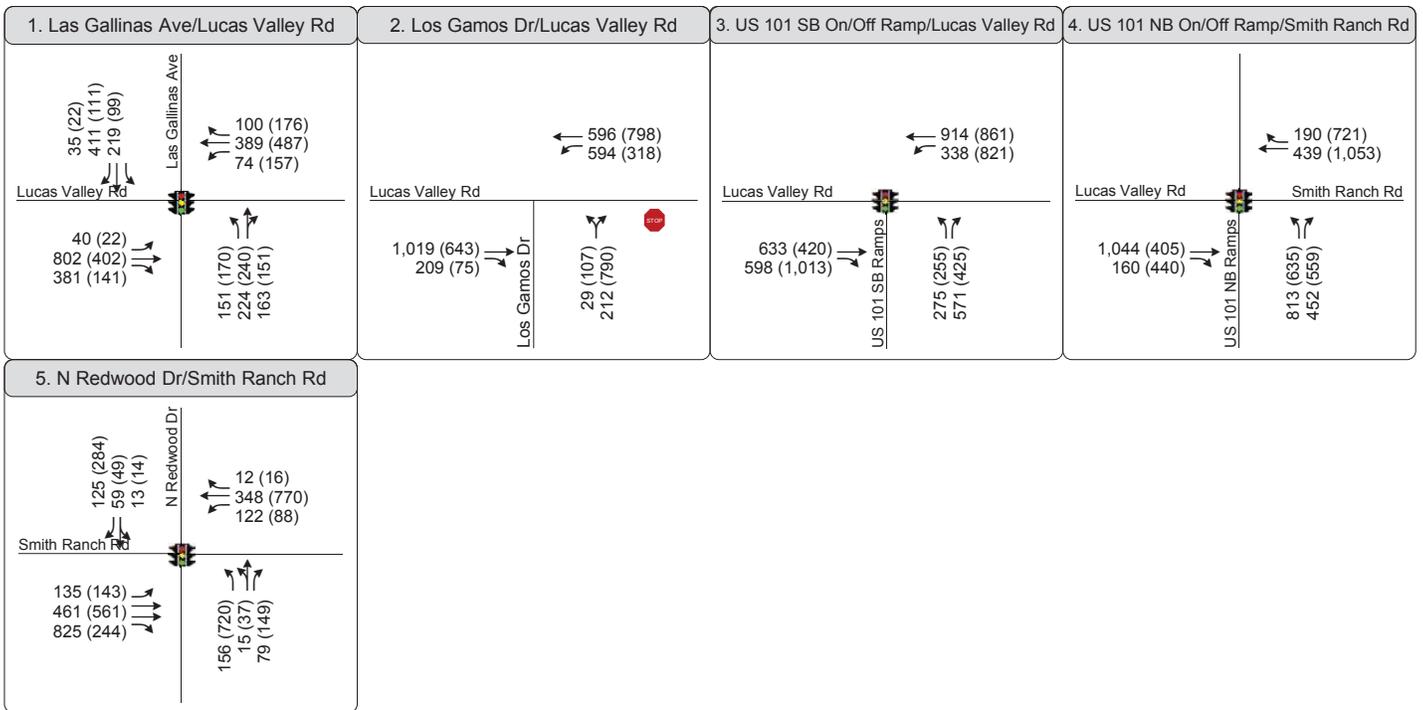
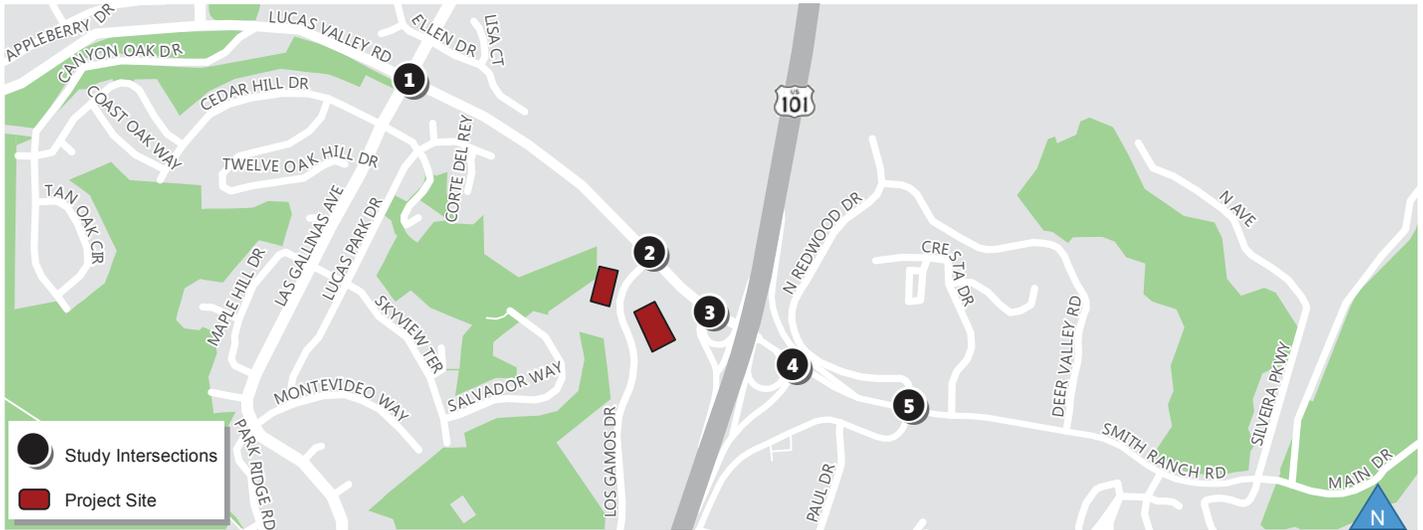
Signalized Intersection



Stop Controlled Approach



Figure 7-1
 Cumulative No Project
 Peak Hour Intersection Control, Volumes, and Lane Configuration



Legend

XX(YY) AM (PM) Peak Hour Traffic



Signalized Intersection



Stop Controlled Approach



Figure 7-2
Cumulative Plus Project
 Peak Hour Intersection Control, Volumes, and Lane Configurations

7.2.2 Intersection Operations

Cumulative No Project and Cumulative Plus Project conditions were evaluated using the same methods described in Chapter 1. The Cumulative Plus Project analysis results are presented in **Table 7-1**, based on the traffic volumes presented in **Figure 7-1** and **Figure 7-2**, respectively.

TABLE 7-1: CUMULATIVE INTERSECTION LEVEL OF SERVICE AND DELAY RESULTS						
Intersection	Intersection Control	Time Period	Cumulative No Project		Cumulative Plus Project	
			LOS ¹	Delay ^{1,2}	LOS ¹	Delay ^{1, 2}
1. Lucas Valley Road and Las Gallinas Avenue	Signal	AM PM	F D	>80 38	F D	>80 38
2. Lucas Valley Road and Los Gamos Drive	Signal	AM PM	B E	20 67	C E	25 67
3. Lucas Valley Road and US 101 Southbound Ramps	Signal	AM PM	B D	19 46	C D	23 47
4. Lucas Valley Road / Smith Ranch Road and US 101 Northbound Ramps	Signal	AM PM	C C	23 30	C C	24 30
5. Lucas Valley Road / Smith Ranch Road and Redwood Drive / Redwood Highway	Signal	AM PM	B F	16 185	B F	17 185

Notes:

1. **Bold** denotes unacceptable level of service and delay.
2. Standard industry practice is to summarize delay greater than 80 seconds (LOS F) as ">80". However, in some instances, the ">80" was over written with the estimated delay to better under the Project's impact to the No Project conditions and its relationship to the significance criteria.

Sources: Fehr & Peers, 2017

As shown on **Table 7-1**, all intersections would operate at an acceptable LOS C or better during the AM peak hour with exception to Lucas Valley Road / Las Gallinas Avenue intersection which operates at LOS F under No Project and Plus Project conditions. The addition of the Project-related traffic would exacerbate the No Project condition and contribute more than 5 seconds of delay, resulting in a **significant impact** which would require mitigation as described in Mitigation Measure TR-6.

During the PM peak hour, all intersections operate at an acceptable LOS D or better except the Lucas Valley Road / Los Gamos Drive and the Lucas Valley Road / Smith Ranch Road / Redwood Drive / Redwood Highway intersections, which operate at LOS E and LOS F, respectively. While the Project would contribute additional traffic to both the intersections, the overall intersection delay would not increase by more than

five seconds compared to the Cumulative No Project conditions. Therefore, the Project impact is considered **less-than-significant** during the PM peak hour.

Mitigation Measure TR-6. Improve Intersection Operations at Lucas Valley Road/Las Gallinas Avenue (MM TR-3)

Intersection improvements have yet to be identified through the City of *San Rafael's General Plan 2020*; however, several improvements vehicle capacity improvements may be considered to mitigate poor operating conditions at the intersection. The feasibility of the potential projects and its adverse impacts will require further study and coordination with the City of San Rafael and local community. Since the intersection is not part of a traffic fee program and intersection improvements have yet to be identified, the Project would result in a **significant and unavoidable impact**.

7.2.2.1 Queue Summary

A queue summary narrative is provided below to supplement the intersection operations analysis; however, results are not part of the significance criteria and the narrative provided is for informational purposes only. Detailed queue results tables are included in **Appendix F**.

Under Cumulative Conditions during the AM peak period, 95-percentile queue lengths exceed storage capacity under both Cumulative No Project and Plus Project conditions for the following movements at the Lucas Valley Road/Los Gamos Drive intersection: northbound left, northbound right, westbound left and eastbound through. Under both Cumulative conditions, queues for vehicles traveling eastbound at this intersection extend past upstream driveways. The addition of the Project increases eastbound queue lengths but does not substantially increase northbound or westbound queues during the AM peak period. During the PM peak period, the 95-percentile queue lengths for northbound movements exceed storage capacity under both No Project and Plus Project conditions; however, the addition of the Project does not substantially increase the queue length.

At the Lucas Valley Road/US 101 Southbound Ramps intersection, average queues for vehicles traveling from the off-ramp exceed the available storage capacity under both No Project and Plus Project conditions, thus spilling back onto mainline US 101, during both peak periods. During the AM peak period, average eastbound queues extend past the upstream intersection (i.e. Los Gamos Drive) during both No Project and Plus Project conditions, although the addition of the Project does not substantially increase eastbound queue lengths. During the PM peak period, westbound 95-percentile vehicle queues extend past the upstream intersection (i.e. US 101 Northbound Ramps) under both No Project and Plus Project conditions; however, the addition of the Project does not substantially increase the queue length.

At the Lucas Valley Road/US 101 Northbound Ramps intersection, the queue for vehicles traveling northbound exceeds the available off-ramp storage length under both No Project and Plus Project conditions during both AM and PM peak periods, thereby spilling onto mainline US 101. During the AM peak period, the queue for vehicles traveling eastbound at this intersection exceeds the storage length under both No Project and Plus Project conditions past the upstream intersection (i.e. US 101 Southbound Ramps). However, the addition of the project does not substantially increase northbound or eastbound queue lengths.

Vehicle queues do not change substantially with the addition of the Project at the Lucas Valley Road/Las Gallinas Avenue and Smith Ranch Road/N Redwood Drive/Redwood Highway intersections.

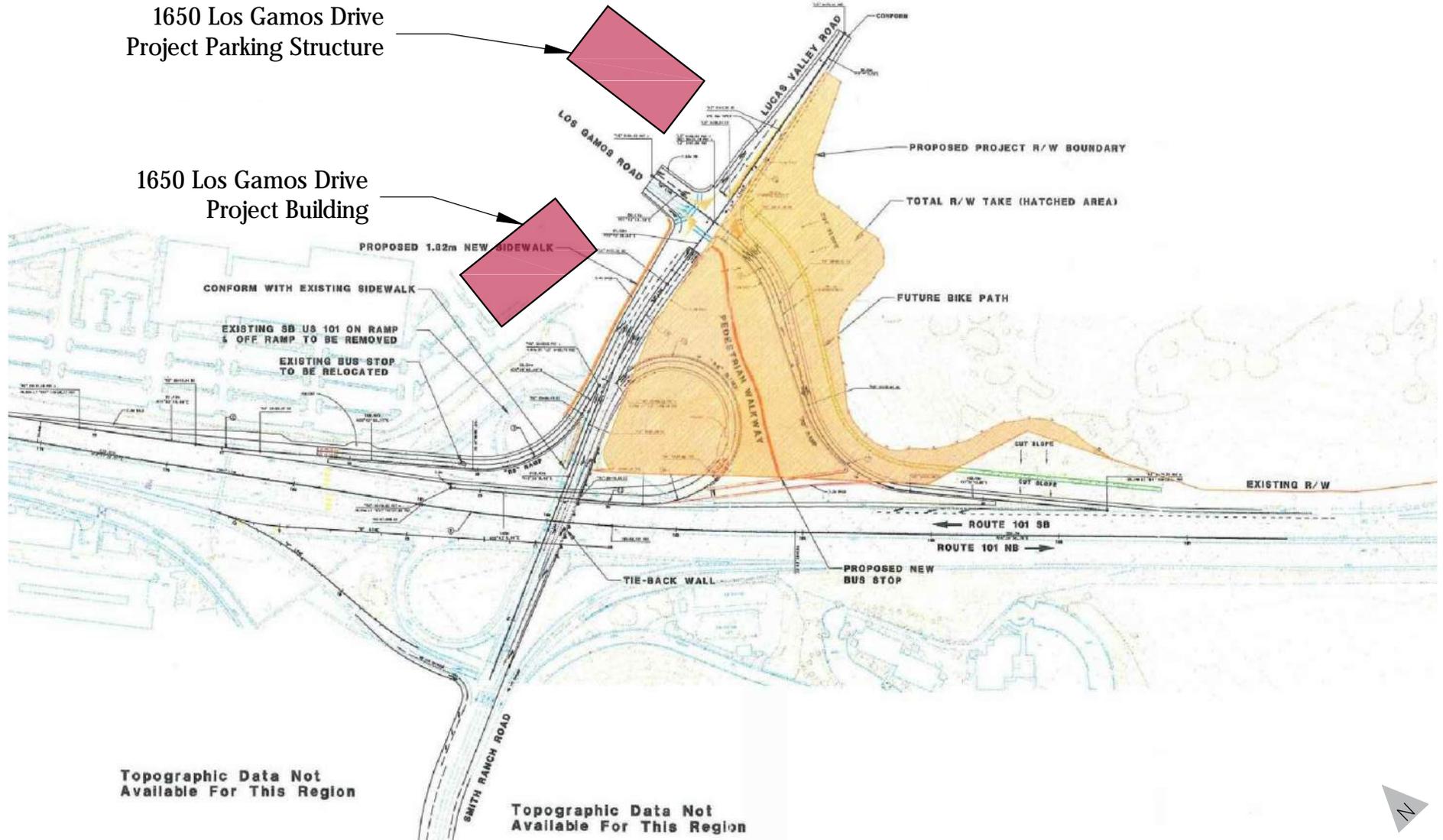
7.2.2.2 Cumulative Conditions with Interchange Improvements

In 2003, Caltrans approved the PSR(PDS) for the US 101/Lucas Valley Interchange Improvement Project to relieve congestion at the existing interchange. The project defined include modifications to the interchange by replacing the existing southbound loop off-ramp with a new diagonal off-ramp on the north side of Lucas Valley Road, which would meet Los Gamos Drive as the fourth leg of the intersection. Additionally, the project would construct a new southbound US 101 loop on-ramp to serve traffic from westbound Smith Ranch Road, widen Lucas Valley Road the US 101 overpass, and add a second right turn lane at the existing northbound off-ramp. The existing southbound on-ramp on the south side of Lucas Valley Road would remain; however, the existing signal would be removed and the eastbound right turn lane would be changed to a free movement. **Figure 7-3** illustrates the proposed interchange improvements.

CADD FILE: \\FPS03\Data\Projects\2015 Projects\SF15-0658_Los Gamos Kaiser TIS\Graphics\CAD\FSR_PDS\Fig 7-3_FSR_PDS.dwg
Feb 03, 2017

1650 Los Gamos Drive
Project Parking Structure

1650 Los Gamos Drive
Project Building



Note: Conceptual illustration not to scale.

Source: Caltrans Approved Project Study Report (Project Development Support) for the Route 101 / Lucas Valley Interchange Improvement Project (2003)



Figure 7-3
US 101 / Lucas Valley Interchange Improvement Project

The PSR(PDS) is not yet funded and was not identified in the San Rafael General Plan 2020; however, a supplementary cumulative analysis was completed for informational purposes, summarized below.

The Cumulative with PSR(PDS) Interchange Improvements were evaluated using the same methods described in Chapter 1. The Cumulative with PSR(PDS) Interchange Improvements analysis results are presented in **Table 7-2**, based on the cumulative traffic volumes presented in **Figure 7-1** and **Figure 7-2**. Detailed LOS calculation worksheets are included in **Appendix B** and queue summary worksheets in **Appendix F**.

During the AM peak hour, Project traffic would result in an increase of more than five seconds in average delay, the threshold for a Project-related impact, at the Lucas Valley Road/Las Gallinas and Lucas Valley Road/Los Gamos Drive intersections. However, the remaining three intersections would operate at an acceptable LOS C or better. During the PM peak hour, the addition of Project traffic would increase delay; however, intersections would continue to operate at an acceptable LOS D or better.

Since the PSR/PDS is not yet funded and was not identified in the San Rafael General Plan 2020 the Project's impact to the proposed interchange is not assumed to be effected by the Significance Criteria set by the City of San Rafael. If the PSR/PDS is to be further considered, a Project Approval/Environmental Document (PA/ED) and further engineering studies must be completed, in which case the Project's contribution may be considered. However, the PSR/PDS has remained stagnant since the 2003 approval and no further studies have been completed.

TABLE 7-2: CUMULATIVE WITH INTERCHANGE IMPROVEMENTS INTERSECTION LEVEL OF SERVICE AND DELAY RESULTS

Intersection	Intersection Control	Time Period	Cumulative No Project		Cumulative Plus Project	
			LOS ¹	Delay ¹	LOS ¹	Delay ¹
1. Lucas Valley Road and Las Gallinas Avenue	Signal	AM	F	>80	F	>80
		PM	C	26	C	34
2. Lucas Valley Road and Los Gamos Drive / US 101 Southbound Off-Ramp ²	Signal	AM	F	>80	F	>80
		PM	D	43	D	47
3. Lucas Valley Road and US 101 Southbound On-Ramps ²	Unsig. ²	AM	B	11	C	18
		PM	A	<10	A	<10
4. Lucas Valley Road / Smith Ranch Road and US 101 Northbound Ramps	Signal	AM	C	21	C	27
		PM	B	20	B	16
5. Lucas Valley Road / Smith Ranch Road and Redwood Drive / Redwood Highway	Signal	AM	B	16	B	16
		PM	C	29	C	31

TABLE 7-2: CUMULATIVE WITH INTERCHANGE IMPROVEMENTS INTERSECTION LEVEL OF SERVICE AND DELAY RESULTS

Intersection	Intersection Control	Time Period	Cumulative No Project		Cumulative Plus Project	
			LOS ¹	Delay ¹	LOS ¹	Delay ¹

Notes:

1. **Bold** denotes unacceptable level of service and delay.
2. The PSR configuration proposes a southbound US 101 diagonal off-ramp which would represent the fourth leg of the Los Gamos Drive / Lucas Valley Road intersection. A new southbound US 101 on-ramp from westbound Lucas Valley Road would be constructed as free loop on-ramp. The existing diagonal on-ramp for eastbound Lucas Valley Road traffic would remain and the intersection would become unsignalized and free.

Sources: Fehr & Peers, 2017

7.2.2.3 Signal Warrants

As described above, the City of San Rafael General Plan 2020 proposes to signalize the Lucas Valley Road / Los Gamos Drive intersection. Therefore, no study intersection remains unsignalized and needs to be evaluated as part of the signal warrant analysis.

7.2.3 Freeway Operations

Cumulative freeway conditions were evaluated using the same methods described in Chapter 1. The Cumulative conditions analysis results are presented in **Table 7-3** and **Table 7-4**, for the AM and PM peak hours, respectively. Detailed freeway level of service calculation sheets are provided in **Appendix D**.

TABLE 7-3: CUMULATIVE CONDITIONS FREEWAY DENSITY AND LOS – AM PEAK HOUR

Segment	Segment Type	Cumulative No Project		Cumulative Plus Project	
		Density (pc/mi/ln) ¹	LOS ²	Density (pc/mi/ln) ¹	LOS
Northbound					
Manuel T Freitas Off / Manuel T Freitas On	Basic	25.4	C	25.4	C
Manuel T Freitas On / Redwood Highway On	Basic	28.4	D	28.5	D
Redwood Highway On	Merge	22	C	22	C
Smith Ranch Road Off	Basic	21.1	C	21.2	C
Smith Ranch Road Off / Lucas Road EB On	Basic	23	C	23.3	C
Lucas Road EB On / Smith Ranch Road WB On	Basic	17.9	B	18.1	C
Smith Ranch Road WB On	Merge	20.1	C	20.3	C
Miller Creek Off	Basic	18.6	C	18.8	C
Miller Creek On	Basic	24	C	24.3	C
Southbound					
Miller Creek Off	Basic	26.4	F³	26.5	F³
Miller Creek On	Merge	36.0	F³	36.2	F³
Lucas Valley Road Off	Basic	23.9	F³	24.1	F³
Lucas Valley Road Off / Lucas Valley Road On	Basic	29.7	F³	29.7	F³
Lucas Valley Road On	Merge	35.7	F³	35.8	F³
Lucas Valley Road On / Manuel T Freitas Off	Basic	35.9	F³	36.0	F³
Manuel T Freitas Off	Diverge	36.9	F³	37.0	F³
Manuel T Freitas Off / Manuel T Freitas On	Basic	28.3	F³	28.4	F³

Notes:

1. pc/mi/ln = passenger car per mile per lane
2. **Bold** = unacceptable LOS
3. This segment operates in queue; however, the results reported in the analysis software does not match existing condition observations because the methodology accounts for the number of vehicles that are able to use the facility, not the number of vehicles that want to use the facility and are in queue (demand). The LOS results were revised to match existing observations.

Sources: Fehr & Peers, 2017

TABLE 7-4: CUMULATIVE CONDITIONS FREEWAY DENSITY AND LOS – PM PEAK HOUR

Segment	Segment Type	Cumulative No Project		Cumulative Plus Project	
		Density (pc/mi/ln) ¹	LOS ²	Density (pc/mi/ln) ¹	LOS ²
Northbound					
Manuel T Freitas Off / Manuel T Freitas On	Basic	42.8	E	47.5	F
Manuel T Freitas On / Redwood Highway On	Basic	56.7	F	60.1	F
Redwood Highway On	Merge	31.4	D	31.9	D
Smith Ranch Road Off	Basic	34.3	D	35.4	E
Smith Ranch Road Off / Lucas Road EB On	Basic	28.7	D	29.3	D
Lucas Road EB On / Smith Ranch Road WB On	Basic	30.4	D	31.2	D
Smith Ranch Road WB On	Merge	31.6	D	32	D
Miller Creek Off	Basic	33.7	D	34.6	D
Miller Creek On	Basic	55.4	F	58.4	F
Southbound					
Miller Creek Off	Basic	27.4	D	28.3	D
Miller Creek On	Merge	30	D	30.6	D
Lucas Valley Road Off	Basic	20.9	C	21.4	C
Lucas Valley Road Off / Lucas Valley Road On	Basic	26.4	D	27	D
Lucas Valley Road On	Merge	35.3	E	35.8	E
Lucas Valley Road On / Manuel T Freitas Off	Basic	34.5	D	35.5	E
Manuel T Freitas Off	Diverge	36.1	E	36.5	E
Manuel T Freitas Off / Manuel T Freitas On	Basic	28.2	D	28.9	D

Notes:

1. pc/mi/ln = passenger car per mile per lane
2. **Bold** = unacceptable LOS

Sources: Fehr & Peers, 2017

During the weekday AM peak hour, all of the freeway study segments operate at LOS E or better across both Cumulative scenarios, except southbound segments during the AM peak hour. As described under Existing conditions, the southbound segments currently operate in congestion due to a downstream bottleneck between the San Pedro on-ramp and Mission Avenue off-ramp. The addition of Project trips would contribute to the existing failing operations. The v/c ratio calculation is summarized in **Table 7-5**.

TABLE 7-5: CUMULATIVE CONDITIONS VOLUME TO CAPACITY (V/C) SUMMARY¹ – AM PEAK HOUR					
Segment	Segment Capacity¹	Cumulative No Project		Cumulative Plus Project	
		Volume²	v/c	Volume²	v/c³
Southbound					
Miller Creek Off / Miller Creek On	6,600	4,729	0.72	4,757	0.72
Miller Creek On / Lucas Valley Road Off	8,100	5,800	0.72	5,828	0.72
Lucas Valley Road Off / Lucas Valley Road On	6,600	5,188	0.79	5,188	0.79
Lucas Valley Road On / Manuel T Freitas Off	6,600	5,871	0.89	5,886	0.89
Manuel T Freitas Off / Manuel T Freitas On	6,600	5,003	0.76	5,018	0.76

Notes:

1. Summary based on mixed flow lanes only. High Occupancy Vehicles lane not included in analysis.
2. v/c calculation assumes the following capacities:
 - Mixed Flow Lanes: 2,200 vehicles per lane
 - Auxiliary Lanes: 1,500 vehicles per lane
3. The total volume reported does not account for the HOV volume.
4. **Bold** = Project contributes greater than 0.01 v/c to the No Project condition resulting in a significant impact

Sources: Fehr & Peers, 2017

As shown in **Table 7-5** the Project would not increase the freeway's v/c ratio by 0.01 or more with the Project's contribution. Therefore, the Project results in a **less than significant impact** during the Cumulative Plus Project AM peak hour.

During the PM peak hour, all freeway study segments operate at LOS E or better across all Cumulative scenarios, except the following northbound segments:

- Manuel T Freitas Off to Manuel T Freitas On (degrades from LOS E to LOS F with the Project)
- Manuel T Freitas On to Redwood Highway On (operates at LOS F across all PM peak hour Cumulative scenarios)
- Miller Creek On (operates at LOS F across all PM peak hour Cumulative scenarios)

The Project’s contribution to these segments are summarized in **Table 7-6**. As shown, the Projects addition to these segment is less than 1-percent of total traffic on the corridor. However, at the Miller Creek segment, the Project’s contribution results in a v/c ratio increase of 0.01, thereby resulting in **significant impact**, even though the Project’s expected VMT per employee is less than the expected VMT per employee for the TAZ.

TABLE 7-6: CUMULATIVE CONDITIONS VOLUME TO CAPACITY (V/C) SUMMARY¹ – PM PEAK HOUR

Segment	Segment Capacity ¹	Cumulative No Project		Cumulative Plus Project	
		Volume ²	v/c	Volume ²	v/c ³
Northbound					
Manuel T Freitas Off / Manuel T Freitas On	6,600	6,451	0.98	6,648	0.98
Manuel T Freitas On / Redwood Highway On	8,800	7,236	0.82	7,262	0.82
Miller Creek On	8,100	7,405	0.91	7,421	0.92

Notes:

1. Summary based on mixed flow lanes only. High Occupancy Vehicles lane not included in analysis.
2. v/c calculation assumes the following capacities:
 - Mixed Flow Lanes: 2,200 vehicles per lane
 - Auxiliary Lanes: 1,500 vehicles per lane
3. The total volume reported does not account for the HOV volume.
4. **Bold** = Project contributes greater than 0.01 v/c to the No Project condition resulting in a significant impact

Sources: Fehr & Peers, 2017

Roadway improvements along US 101, within the Project vicinity, are neither planned nor funded. Thus, it is infeasible for the Project Sponsor to contribute its fair-share contribution. Caltrans IGR states that implementation of a TDM program could reduce VMT and the Project’s impact to the regional network. Therefore, the Project Sponsor could implement a TDM Program, to be reviewed and approved by the City of San Rafael, with the goal of reducing the Project’s employee vehicle trips and reducing the Project’s impact on the regional network.

Mitigation Measure TR-7. Project Sponsor shall identify and implement additional TDM measures (MM TR-2).

Implement MM TR-2: The Project Sponsor shall implement TDM measures currently under consideration and implemented at other nearby facilities, as described in the Project Description. These TDM elements would go beyond what is already required as part of the PD District with the goal of reducing employee vehicle trips and reducing the Project’s impact on the regional network. The program will be submitted to the City of San Rafael for review, comment, and approval. If

coordination is required, the Project Sponsor will work with the City of San Rafael to implement the program.

Since details of the ultimate TDM program have not yet been defined, a quantitative analysis of the TDM program's effectiveness for reducing vehicle trips was not completed. Thus it is unknown if the reduction in vehicle trips would mitigate the Project's contribution to US 101 to less than significant. Therefore, even with implementation, the impact would remain **significant and unavoidable**.

7.3 BICYCLE & PEDESTRIAN IMPACTS

Bicycling and pedestrian trips in the study area may increase as a result of the proposed Project and Cumulative growth, which may result in an increase in vehicle-bicycle-pedestrian conflicts at intersections in the study area. However, the proposed Project would not create potentially hazardous conditions for bicycles, pedestrians, or otherwise interfere with bicycle and pedestrian accessibility to the site and adjoining areas because the Project does not remove existing facilities and does not prohibit the construction of proposed future facilities as documented under the Cumulative Roadway Assumptions. Therefore, the Project's impact to bicycle and pedestrian facilities are considered **less than significant** and mitigations are not required under Cumulative Plus Project conditions.

7.4 TRANSIT IMPACTS

Transit trips in the study area may increase as a result of the Project. However, Project related transit trips would have no foreseeable impacts to transit operations because the Project would not likely generate enough transit demand to exceed the capacity of existing or planned transit service nor does it interfere with existing or future transit users. Therefore, the Project impacts to transit facilities are considered **less than significant** and mitigations are not required.



1650 Los Gamos Drive Kaiser

Transportation Impact Analysis

Technical Appendix

Draft

February 2017

Prepared for the City of San Rafael

SF15-0858

Appendices

Appendix A: Peak Hour Intersection Counts

Appendix B: Detailed Intersection LOS Results

Appendix C: Peak Hour Signal Warrants

Appendix D: Detailed Freeway LOS Results

Appendix E: Detailed VMT Comparison Table

Appendix F: Detailed Intersection Queue Summary



APPENDIX A: PEAK HOUR INTERSECTION COUNTS



TRAFFIC COUNTS PLUS

mietekm@comcast.net
925.305.4358

CITY OF SAN RAFAEL

File Name : 101 nb-smitch ranch-a
Site Code : 4
Start Date : 11/18/2015
Page No : 1

Groups Printed- Vehicles Only

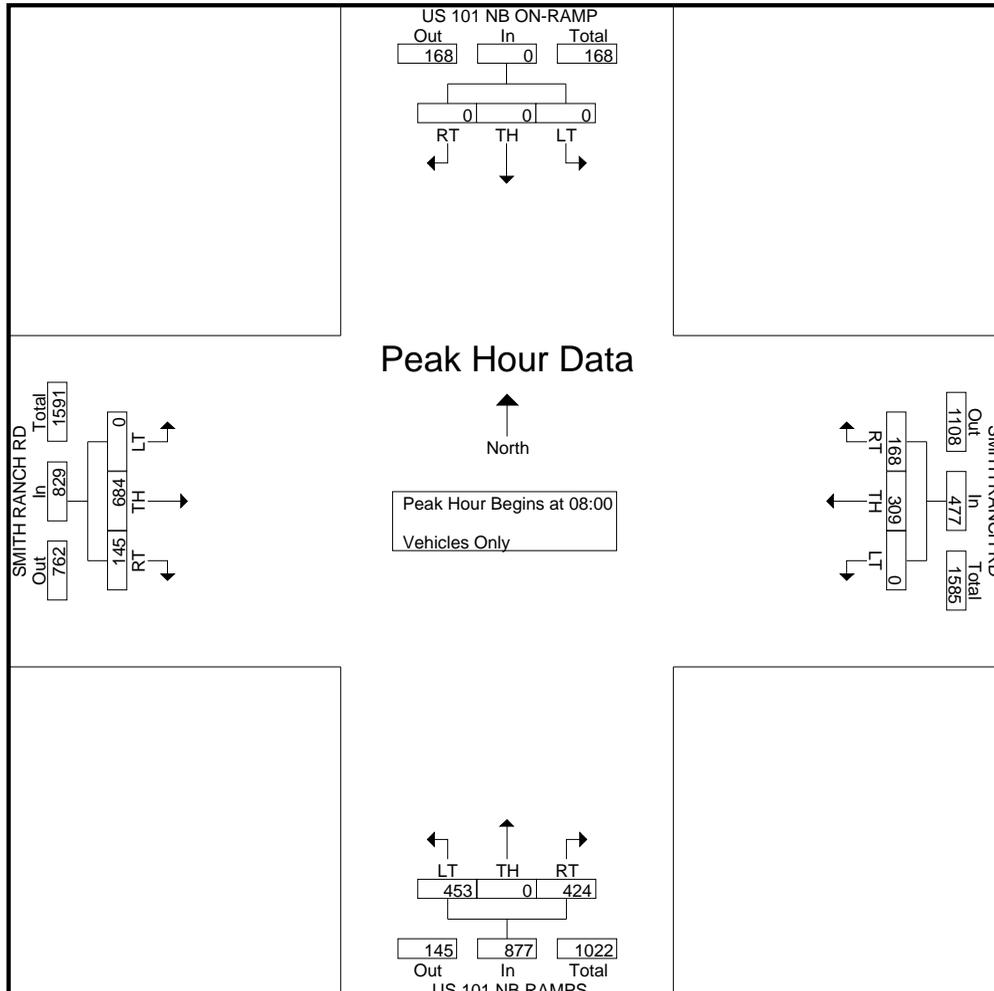
Start Time	US 101 NB ON-RAMP Southbound				SMITH RANCH RD Westbound				US 101 NB RAMPS Northbound				SMITH RANCH RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	
07:00	0	0	0	0	24	81	0	105	47	0	42	89	11	127	0	138	332
07:15	0	0	0	0	26	94	0	120	53	0	56	109	22	121	0	143	372
07:30	0	0	0	0	34	94	0	128	71	0	67	138	20	119	0	139	405
07:45	0	0	0	0	45	104	0	149	77	0	83	160	23	142	0	165	474
Total	0	0	0	0	129	373	0	502	248	0	248	496	76	509	0	585	1583
08:00	0	0	0	0	46	83	0	129	92	0	126	218	29	169	0	198	545
08:15	0	0	0	0	45	79	0	124	106	0	117	223	38	165	0	203	550
08:30	0	0	0	0	35	75	0	110	105	0	118	223	43	163	0	206	539
08:45	0	0	0	0	42	72	0	114	121	0	92	213	35	187	0	222	549
Total	0	0	0	0	168	309	0	477	424	0	453	877	145	684	0	829	2183
Grand Total	0	0	0	0	297	682	0	979	672	0	701	1373	221	1193	0	1414	3766
Apprch %	0	0	0	0	30.3	69.7	0		48.9	0	51.1		15.6	84.4	0		
Total %	0	0	0	0	7.9	18.1	0	26	17.8	0	18.6	36.5	5.9	31.7	0	37.5	

Start Time	US 101 NB ON-RAMP Southbound				SMITH RANCH RD Westbound				US 101 NB RAMPS Northbound				SMITH RANCH RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	

Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 08:00

08:00	0	0	0	0	46	83	0	129	92	0	126	218	29	169	0	198	545
08:15	0	0	0	0	45	79	0	124	106	0	117	223	38	165	0	203	550
08:30	0	0	0	0	35	75	0	110	105	0	118	223	43	163	0	206	539
08:45	0	0	0	0	42	72	0	114	121	0	92	213	35	187	0	222	549
Total Volume	0	0	0	0	168	309	0	477	424	0	453	877	145	684	0	829	2183
% App. Total	0	0	0	0	35.2	64.8	0		48.3	0	51.7		17.5	82.5	0		
PHF	.000	.000	.000	.000	.913	.931	.000	.924	.876	.000	.899	.983	.843	.914	.000	.934	.992



TRAFFIC COUNTS PLUS

mietekm@comcast.net
925.305.4358

CITY OF SAN RAFAEL

File Name : 101 nb-smitch ranch-p
Site Code : 4
Start Date : 11/18/2015
Page No : 1

Groups Printed- Vehicles Only

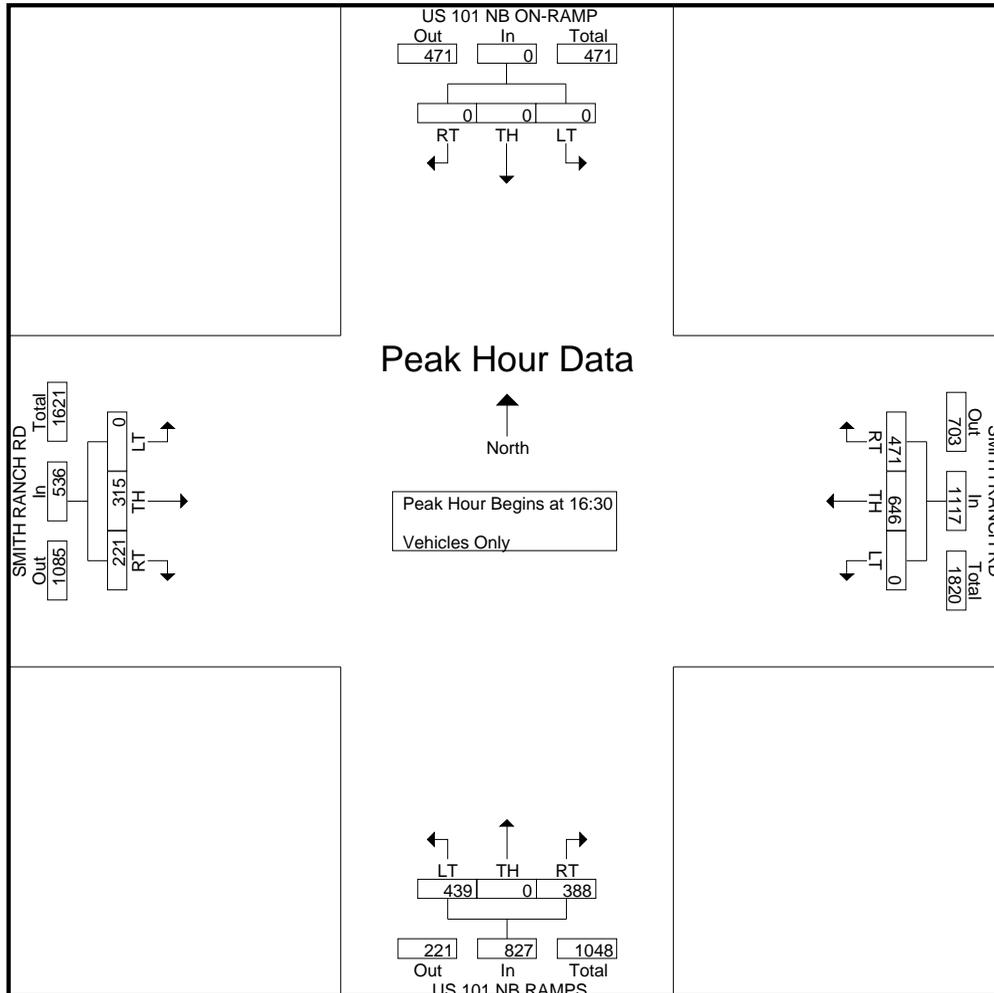
Start Time	US 101 NB ON-RAMP Southbound				SMITH RANCH RD Westbound				US 101 NB RAMPS Northbound				SMITH RANCH RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	
16:00	0	0	0	0	113	149	0	262	104	0	81	185	67	75	0	142	589
16:15	0	0	0	0	102	149	0	251	99	0	95	194	32	79	0	111	556
16:30	0	0	0	0	116	158	0	274	86	0	110	196	49	72	0	121	591
16:45	0	0	0	0	111	151	0	262	125	0	107	232	40	84	0	124	618
Total	0	0	0	0	442	607	0	1049	414	0	393	807	188	310	0	498	2354
17:00	0	0	0	0	144	200	0	344	77	0	114	191	77	76	0	153	688
17:15	0	0	0	0	100	137	0	237	100	0	108	208	55	83	0	138	583
17:30	0	0	0	0	94	147	0	241	88	0	93	181	51	59	0	110	532
17:45	0	0	0	0	75	104	0	179	91	0	104	195	42	70	0	112	486
Total	0	0	0	0	413	588	0	1001	356	0	419	775	225	288	0	513	2289
Grand Total	0	0	0	0	855	1195	0	2050	770	0	812	1582	413	598	0	1011	4643
Apprch %	0	0	0	0	41.7	58.3	0		48.7	0	51.3		40.9	59.1	0		
Total %	0	0	0	0	18.4	25.7	0	44.2	16.6	0	17.5	34.1	8.9	12.9	0	21.8	

Start Time	US 101 NB ON-RAMP Southbound				SMITH RANCH RD Westbound				US 101 NB RAMPS Northbound				SMITH RANCH RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	

Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 16:30

16:30	0	0	0	0	116	158	0	274	86	0	110	196	49	72	0	121	591
16:45	0	0	0	0	111	151	0	262	125	0	107	232	40	84	0	124	618
17:00	0	0	0	0	144	200	0	344	77	0	114	191	77	76	0	153	688
17:15	0	0	0	0	100	137	0	237	100	0	108	208	55	83	0	138	583
Total Volume	0	0	0	0	471	646	0	1117	388	0	439	827	221	315	0	536	2480
% App. Total	0	0	0	0	42.2	57.8	0		46.9	0	53.1		41.2	58.8	0		
PHF	.000	.000	.000	.000	.818	.808	.000	.812	.776	.000	.963	.891	.718	.938	.000	.876	.901



TRAFFIC COUNTS PLUS

mietekm@comcast.net
925.305.4358

CITY OF SAN RAFAEL

File Name : 101 sb-lucas valley-a
Site Code : 3
Start Date : 11/18/2015
Page No : 1

Groups Printed- Vehicles Only

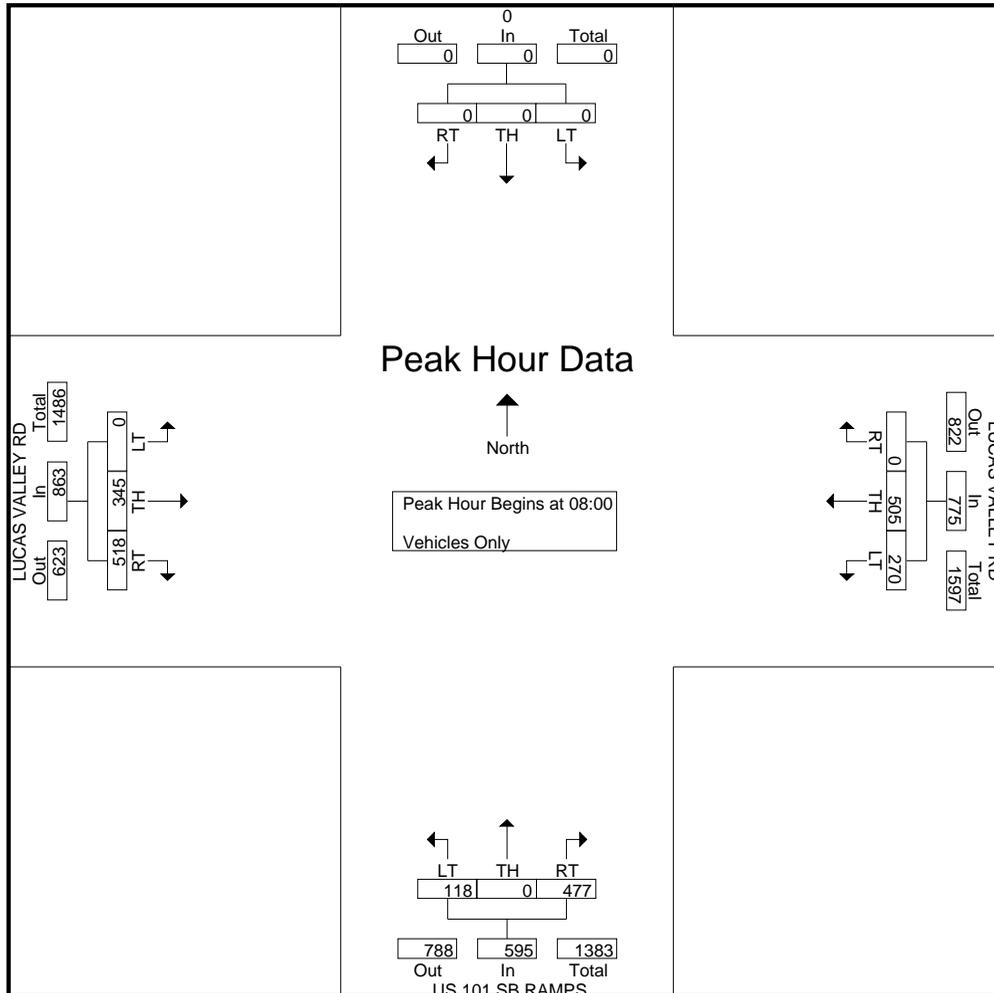
Start Time	0 Southbound				LUCAS VALLEY RD Westbound				US 101 SB RAMPS Northbound				LUCAS VALLEY RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	
07:00	0	0	0	0	0	47	71	118	97	0	20	117	91	36	0	127	362
07:15	0	0	0	0	5	69	75	149	92	0	16	108	116	48	0	164	421
07:30	0	0	0	0	0	77	79	156	84	0	18	102	138	58	0	196	454
07:45	0	0	0	0	0	104	82	186	93	0	15	108	145	69	0	214	508
Total	0	0	0	0	5	297	307	609	366	0	69	435	490	211	0	701	1745
08:00	0	0	0	0	0	138	68	206	114	0	32	146	127	89	0	216	568
08:15	0	0	0	0	0	133	74	207	112	0	28	140	131	87	0	218	565
08:30	0	0	0	0	0	137	66	203	124	0	22	146	141	75	0	216	565
08:45	0	0	0	0	0	97	62	159	127	0	36	163	119	94	0	213	535
Total	0	0	0	0	0	505	270	775	477	0	118	595	518	345	0	863	2233
Grand Total	0	0	0	0	5	802	577	1384	843	0	187	1030	1008	556	0	1564	3978
Apprch %	0	0	0	0	0.4	57.9	41.7		81.8	0	18.2		64.5	35.5	0		
Total %	0	0	0	0	0.1	20.2	14.5	34.8	21.2	0	4.7	25.9	25.3	14	0	39.3	

Start Time	0 Southbound				LUCAS VALLEY RD Westbound				US 101 SB RAMPS Northbound				LUCAS VALLEY RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	

Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 08:00

08:00	0	0	0	0	0	138	68	206	114	0	32	146	127	89	0	216	568
08:15	0	0	0	0	0	133	74	207	112	0	28	140	131	87	0	218	565
08:30	0	0	0	0	0	137	66	203	124	0	22	146	141	75	0	216	565
08:45	0	0	0	0	0	97	62	159	127	0	36	163	119	94	0	213	535
Total Volume	0	0	0	0	0	505	270	775	477	0	118	595	518	345	0	863	2233
% App. Total	0	0	0	0	0	65.2	34.8		80.2	0	19.8		60	40	0		
PHF	.000	.000	.000	.000	.000	.915	.912	.936	.939	.000	.819	.913	.918	.918	.000	.990	.983



TRAFFIC COUNTS PLUS

mietekm@comcast.net
925.305.4358

CITY OF SAN RAFAEL

File Name : 101 sb-lucas valley-p
Site Code : 3
Start Date : 11/18/2015
Page No : 1

Groups Printed- Vehicles Only

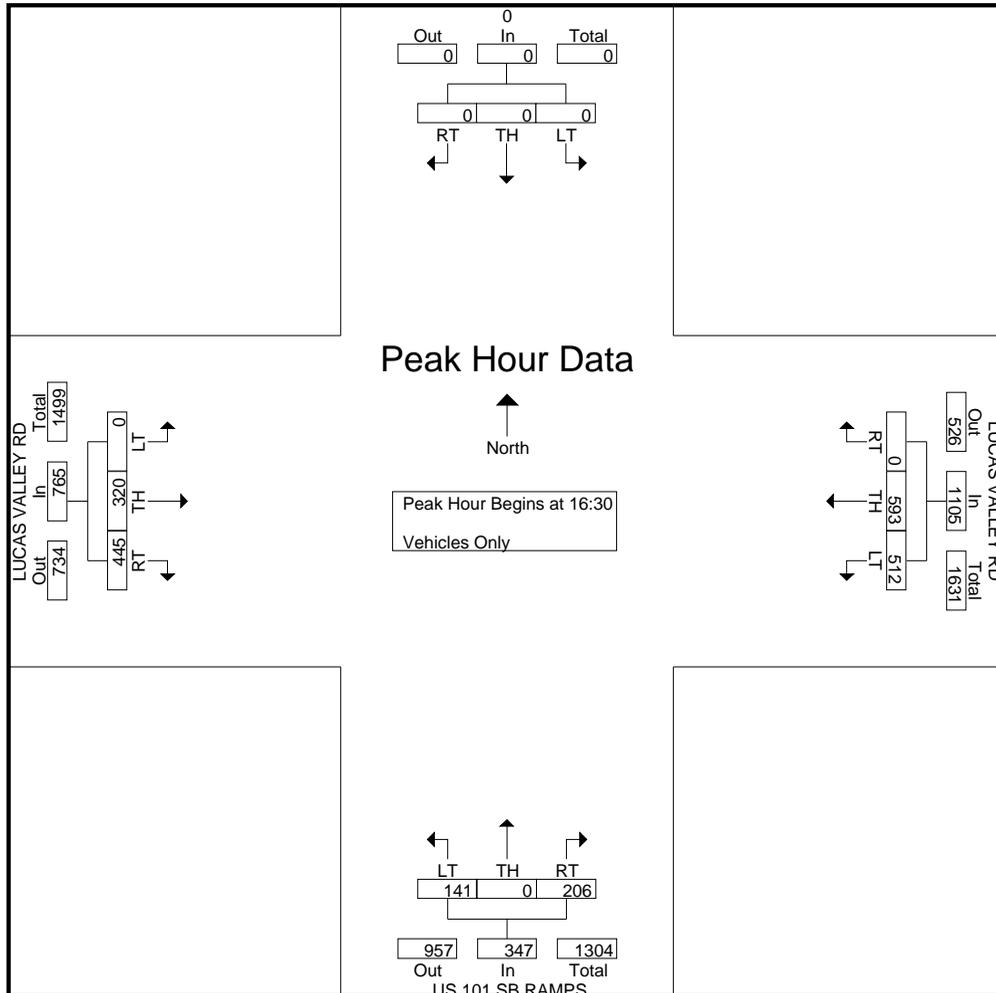
Start Time	0 Southbound				LUCAS VALLEY RD Westbound				US 101 SB RAMPS Northbound				LUCAS VALLEY RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	
16:00	0	0	0	0	0	114	106	220	51	0	22	73	87	93	0	180	473
16:15	0	0	0	0	0	107	103	210	45	0	24	69	71	59	0	130	409
16:30	0	0	0	0	0	152	109	261	42	0	36	78	142	78	0	220	559
16:45	0	0	0	0	0	150	116	266	50	0	37	87	117	68	0	185	538
Total	0	0	0	0	0	523	434	957	188	0	119	307	417	298	0	715	1979
17:00	0	0	0	0	0	160	169	329	61	0	28	89	100	101	0	201	619
17:15	0	0	0	0	0	131	118	249	53	0	40	93	86	73	0	159	501
17:30	0	0	0	0	0	125	118	243	32	0	42	74	110	79	0	189	506
17:45	0	0	0	0	0	147	79	226	49	0	29	78	102	51	0	153	457
Total	0	0	0	0	0	563	484	1047	195	0	139	334	398	304	0	702	2083
Grand Total	0	0	0	0	0	1086	918	2004	383	0	258	641	815	602	0	1417	4062
Apprch %	0	0	0	0	0	54.2	45.8	59.8	59.8	0	40.2	64.1	57.5	42.5	0	70.2	64.1
Total %	0	0	0	0	0	26.7	22.6	49.3	9.4	0	6.4	15.8	20.1	14.8	0	34.9	34.9

Start Time	0 Southbound				LUCAS VALLEY RD Westbound				US 101 SB RAMPS Northbound				LUCAS VALLEY RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	

Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 16:30

16:30	0	0	0	0	0	152	109	261	42	0	36	78	142	78	0	220	559
16:45	0	0	0	0	0	150	116	266	50	0	37	87	117	68	0	185	538
17:00	0	0	0	0	0	160	169	329	61	0	28	89	100	101	0	201	619
17:15	0	0	0	0	0	131	118	249	53	0	40	93	86	73	0	159	501
Total Volume	0	0	0	0	0	593	512	1105	206	0	141	347	445	320	0	765	2217
% App. Total	0	0	0	0	0	53.7	46.3	59.4	59.4	0	40.6	64.1	58.2	41.8	0	70.2	64.1
PHF	.000	.000	.000	.000	.000	.927	.757	.840	.844	.000	.881	.933	.783	.792	.000	.869	.895



TRAFFIC COUNTS PLUS

mietekm@comcast.net
925.305.4358

CITY OF SAN RAFAEL

File Name : las gallinas-lucas valley-a
Site Code : 1
Start Date : 11/19/2015
Page No : 1

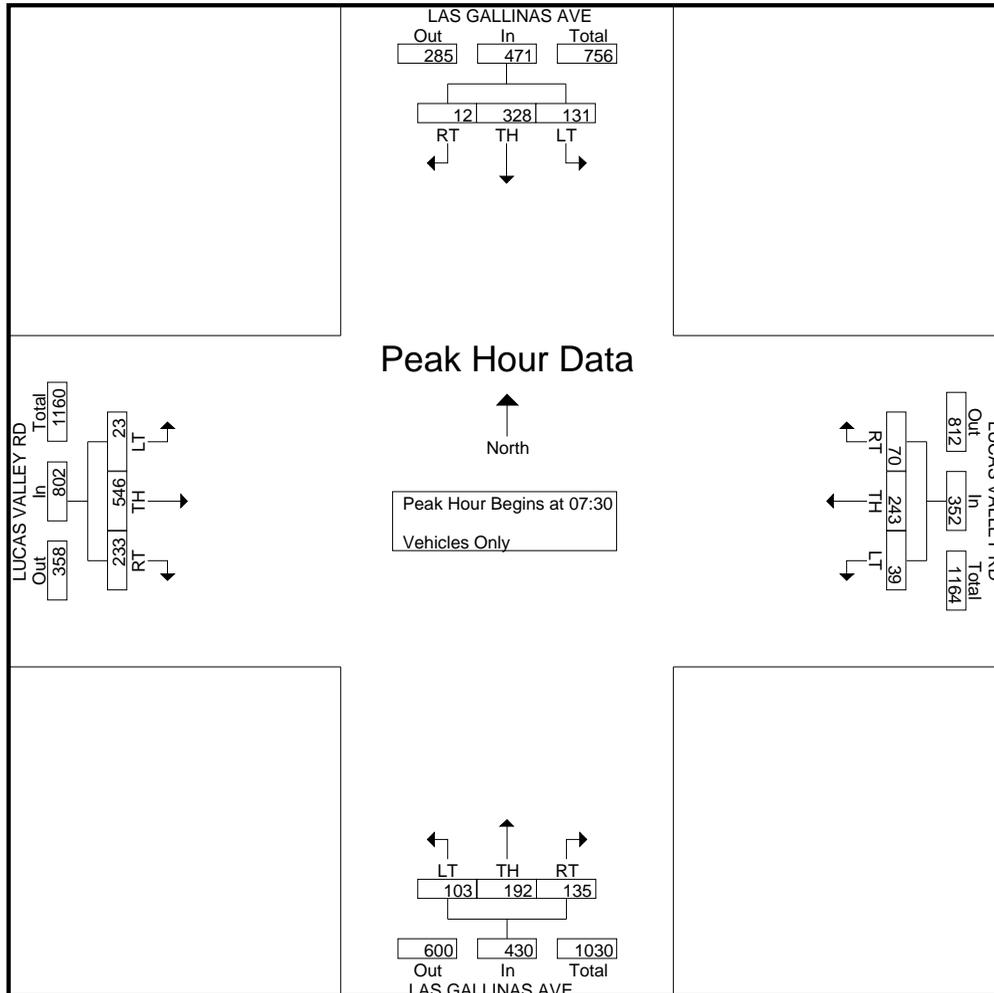
Groups Printed- Vehicles Only

Start Time	LAS GALLINAS AVE Southbound				LUCAS VALLEY RD Westbound				LAS GALLINAS AVE Northbound				LUCAS VALLEY RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	
07:00	1	51	35	87	7	25	7	39	12	7	5	24	10	85	2	97	247
07:15	1	81	35	117	8	17	5	30	32	18	12	62	21	107	10	138	347
07:30	1	83	32	116	22	39	7	68	27	71	10	108	68	130	9	207	499
07:45	9	97	38	144	33	52	12	97	35	61	22	118	46	123	3	172	531
Total	12	312	140	464	70	133	31	234	106	157	49	312	145	445	24	614	1624
08:00	2	84	31	117	8	93	10	111	37	48	49	134	56	142	3	201	563
08:15	0	64	30	94	7	59	10	76	36	12	22	70	63	151	8	222	462
08:30	3	80	34	117	9	61	14	84	26	12	22	60	33	126	1	160	421
08:45	4	63	48	115	9	71	13	93	29	11	15	55	41	127	5	173	436
Total	9	291	143	443	33	284	47	364	128	83	108	319	193	546	17	756	1882
Grand Total	21	603	283	907	103	417	78	598	234	240	157	631	338	991	41	1370	3506
Apprch %	2.3	66.5	31.2		17.2	69.7	13		37.1	38	24.9		24.7	72.3	3		
Total %	0.6	17.2	8.1	25.9	2.9	11.9	2.2	17.1	6.7	6.8	4.5	18	9.6	28.3	1.2	39.1	

Start Time	LAS GALLINAS AVE Southbound				LUCAS VALLEY RD Westbound				LAS GALLINAS AVE Northbound				LUCAS VALLEY RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	
07:30	1	83	32	116	22	39	7	68	27	71	10	108	68	130	9	207	499
07:45	9	97	38	144	33	52	12	97	35	61	22	118	46	123	3	172	531
08:00	2	84	31	117	8	93	10	111	37	48	49	134	56	142	3	201	563
08:15	0	64	30	94	7	59	10	76	36	12	22	70	63	151	8	222	462
Total Volume	12	328	131	471	70	243	39	352	135	192	103	430	233	546	23	802	2055
% App. Total	2.5	69.6	27.8		19.9	69	11.1		31.4	44.7	24		29.1	68.1	2.9		
PHF	.333	.845	.862	.818	.530	.653	.813	.793	.912	.676	.526	.802	.857	.904	.639	.903	.913

Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 07:30



TRAFFIC COUNTS PLUS

mietekm@comcast.net
925.305.4358

CITY OF SAN RAFAEL

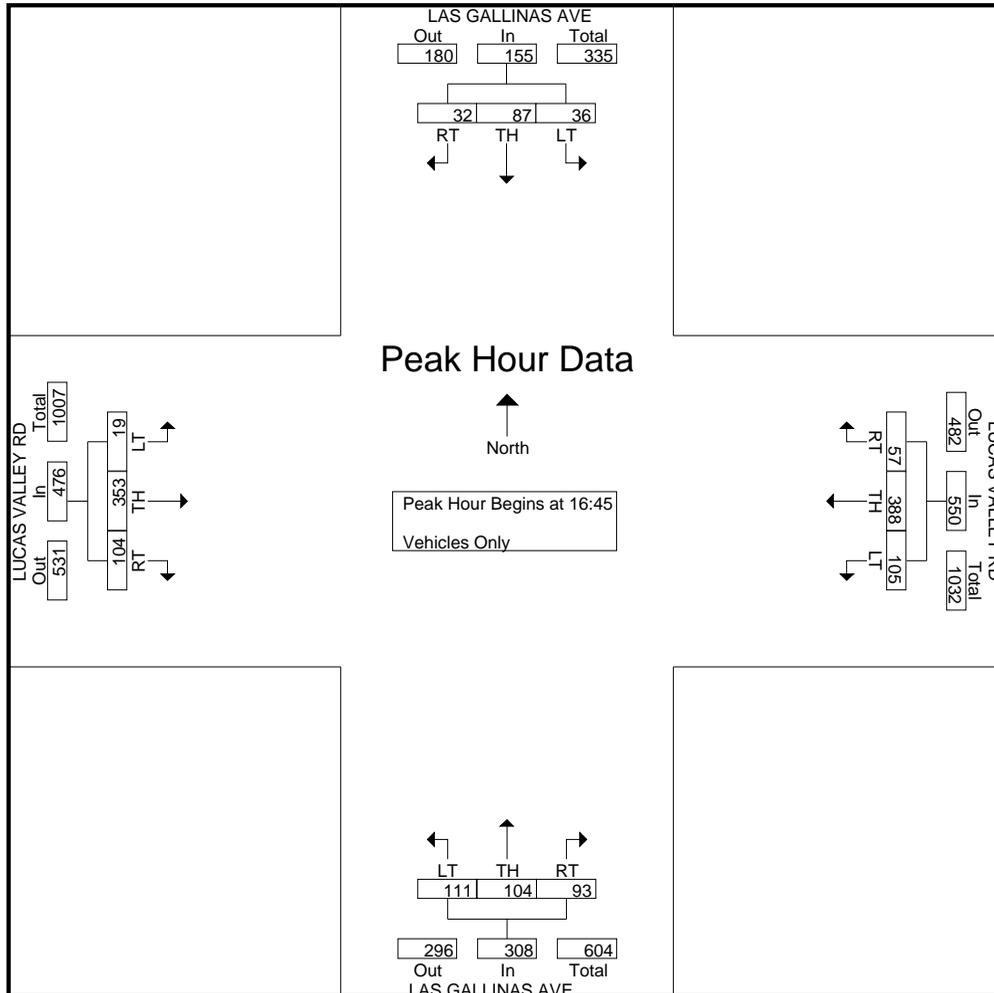
File Name : las gallinas-lucas valley-p
Site Code : 1
Start Date : 11/19/2015
Page No : 1

Groups Printed- Vehicles Only

Start Time	LAS GALLINAS AVE Southbound				LUCAS VALLEY RD Westbound				LAS GALLINAS AVE Northbound				LUCAS VALLEY RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	
16:00	5	17	8	30	11	89	21	121	18	21	31	70	16	75	5	96	317
16:15	1	20	12	33	8	78	17	103	23	42	27	92	25	82	8	115	343
16:30	8	37	16	61	12	91	21	124	18	39	34	91	12	59	7	78	354
16:45	12	26	14	52	21	107	18	146	22	21	25	68	31	82	5	118	384
Total	26	100	50	176	52	365	77	494	81	123	117	321	84	298	25	407	1398
17:00	5	23	5	33	8	84	22	114	24	31	35	90	19	99	5	123	360
17:15	8	16	10	34	17	103	27	147	27	27	24	78	34	88	4	126	385
17:30	7	22	7	36	11	94	38	143	20	25	27	72	20	84	5	109	360
17:45	10	19	9	38	12	81	22	115	25	23	25	73	17	48	2	67	293
Total	30	80	31	141	48	362	109	519	96	106	111	313	90	319	16	425	1398
Grand Total	56	180	81	317	100	727	186	1013	177	229	228	634	174	617	41	832	2796
Apprch %	17.7	56.8	25.6		9.9	71.8	18.4		27.9	36.1	36		20.9	74.2	4.9		
Total %	2	6.4	2.9	11.3	3.6	26	6.7	36.2	6.3	8.2	8.2	22.7	6.2	22.1	1.5	29.8	

Start Time	LAS GALLINAS AVE Southbound				LUCAS VALLEY RD Westbound				LAS GALLINAS AVE Northbound				LUCAS VALLEY RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	
16:45	12	26	14	52	21	107	18	146	22	21	25	68	31	82	5	118	384
17:00	5	23	5	33	8	84	22	114	24	31	35	90	19	99	5	123	360
17:15	8	16	10	34	17	103	27	147	27	27	24	78	34	88	4	126	385
17:30	7	22	7	36	11	94	38	143	20	25	27	72	20	84	5	109	360
Total Volume	32	87	36	155	57	388	105	550	93	104	111	308	104	353	19	476	1489
% App. Total	20.6	56.1	23.2		10.4	70.5	19.1		30.2	33.8	36		21.8	74.2	4		
PHF	.667	.837	.643	.745	.679	.907	.691	.935	.861	.839	.793	.856	.765	.891	.950	.944	.967

Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 16:45



TRAFFIC COUNTS PLUS

mietekm@comcast.net
925.305.4358

CITY OF SAN RAFAEL

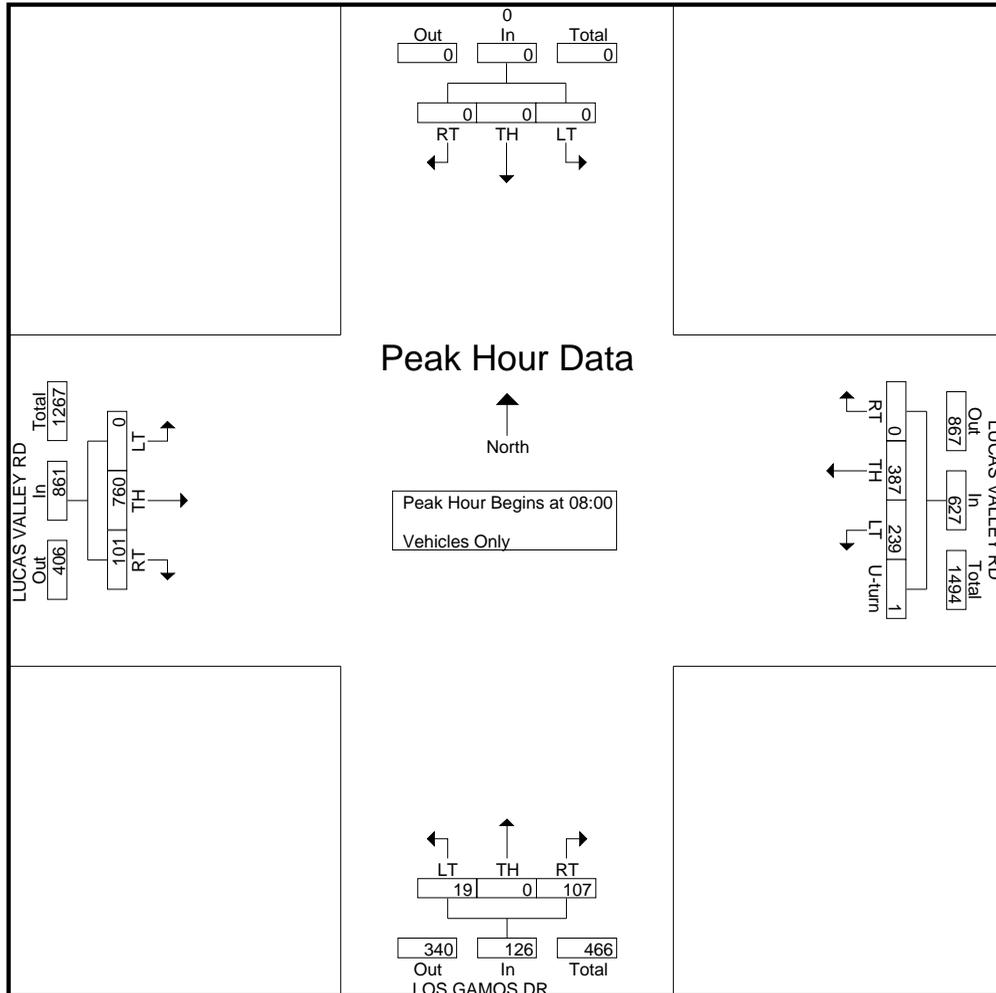
File Name : los gamos-lucas valley-a
Site Code : 2
Start Date : 11/18/2015
Page No : 1

Groups Printed- Vehicles Only

Start Time	0 Southbound				LUCAS VALLEY RD Westbound					LOS GAMOS DR Northbound				LUCAS VALLEY RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	U-turn	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	
07:00	0	0	0	0	0	33	31	0	64	21	0	5	26	8	107	0	115	205
07:15	0	0	0	0	0	48	36	1	85	17	0	4	21	16	150	0	166	272
07:30	0	0	0	0	0	73	32	0	105	25	0	5	30	15	163	0	178	313
07:45	0	0	0	0	0	91	30	0	121	26	0	7	33	19	197	0	216	370
Total	0	0	0	0	0	245	129	1	375	89	0	21	110	58	617	0	675	1160
08:00	0	0	0	0	0	116	60	1	177	24	0	3	27	21	183	0	204	408
08:15	0	0	0	0	0	93	62	0	155	25	0	6	31	30	197	0	227	413
08:30	0	0	0	0	0	92	61	0	153	26	0	4	30	19	194	0	213	396
08:45	0	0	0	0	0	86	56	0	142	32	0	6	38	31	186	0	217	397
Total	0	0	0	0	0	387	239	1	627	107	0	19	126	101	760	0	861	1614
Grand Total	0	0	0	0	0	632	368	2	1002	196	0	40	236	159	1377	0	1536	2774
Apprch %	0	0	0	0	0	63.1	36.7	0.2		83.1	0	16.9		10.4	89.6	0		
Total %	0	0	0	0	0	22.8	13.3	0.1	36.1	7.1	0	1.4	8.5	5.7	49.6	0	55.4	

Start Time	0 Southbound				LUCAS VALLEY RD Westbound					LOS GAMOS DR Northbound				LUCAS VALLEY RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	U-turn	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	
08:00	0	0	0	0	0	116	60	1	177	24	0	3	27	21	183	0	204	408
08:15	0	0	0	0	0	93	62	0	155	25	0	6	31	30	197	0	227	413
08:30	0	0	0	0	0	92	61	0	153	26	0	4	30	19	194	0	213	396
08:45	0	0	0	0	0	86	56	0	142	32	0	6	38	31	186	0	217	397
Total Volume	0	0	0	0	0	387	239	1	627	107	0	19	126	101	760	0	861	1614
% App. Total	0	0	0	0	0	61.7	38.1	0.2		84.9	0	15.1		11.7	88.3	0		
PHF	.000	.000	.000	.000	.000	.834	.964	.250	.886	.836	.000	.792	.829	.815	.964	.000	.948	.977

Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 08:00



TRAFFIC COUNTS PLUS

mietekm@comcast.net
925.305.4358

CITY OF SAN RAFAEL

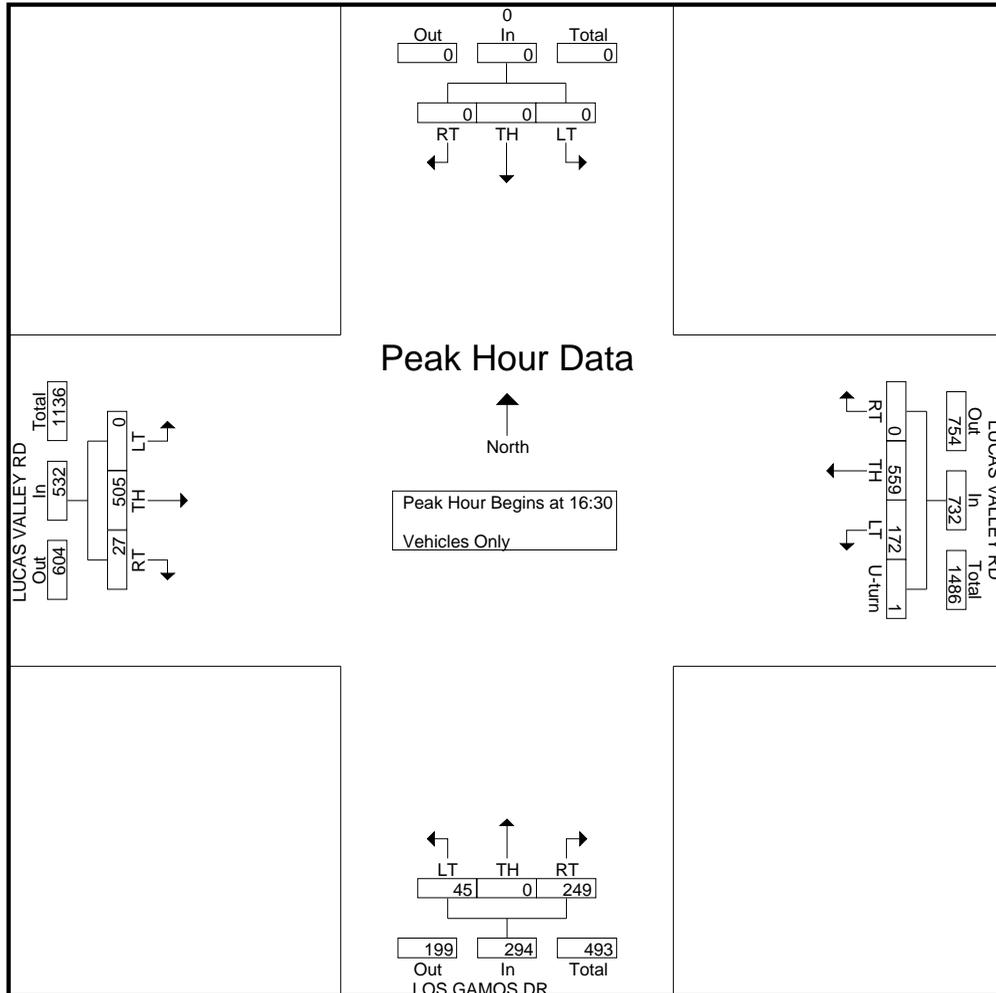
File Name : los gamos-lucas valley-p
Site Code : 2
Start Date : 11/18/2015
Page No : 1

Groups Printed- Vehicles Only

Start Time	0 Southbound				LUCAS VALLEY RD Westbound					LOS GAMOS DR Northbound				LUCAS VALLEY RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	U-turn	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	
16:00	0	0	0	0	0	105	31	1	137	51	0	8	59	8	121	0	129	325
16:15	0	0	0	0	0	100	31	0	131	44	0	8	52	7	109	0	116	299
16:30	0	0	0	0	0	136	53	1	190	59	0	6	65	3	141	0	144	399
16:45	0	0	0	0	0	139	47	0	186	55	0	9	64	5	137	0	142	392
Total	0	0	0	0	0	480	162	2	644	209	0	31	240	23	508	0	531	1415
17:00	0	0	0	0	0	149	37	0	186	77	0	16	93	10	122	0	132	411
17:15	0	0	0	0	0	135	35	0	170	58	0	14	72	9	105	0	114	356
17:30	0	0	0	0	0	134	26	0	160	58	0	3	61	5	113	0	118	339
17:45	0	0	0	0	0	138	35	0	173	45	0	9	54	9	101	0	110	337
Total	0	0	0	0	0	556	133	0	689	238	0	42	280	33	441	0	474	1443
Grand Total	0	0	0	0	0	1036	295	2	1333	447	0	73	520	56	949	0	1005	2858
Apprch %	0	0	0	0	0	77.7	22.1	0.2		86	0	14		5.6	94.4	0		
Total %	0	0	0	0	0	36.2	10.3	0.1	46.6	15.6	0	2.6	18.2	2	33.2	0	35.2	

Start Time	0 Southbound				LUCAS VALLEY RD Westbound					LOS GAMOS DR Northbound				LUCAS VALLEY RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	U-turn	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	
16:30	0	0	0	0	0	136	53	1	190	59	0	6	65	3	141	0	144	399
16:45	0	0	0	0	0	139	47	0	186	55	0	9	64	5	137	0	142	392
17:00	0	0	0	0	0	149	37	0	186	77	0	16	93	10	122	0	132	411
17:15	0	0	0	0	0	135	35	0	170	58	0	14	72	9	105	0	114	356
Total Volume	0	0	0	0	0	559	172	1	732	249	0	45	294	27	505	0	532	1558
% App. Total	0	0	0	0	0	76.4	23.5	0.1		84.7	0	15.3		5.1	94.9	0		
PHF	.000	.000	.000	.000	.000	.938	.811	.250	.963	.808	.000	.703	.790	.675	.895	.000	.924	.948

Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 16:30



TRAFFIC COUNTS PLUS

mietekm@comcast.net
925.305.4358

CITY OF SAN RAFAEL

File Name : redwood-smith ranch-a
Site Code : 5
Start Date : 11/18/2015
Page No : 1

Groups Printed- Vehicles Only

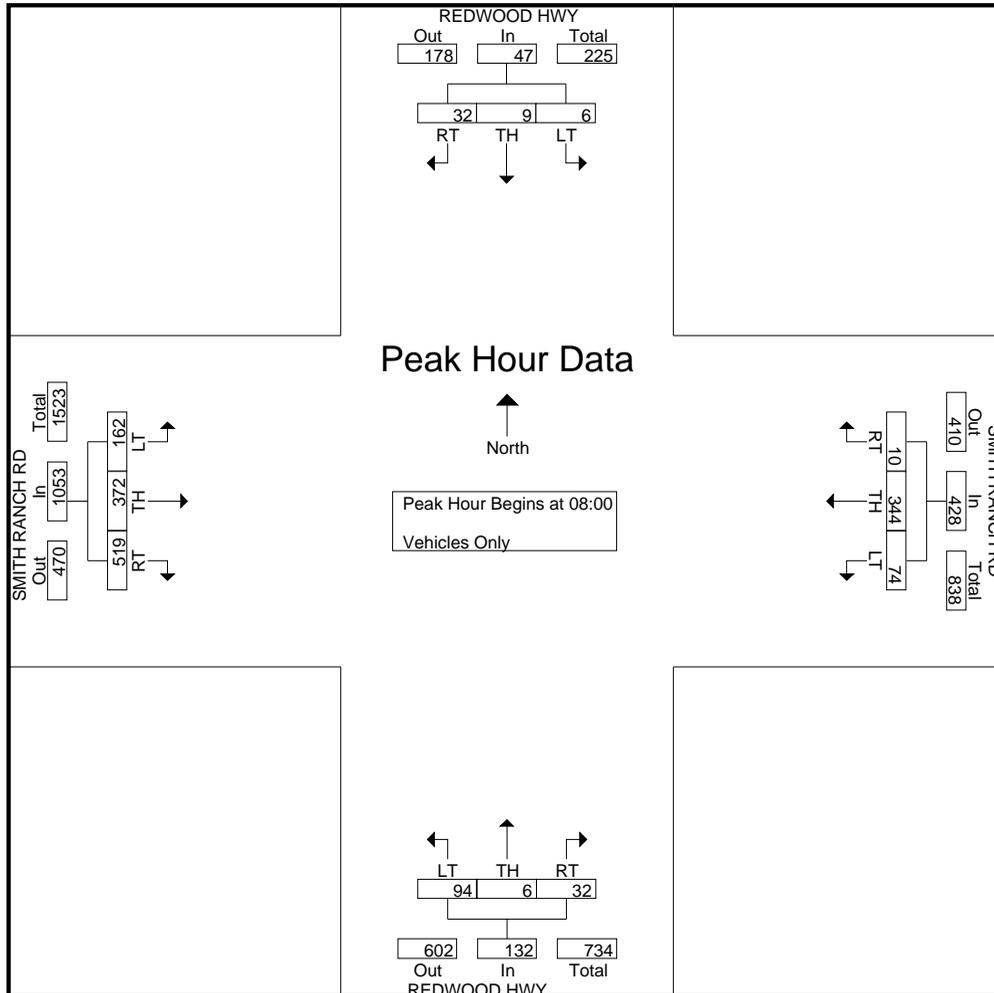
Start Time	REDWOOD HWY Southbound				SMITH RANCH RD Westbound				REDWOOD HWY Northbound				SMITH RANCH RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	
07:00	5	1	0	6	1	84	19	104	4	0	15	19	99	43	29	171	300
07:15	1	2	0	3	2	101	12	115	4	0	17	21	95	42	32	169	308
07:30	6	3	1	10	2	106	24	132	2	1	14	17	82	63	38	183	342
07:45	3	1	0	4	3	114	34	151	4	5	31	40	107	67	37	211	406
Total	15	7	1	23	8	405	89	502	14	6	77	97	383	215	136	734	1356
08:00	5	1	2	8	1	100	15	116	8	0	23	31	128	79	36	243	398
08:15	6	1	2	9	3	89	20	112	7	1	26	34	128	91	44	263	418
08:30	7	2	1	10	1	75	18	94	7	2	26	35	114	86	43	243	382
08:45	14	5	1	20	5	80	21	106	10	3	19	32	149	116	39	304	462
Total	32	9	6	47	10	344	74	428	32	6	94	132	519	372	162	1053	1660
Grand Total	47	16	7	70	18	749	163	930	46	12	171	229	902	587	298	1787	3016
Apprch %	67.1	22.9	10		1.9	80.5	17.5		20.1	5.2	74.7		50.5	32.8	16.7		
Total %	1.6	0.5	0.2	2.3	0.6	24.8	5.4	30.8	1.5	0.4	5.7	7.6	29.9	19.5	9.9	59.3	

Start Time	REDWOOD HWY Southbound				SMITH RANCH RD Westbound				REDWOOD HWY Northbound				SMITH RANCH RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	

Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 08:00

08:00	5	1	2	8	1	100	15	116	8	0	23	31	128	79	36	243	398
08:15	6	1	2	9	3	89	20	112	7	1	26	34	128	91	44	263	418
08:30	7	2	1	10	1	75	18	94	7	2	26	35	114	86	43	243	382
08:45	14	5	1	20	5	80	21	106	10	3	19	32	149	116	39	304	462
Total Volume	32	9	6	47	10	344	74	428	32	6	94	132	519	372	162	1053	1660
% App. Total	68.1	19.1	12.8		2.3	80.4	17.3		24.2	4.5	71.2		49.3	35.3	15.4		
PHF	.571	.450	.750	.588	.500	.860	.881	.922	.800	.500	.904	.943	.871	.802	.920	.866	.898



TRAFFIC COUNTS PLUS

mietekm@comcast.net
925.305.4358

CITY OF SAN RAFAEL

File Name : redwood-smith ranch-p
Site Code : 5
Start Date : 11/18/2015
Page No : 1

Groups Printed- Vehicles Only

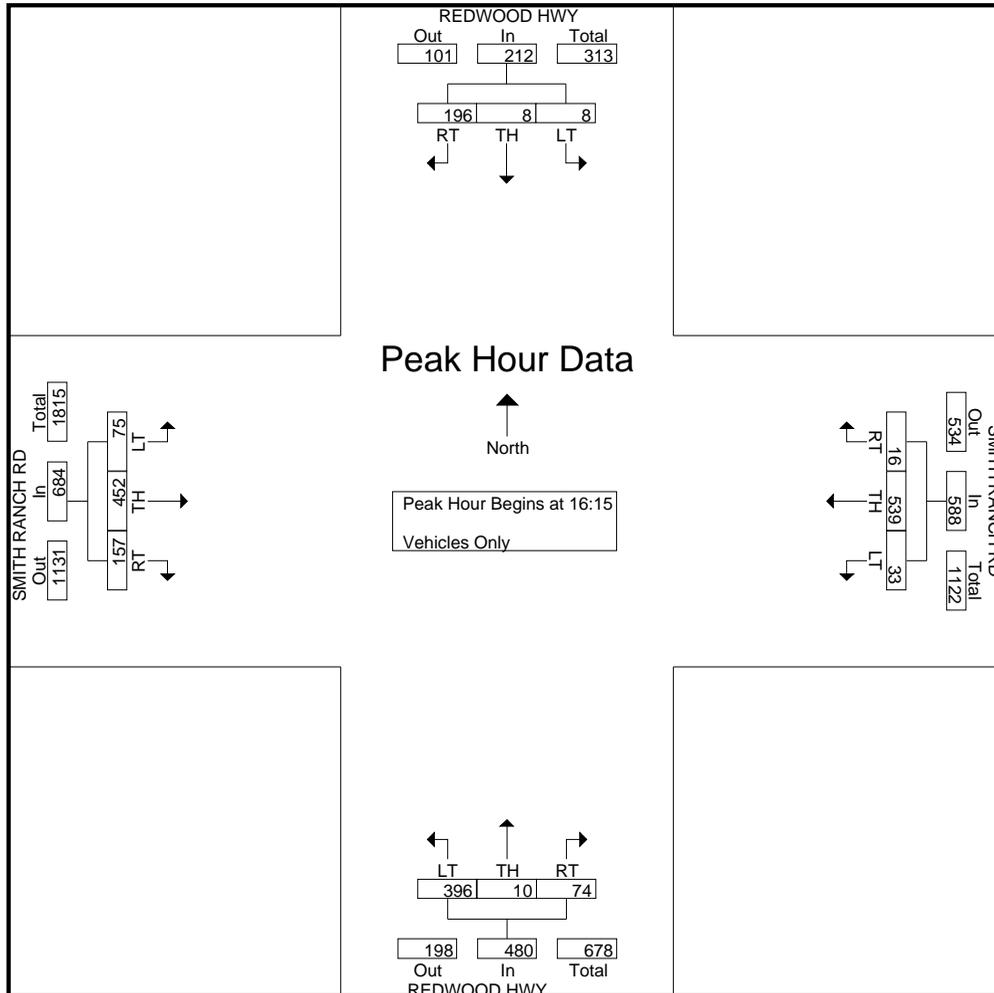
Start Time	REDWOOD HWY Southbound				SMITH RANCH RD Westbound				REDWOOD HWY Northbound				SMITH RANCH RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	
16:00	55	3	1	59	7	100	13	120	21	1	103	125	49	116	13	178	482
16:15	54	1	1	56	8	121	8	137	13	1	74	88	37	113	20	170	451
16:30	53	2	4	59	3	129	6	138	21	3	90	114	40	90	24	154	465
16:45	43	3	0	46	2	129	14	145	16	1	93	110	51	133	20	204	505
Total	205	9	6	220	20	479	41	540	71	6	360	437	177	452	77	706	1903
17:00	46	2	3	51	3	160	5	168	24	5	139	168	29	116	11	156	543
17:15	28	2	0	30	3	112	6	121	21	1	92	114	34	131	13	178	443
17:30	46	0	0	46	4	120	7	131	13	0	69	82	26	114	7	147	406
17:45	19	0	1	20	3	95	6	104	16	1	59	76	37	98	14	149	349
Total	139	4	4	147	13	487	24	524	74	7	359	440	126	459	45	630	1741
Grand Total	344	13	10	367	33	966	65	1064	145	13	719	877	303	911	122	1336	3644
Apprch %	93.7	3.5	2.7		3.1	90.8	6.1		16.5	1.5	82		22.7	68.2	9.1		
Total %	9.4	0.4	0.3	10.1	0.9	26.5	1.8	29.2	4	0.4	19.7	24.1	8.3	25	3.3	36.7	

Start Time	REDWOOD HWY Southbound				SMITH RANCH RD Westbound				REDWOOD HWY Northbound				SMITH RANCH RD Eastbound				Int. Total
	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	RT	TH	LT	App. Total	

Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 16:15

16:15	54	1	1	56	8	121	8	137	13	1	74	88	37	113	20	170	451
16:30	53	2	4	59	3	129	6	138	21	3	90	114	40	90	24	154	465
16:45	43	3	0	46	2	129	14	145	16	1	93	110	51	133	20	204	505
17:00	46	2	3	51	3	160	5	168	24	5	139	168	29	116	11	156	543
Total Volume	196	8	8	212	16	539	33	588	74	10	396	480	157	452	75	684	1964
% App. Total	92.5	3.8	3.8		2.7	91.7	5.6		15.4	2.1	82.5		23	66.1	11		
PHF	.907	.667	.500	.898	.500	.842	.589	.875	.771	.500	.712	.714	.770	.850	.781	.838	.904



APPENDIX B: DETAILED INTERSECTION LOS RESULTS



SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Existing
AM Peak Hour

Intersection 1 Las Gallinas Ave/Lucas Valley Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	108	109	100.9%	31.1	5.4	C
	Through	83	82	98.2%	28.1	6.2	C
	Right Turn	128	130	101.2%	3.0	1.2	A
	Subtotal	319	320	100.3%	18.5	2.4	B
SB	Left Turn	143	146	102.4%	37.7	10.2	D
	Through	291	293	100.6%	28.9	8.1	C
	Right Turn	9	10	110.0%	5.2	6.3	A
	Subtotal	443	449	101.4%	31.3	8.3	C
EB	Left Turn	17	16	92.9%	34.3	9.5	C
	Through	546	556	101.8%	25.9	2.1	C
	Right Turn	193	192	99.5%	8.7	1.7	A
	Subtotal	756	763	101.0%	21.5	2.1	C
WB	Left Turn	47	47	98.9%	37.4	6.2	D
	Through	284	297	104.4%	14.7	2.7	B
	Right Turn	33	33	99.1%	2.2	0.9	A
	Subtotal	364	376	103.2%	16.2	2.9	B
Total		1,882	1,908	101.4%	22.4	2.7	C

Intersection 2 Los Gamos Dr/Lucas Valley Rd Side-street Stop

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	19	20	103.7%	67.5	87.4	F
	Through						
	Right Turn	107	107	99.9%	2.3	0.6	A
	Subtotal	126	127	100.5%	17.3	28.3	C
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	760	772	101.6%	3.9	0.5	A
	Right Turn	101	105	104.0%	3.0	0.5	A
	Subtotal	861	877	101.8%	3.8	0.5	A
WB	Left Turn	239	248	103.8%	13.0	3.7	B
	Through	387	405	104.7%	1.9	0.3	A
	Right Turn						
	Subtotal	626	653	104.3%	6.4	2.0	A
Total		1,613	1,657	102.7%	5.7	2.4	A

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Existing
AM Peak Hour

Intersection 3 **US-101 SB Ramps/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	118	117	98.8%	31.1	6.4	C
	Through						
	Right Turn	480	478	99.6%	16.5	2.4	B
	Subtotal	598	595	99.5%	19.4	2.3	B
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	349	350	100.3%	31.7	6.9	C
	Right Turn	518	529	102.1%	15.4	3.3	B
	Subtotal	867	879	101.4%	22.1	3.0	C
WB	Left Turn	266	251	94.4%	17.2	2.7	B
	Through	508	539	106.0%	2.6	0.3	A
	Right Turn						
	Subtotal	774	790	102.1%	7.3	1.3	A
Total		2,239	2,264	101.1%	16.3	2.1	B

Intersection 4 **US-101 NB Ramps/Smith Ranch Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	460	471	102.4%	51.8	17.6	D
	Through						
	Right Turn	424	425	100.3%	9.1	7.6	A
	Subtotal	884	896	101.4%	32.1	13.9	C
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	684	686	100.3%	15.7	5.8	B
	Right Turn	145	141	97.4%	9.4	3.2	A
	Subtotal	829	827	99.8%	14.7	5.4	B
WB	Left Turn						
	Through	314	320	101.9%	7.4	1.7	A
	Right Turn	168	171	101.7%	0.6	0.1	A
	Subtotal	482	491	101.8%	5.1	1.1	A
Total		2,195	2,214	100.9%	19.7	6.8	B

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Existing
AM Peak Hour

Intersection 5 Redwood Dr/Smith Ranch Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	94	93	99.0%	14.3	3.0	B
	Through	6	6	103.3%	7.6	7.8	A
	Right Turn	32	34	105.9%	0.2	0.2	A
	Subtotal	132	133	100.9%	11.0	2.4	B
SB	Left Turn	6	5	88.3%	14.5	13.8	B
	Through	9	9	98.9%	20.6	8.6	C
	Right Turn	32	34	105.9%	0.3	0.2	A
	Subtotal	47	48	102.3%	6.2	3.2	A
EB	Left Turn	162	163	100.6%	16.0	3.4	B
	Through	372	380	102.1%	8.8	2.0	A
	Right Turn	519	516	99.5%	5.2	0.6	A
	Subtotal	1,053	1,059	100.6%	8.1	1.3	A
WB	Left Turn	74	69	93.4%	17.5	4.5	B
	Through	356	363	101.9%	12.9	1.6	B
	Right Turn	10	11	107.0%	4.9	3.1	A
	Subtotal	440	443	100.6%	13.4	1.4	B
Total		1,672	1,683	100.7%	9.7	1.1	A

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Existing
PM Peak Hour

Intersection 1 Las Gallinas Ave/Lucas Valley Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	118	120	101.8%	18.1	2.4	B
	Through	118	117	98.9%	16.1	3.5	B
	Right Turn	91	92	100.7%	1.9	0.4	A
	Subtotal	327	328	100.4%	12.8	2.2	B
SB	Left Turn	45	44	98.7%	21.9	3.7	C
	Through	102	100	98.0%	18.8	2.6	B
	Right Turn	33	33	99.7%	1.4	0.3	A
	Subtotal	180	177	98.5%	16.3	1.8	B
EB	Left Turn	21	18	87.1%	23.9	9.1	C
	Through	337	336	99.7%	16.6	2.0	B
	Right Turn	96	90	93.8%	3.4	0.4	A
	Subtotal	454	444	97.9%	14.3	1.7	B
WB	Left Turn	88	90	102.4%	23.1	5.4	C
	Through	385	389	101.0%	12.7	1.6	B
	Right Turn	58	59	102.4%	2.6	0.5	A
	Subtotal	531	538	101.4%	13.1	1.6	B
Total		1,492	1,488	99.8%	13.8	1.4	B

Intersection 2 Los Gamos Dr/Lucas Valley Rd Side-street Stop

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	45	47	105.1%	29.0	10.7	D
	Through						
	Right Turn	257	255	99.1%	3.6	0.7	A
	Subtotal	302	302	100.0%	8.3	2.5	A
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	514	519	101.0%	2.4	0.2	A
	Right Turn	27	28	102.2%	1.9	0.7	A
	Subtotal	541	547	101.0%	2.3	0.2	A
WB	Left Turn	173	171	98.8%	6.7	1.6	A
	Through	559	562	100.6%	1.3	0.2	A
	Right Turn						
	Subtotal	732	733	100.2%	2.6	0.6	A
Total		1,575	1,582	100.4%	3.5	0.7	A

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Existing
PM Peak Hour

Intersection 3 **US-101 SB Ramps/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	141	135	95.5%	31.6	4.5	C
	Through						
	Right Turn	210	213	101.2%	8.0	3.1	A
	Subtotal	351	347	98.9%	17.6	3.8	B
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	326	327	100.2%	33.5	9.5	C
	Right Turn	445	446	100.2%	19.8	2.9	B
	Subtotal	771	773	100.2%	25.7	5.0	C
WB	Left Turn	512	521	101.7%	39.9	3.6	D
	Through	591	600	101.5%	3.5	0.5	A
	Right Turn						
	Subtotal	1,103	1,120	101.6%	19.8	2.5	B
Total		2,225	2,240	100.7%	21.6	2.1	C

Intersection 4 **US-101 NB Ramps/Smith Ranch Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	446	440	98.6%	28.1	6.5	C
	Through						
	Right Turn	388	388	99.9%	4.1	2.3	A
	Subtotal	834	828	99.2%	17.2	5.2	B
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	315	322	102.2%	9.0	1.5	A
	Right Turn	221	217	98.4%	5.9	0.3	A
	Subtotal	536	539	100.6%	7.8	1.0	A
WB	Left Turn						
	Through	657	678	103.2%	15.0	4.2	B
	Right Turn	471	462	98.0%	1.1	0.2	A
	Subtotal	1,128	1,140	101.0%	9.6	2.7	A
Total		2,498	2,507	100.3%	11.6	3.1	B

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Existing
PM Peak Hour

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	419	412	98.4%	13.7	1.6	B
	Through	10	12	121.0%	9.7	7.2	A
	Right Turn	82	82	100.2%	0.7	0.3	A
	Subtotal	511	506	99.1%	11.5	1.5	B
SB	Left Turn	7	7	97.1%	23.8	18.7	C
	Through	9	10	112.2%	22.3	10.2	C
	Right Turn	170	167	98.1%	1.1	0.7	A
	Subtotal	186	184	98.7%	3.4	1.8	A
EB	Left Turn	68	66	96.5%	23.4	4.2	C
	Through	470	474	100.9%	12.2	2.0	B
	Right Turn	154	160	104.2%	3.0	0.3	A
	Subtotal	692	700	101.2%	11.2	1.4	B
WB	Left Turn	31	31	101.3%	27.3	5.7	C
	Through	539	560	103.8%	16.0	2.3	B
	Right Turn	11	11	103.6%	10.7	7.4	B
	Subtotal	581	602	103.7%	16.4	2.2	B
Total		1,970	1,992	101.1%	12.2	1.1	B

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Existing Plus Project
AM Peak Hour

Intersection 1 Las Gallinas Ave/Lucas Valley Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	108	104	96.4%	29.4	8.1	C
	Through	83	83	100.4%	27.6	8.9	C
	Right Turn	132	134	101.7%	3.0	0.9	A
	Subtotal	323	322	99.6%	18.2	5.2	B
SB	Left Turn	145	147	101.1%	36.3	8.1	D
	Through	291	287	98.7%	28.7	6.7	C
	Right Turn	9	8	91.1%	5.4	7.1	A
	Subtotal	445	442	99.3%	30.8	7.0	C
EB	Left Turn	17	17	101.2%	44.6	17.0	D
	Through	557	562	100.8%	25.6	2.9	C
	Right Turn	193	187	97.0%	8.6	2.1	A
	Subtotal	767	766	99.9%	21.5	2.8	C
WB	Left Turn	48	45	94.0%	34.1	7.9	C
	Through	287	289	100.7%	13.9	2.6	B
	Right Turn	34	33	96.5%	2.1	0.5	A
	Subtotal	369	367	99.4%	16.1	3.7	B
Total		1,904	1,897	99.6%	22.1	3.3	C

Intersection 2 Los Gamos Dr/Lucas Valley Rd Side-street Stop

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	24	22	91.7%	200.2	152.5	F
	Through						
	Right Turn	168	158	94.0%	9.2	18.8	A
	Subtotal	192	180	93.8%	36.5	40.1	E
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	760	769	101.2%	4.7	0.6	A
	Right Turn	118	121	102.1%	3.4	0.5	A
	Subtotal	878	890	101.4%	4.5	0.5	A
WB	Left Turn	437	440	100.6%	31.9	13.4	D
	Through	387	383	99.0%	7.6	7.5	A
	Right Turn						
	Subtotal	824	823	99.9%	20.6	11.1	C
Total		1,894	1,893	99.9%	14.7	6.7	B

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Existing Plus Project
AM Peak Hour

Intersection 3 **US-101 SB Ramps/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	221	227	102.5%	57.3	18.1	E
	Through						
	Right Turn	480	491	102.3%	36.4	16.5	D
	Subtotal	701	717	102.3%	42.8	17.4	D
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	384	387	100.7%	31.2	3.3	C
	Right Turn	544	541	99.4%	15.8	1.5	B
	Subtotal	928	928	99.9%	22.6	1.7	C
WB	Left Turn	266	250	94.1%	18.3	5.6	B
	Through	603	595	98.7%	6.7	8.6	A
	Right Turn						
	Subtotal	869	845	97.3%	10.3	7.4	B
Total		2,498	2,490	99.7%	24.2	5.9	C

Intersection 4 **US-101 NB Ramps/Smith Ranch Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	546	524	96.0%	142.0	35.1	F
	Through						
	Right Turn	424	389	91.6%	94.4	34.8	F
	Subtotal	970	912	94.1%	122.1	35.1	F
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	687	702	102.2%	19.2	3.9	B
	Right Turn	177	176	99.3%	12.2	2.6	B
	Subtotal	864	878	101.6%	17.7	3.5	B
WB	Left Turn						
	Through	323	323	99.9%	7.1	1.3	A
	Right Turn	168	174	103.7%	0.5	0.3	A
	Subtotal	491	497	101.2%	5.1	0.8	A
Total		2,325	2,287	98.4%	55.9	13.3	E

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Existing Plus Project
AM Peak Hour

Intersection 5 Redwood Dr/Smith Ranch Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	94	92	98.1%	12.2	2.8	B
	Through	6	6	101.7%	10.4	8.9	B
	Right Turn	32	37	115.0%	0.2	0.1	A
	Subtotal	132	135	102.3%	9.5	1.7	A
SB	Left Turn	6	7	108.3%	17.8	17.5	B
	Through	9	9	103.3%	22.6	10.0	C
	Right Turn	32	34	104.7%	0.4	0.1	A
	Subtotal	47	49	104.9%	8.1	3.9	A
EB	Left Turn	162	155	95.4%	15.7	3.0	B
	Through	375	370	98.8%	8.4	1.0	A
	Right Turn	519	505	97.3%	6.0	1.0	A
	Subtotal	1,056	1,030	97.5%	8.3	0.9	A
WB	Left Turn	74	69	93.0%	18.8	3.0	B
	Through	365	370	101.5%	12.6	1.6	B
	Right Turn	10	10	97.0%	5.3	7.3	A
	Subtotal	449	449	100.0%	13.3	1.7	B
Total		1,684	1,663	98.8%	9.8	1.1	A

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Existing Plus Project
PM Peak Hour

Intersection 1 Las Gallinas Ave/Lucas Valley Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	118	120	101.7%	18.3	3.5	B
	Through	118	119	101.0%	17.1	4.1	B
	Right Turn	94	95	100.5%	2.0	0.3	A
	Subtotal	330	334	101.1%	13.2	2.5	B
SB	Left Turn	46	45	97.8%	23.0	4.1	C
	Through	102	105	102.9%	19.4	3.2	B
	Right Turn	33	32	96.1%	1.5	0.4	A
	Subtotal	181	182	100.4%	17.4	2.3	B
EB	Left Turn	21	22	103.8%	26.7	5.5	C
	Through	344	344	100.0%	16.1	2.2	B
	Right Turn	96	99	103.1%	3.6	0.5	A
	Subtotal	461	465	100.8%	13.9	1.8	B
WB	Left Turn	94	92	97.3%	22.9	2.8	C
	Through	401	411	102.5%	12.4	2.0	B
	Right Turn	61	61	100.7%	2.5	0.4	A
	Subtotal	556	564	101.4%	12.9	1.7	B
Total		1,528	1,544	101.1%	13.8	1.6	B

Intersection 2 Los Gamos Dr/Lucas Valley Rd Side-street Stop

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	71	65	91.7%	101.4	107.2	F
	Through						
	Right Turn	555	539	97.2%	59.2	101.0	F
	Subtotal	626	604	96.5%	64.1	101.2	F
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	514	508	98.9%	34.2	61.5	D
	Right Turn	38	37	97.6%	20.6	44.8	C
	Subtotal	552	545	98.8%	33.4	60.5	D
WB	Left Turn	299	306	102.2%	11.2	2.8	B
	Through	559	577	103.2%	1.7	0.2	A
	Right Turn						
	Subtotal	858	882	102.8%	5.0	1.0	A
Total		2,036	2,032	99.8%	30.1	43.5	D

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Existing Plus Project
PM Peak Hour

Intersection 3 **US-101 SB Ramps/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	207	216	104.3%	37.3	9.4	D
	Through						
	Right Turn	210	209	99.4%	11.1	4.0	B
	Subtotal	417	425	101.8%	24.5	7.7	C
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	494	479	96.9%	120.0	88.2	F
	Right Turn	575	569	99.0%	80.9	73.6	F
	Subtotal	1,069	1,048	98.1%	98.9	80.8	F
WB	Left Turn	512	502	98.0%	38.6	4.1	D
	Through	651	666	102.2%	3.8	0.7	A
	Right Turn						
	Subtotal	1,163	1,168	100.4%	19.3	2.2	B
Total		2,649	2,640	99.7%	50.8	29.2	D

Intersection 4 **US-101 NB Ramps/Smith Ranch Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	501	499	99.5%	24.3	4.0	C
	Through						
	Right Turn	388	390	100.5%	3.4	0.9	A
	Subtotal	889	889	99.9%	14.8	3.1	B
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	328	325	98.9%	10.3	1.7	B
	Right Turn	377	364	96.4%	7.1	0.2	A
	Subtotal	705	688	97.6%	8.7	0.9	A
WB	Left Turn						
	Through	662	670	101.3%	20.4	5.1	C
	Right Turn	471	474	100.5%	1.2	0.2	A
	Subtotal	1,133	1,144	101.0%	12.5	3.2	B
Total		2,727	2,720	99.8%	12.3	1.4	B

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Existing Plus Project
PM Peak Hour

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	419	425	101.5%	13.3	1.1	B
	Through	10	8	84.0%	8.3	6.7	A
	Right Turn	82	84	102.7%	0.7	0.2	A
	Subtotal	511	518	101.3%	11.2	1.0	B
SB	Left Turn	7	9	121.4%	20.6	14.9	C
	Through	9	9	95.6%	17.9	13.9	B
	Right Turn	170	174	102.1%	1.8	1.0	A
	Subtotal	186	191	102.5%	3.7	1.9	A
EB	Left Turn	68	66	97.2%	22.1	3.3	C
	Through	483	478	99.0%	12.1	2.2	B
	Right Turn	154	156	101.0%	3.1	0.3	A
	Subtotal	705	700	99.3%	11.0	1.6	B
WB	Left Turn	31	31	98.4%	27.8	3.5	C
	Through	544	544	100.0%	17.0	4.0	B
	Right Turn	11	11	101.8%	13.1	10.4	B
	Subtotal	586	586	100.0%	17.5	3.9	B
Total		1,988	1,994	100.3%	12.2	1.9	B

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Baseline No Project
AM Peak Hour

Intersection 1 **Las Gallinas Ave/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	97	94	97.0%	34.8	4.7	C
	Through	189	188	99.2%	28.1	4.5	C
	Right Turn	138	140	101.4%	6.6	2.3	A
	Subtotal	424	422	99.4%	22.9	2.9	C
SB	Left Turn	208	150	71.9%	223.4	29.6	F
	Through	395	282	71.4%	200.6	18.0	F
	Right Turn	20	13	67.0%	178.9	72.0	F
	Subtotal	623	445	71.4%	208.8	22.5	F
EB	Left Turn	40	32	81.0%	123.7	19.2	F
	Through	729	596	81.8%	107.7	15.9	F
	Right Turn	366	310	84.6%	88.0	12.6	F
	Subtotal	1,135	938	82.7%	101.7	14.4	F
WB	Left Turn	67	55	81.9%	46.5	10.0	D
	Through	290	253	87.2%	16.5	3.5	B
	Right Turn	82	74	90.1%	2.4	0.5	A
	Subtotal	439	382	87.0%	17.6	3.1	B
Total		2,621	2,186	83.4%	94.4	7.4	F

Intersection 2 **Los Gamos Dr/Lucas Valley Rd** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	19	20	103.7%	240.7	185.1	F
	Through						
	Right Turn	123	121	98.7%	47.4	99.6	E
	Subtotal	142	141	99.4%	66.5	111.2	F
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	900	736	81.8%	48.6	41.9	E
	Right Turn	214	177	82.6%	43.7	38.1	E
	Subtotal	1,114	913	81.9%	47.6	41.2	E
WB	Left Turn	494	428	86.6%	43.7	28.0	E
	Through	477	404	84.7%	17.4	16.7	C
	Right Turn						
	Subtotal	971	832	85.6%	31.1	22.4	D
Total		2,227	1,885	84.7%	44.1	24.5	E

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Baseline No Project
AM Peak Hour

Intersection 3 **US-101 SB Ramps/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	196	173	88.1%	76.7	28.6	E
	Through						
	Right Turn	631	558	88.4%	52.7	10.2	D
	Subtotal	827	730	88.3%	58.9	15.1	E
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	471	383	81.3%	129.3	72.6	F
	Right Turn	552	466	84.3%	68.0	47.4	E
	Subtotal	1,023	849	83.0%	97.1	60.1	F
WB	Left Turn	247	244	98.7%	20.4	8.1	C
	Through	775	661	85.3%	17.2	22.0	B
	Right Turn						
	Subtotal	1,022	904	88.5%	17.9	17.8	B
Total		2,872	2,484	86.5%	57.5	25.1	E

Intersection 4 **US-101 NB Ramps/Smith Ranch Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	630	513	81.4%	88.6	17.3	F
	Through						
	Right Turn	411	328	79.8%	33.5	6.6	C
	Subtotal	1,041	841	80.8%	67.2	12.8	E
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	977	841	86.1%	47.3	15.8	D
	Right Turn	125	99	79.0%	34.2	14.6	C
	Subtotal	1,102	940	85.3%	45.8	15.9	D
WB	Left Turn						
	Through	392	396	101.0%	11.2	4.8	B
	Right Turn	183	184	100.8%	0.5	0.1	A
	Subtotal	575	580	100.9%	7.9	3.4	A
Total		2,718	2,361	86.9%	43.9	3.7	D

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Baseline No Project
AM Peak Hour

Intersection 5 Redwood Dr/Smith Ranch Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	135	134	99.6%	15.1	3.9	B
	Through	12	14	113.3%	18.0	6.5	B
	Right Turn	59	63	107.3%	0.4	0.2	A
	Subtotal	206	211	102.6%	11.5	3.2	B
SB	Left Turn	6	6	105.0%	22.2	10.2	C
	Through	62	63	101.0%	22.2	4.1	C
	Right Turn	106	106	99.9%	1.0	0.3	A
	Subtotal	174	175	100.5%	9.0	2.2	A
EB	Left Turn	123	102	83.1%	20.5	3.5	C
	Through	411	356	86.6%	14.6	2.9	B
	Right Turn	779	656	84.2%	13.5	3.8	B
	Subtotal	1,313	1,114	84.8%	14.4	2.8	B
WB	Left Turn	139	138	99.6%	24.7	5.4	C
	Through	334	341	102.2%	15.2	2.3	B
	Right Turn	12	12	102.5%	5.0	3.6	A
	Subtotal	485	492	101.4%	17.7	2.7	B
Total		2,178	1,992	91.5%	14.5	2.0	B

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Baseline No Project
PM Peak Hour

Intersection 1 Las Gallinas Ave/Lucas Valley Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	158	146	92.5%	27.7	6.0	C
	Through	153	161	105.0%	25.5	3.7	C
	Right Turn	147	148	100.9%	5.7	4.1	A
	Subtotal	458	455	99.4%	20.0	4.0	C
SB	Left Turn	88	82	93.3%	77.5	54.1	E
	Through	97	92	95.3%	42.9	21.6	D
	Right Turn	22	23	105.9%	18.6	25.4	B
	Subtotal	207	198	95.6%	52.6	32.3	D
EB	Left Turn	13	14	108.5%	62.5	34.6	E
	Through	357	344	96.2%	75.4	45.0	E
	Right Turn	74	78	105.3%	33.4	26.1	C
	Subtotal	444	436	98.1%	66.3	39.1	E
WB	Left Turn	110	108	97.7%	30.9	7.1	C
	Through	383	371	97.0%	13.0	2.5	B
	Right Turn	110	111	100.7%	2.4	0.5	A
	Subtotal	603	590	97.8%	13.8	1.7	B
Total		1,712	1,678	98.0%	33.8	13.7	C

Intersection 2 Los Gamos Dr/Lucas Valley Rd Side-street Stop

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	74	53	70.9%	338.4	57.3	F
	Through						
	Right Turn	594	405	68.1%	378.9	21.6	F
	Subtotal	668	457	68.4%	374.6	22.9	F
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	579	499	86.1%	186.9	31.7	F
	Right Turn	79	69	86.7%	156.1	34.8	F
	Subtotal	658	567	86.2%	183.8	31.3	F
WB	Left Turn	213	216	101.6%	9.4	1.6	A
	Through	614	616	100.4%	1.6	0.2	A
	Right Turn						
	Subtotal	827	833	100.7%	3.7	0.4	A
Total		2,153	1,857	86.2%	150.0	9.0	F

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Baseline No Project
PM Peak Hour

Intersection 3 **US-101 SB Ramps/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	166	163	98.1%	28.6	5.4	C
	Through						
	Right Turn	255	254	99.6%	6.5	0.7	A
	Subtotal	421	417	99.0%	15.3	2.5	B
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	537	431	80.2%	462.4	94.2	F
	Right Turn	636	468	73.6%	379.0	93.4	F
	Subtotal	1,173	899	76.6%	419.3	93.1	F
WB	Left Turn	629	628	99.8%	39.1	5.6	D
	Through	661	670	101.3%	5.5	0.7	A
	Right Turn						
	Subtotal	1,290	1,297	100.6%	22.1	3.5	C
Total		2,884	2,613	90.6%	156.1	29.8	F

Intersection 4 **US-101 NB Ramps/Smith Ranch Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	418	419	100.1%	28.1	7.8	C
	Through						
	Right Turn	442	433	98.0%	4.1	1.3	A
	Subtotal	860	852	99.0%	15.9	4.3	B
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	439	402	91.5%	9.3	1.1	A
	Right Turn	353	284	80.4%	6.6	0.2	A
	Subtotal	792	685	86.5%	8.3	0.7	A
WB	Left Turn						
	Through	872	878	100.7%	28.9	7.4	C
	Right Turn	682	673	98.7%	2.0	0.3	A
	Subtotal	1,554	1,551	99.8%	17.0	4.8	B
Total		3,206	3,088	96.3%	14.6	2.4	B

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Baseline No Project
PM Peak Hour

Intersection 5 Redwood Dr/Smith Ranch Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	675	684	101.3%	27.7	11.4	C
	Through	35	36	103.7%	30.1	14.1	C
	Right Turn	146	156	106.6%	3.2	3.2	A
	Subtotal	856	876	102.3%	23.3	9.8	C
SB	Left Turn	16	13	82.5%	35.3	17.1	D
	Through	47	49	104.5%	36.2	12.0	D
	Right Turn	249	253	101.8%	5.9	2.7	A
	Subtotal	312	316	101.2%	11.5	3.9	B
EB	Left Turn	140	132	94.6%	30.7	5.2	C
	Through	500	474	94.8%	21.3	3.6	C
	Right Turn	225	207	92.0%	3.6	0.5	A
	Subtotal	865	814	94.1%	18.1	2.8	B
WB	Left Turn	76	73	96.3%	78.2	65.7	E
	Through	630	618	98.1%	78.8	65.7	E
	Right Turn	14	13	92.1%	59.9	72.0	E
	Subtotal	720	704	97.8%	78.2	65.7	E
Total		2,753	2,710	98.4%	35.0	20.5	C

Intersection 1 **Las Gallinas Ave/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	97	99	102.1%	40.8	12.8	D
	Through	189	180	95.4%	27.3	3.3	C
	Right Turn	135	133	98.1%	5.4	1.8	A
	Subtotal	421	412	97.8%	24.1	4.6	C
SB	Left Turn	207	146	70.7%	218.5	22.4	F
	Through	395	278	70.4%	194.1	25.2	F
	Right Turn	20	14	71.0%	197.9	46.9	F
	Subtotal	622	439	70.5%	202.2	24.7	F
EB	Left Turn	40	33	83.3%	115.8	16.7	F
	Through	722	603	83.6%	99.7	6.8	F
	Right Turn	366	320	87.5%	80.4	4.1	F
	Subtotal	1,128	957	84.8%	93.9	5.6	F
WB	Left Turn	67	64	95.1%	48.8	12.5	D
	Through	289	273	94.6%	15.3	4.3	B
	Right Turn	82	82	99.8%	2.9	0.5	A
	Subtotal	438	419	95.6%	17.8	2.2	B
Total		2,609	2,226	85.3%	89.6	4.2	F

Intersection 2 **Los Gamos Dr/Lucas Valley Rd** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	17	17	98.2%	103.2	119.9	F
	Through						
	Right Turn	106	106	100.0%	2.4	0.8	A
	Subtotal	123	123	99.8%	24.1	28.8	C
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	900	751	83.4%	31.7	29.4	D
	Right Turn	203	175	86.0%	27.5	26.0	D
	Subtotal	1,103	925	83.9%	30.9	28.7	D
WB	Left Turn	368	351	95.3%	26.4	13.2	D
	Through	477	453	95.0%	7.0	6.8	A
	Right Turn						
	Subtotal	845	804	95.1%	15.8	9.8	C
Total		2,071	1,852	89.4%	23.6	15.1	C

Intersection 3 US-101 SB Ramps/Lucas Valley Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	130	131	101.1%	46.1	5.0	D
	Through						
	Right Turn	631	635	100.6%	37.0	5.9	D
	Subtotal	761	767	100.7%	38.4	5.5	D
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	461	391	84.9%	111.9	59.5	F
	Right Turn	545	462	84.8%	49.9	38.0	D
	Subtotal	1,006	854	84.9%	78.1	48.0	E
WB	Left Turn	247	245	99.2%	17.2	3.6	B
	Through	715	672	94.0%	5.8	7.0	A
	Right Turn						
	Subtotal	962	917	95.4%	8.9	5.9	A
Total		2,729	2,537	93.0%	40.7	16.3	D

Intersection 4 US-101 NB Ramps/Smith Ranch Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	575	526	91.5%	78.6	7.3	E
	Through						
	Right Turn	411	365	88.8%	27.7	3.7	C
	Subtotal	986	891	90.4%	57.9	7.3	E
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	976	925	94.8%	47.2	2.1	D
	Right Turn	116	96	82.6%	36.0	3.6	D
	Subtotal	1,092	1,021	93.5%	46.2	2.4	D
WB	Left Turn						
	Through	387	393	101.5%	8.6	1.7	A
	Right Turn	183	194	105.8%	0.6	0.2	A
	Subtotal	570	586	102.9%	6.0	1.3	A
Total		2,648	2,498	94.4%	40.5	2.6	D

Intersection 5 Redwood Dr/Smith Ranch Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	135	139	103.0%	16.1	3.8	B
	Through	12	12	101.7%	16.2	6.3	B
	Right Turn	59	58	98.3%	0.4	0.2	A
	Subtotal	206	209	101.6%	11.6	3.3	B
SB	Left Turn	6	6	91.7%	15.5	12.4	B
	Through	62	61	98.5%	22.8	4.3	C
	Right Turn	106	109	102.9%	1.0	0.2	A
	Subtotal	174	176	101.0%	9.4	2.5	A
EB	Left Turn	123	115	93.7%	22.6	2.5	C
	Through	410	378	92.1%	19.9	2.5	B
	Right Turn	779	726	93.2%	19.4	6.9	B
	Subtotal	1,312	1,219	92.9%	19.9	4.9	B
WB	Left Turn	139	142	102.1%	22.0	3.5	C
	Through	329	341	103.6%	14.8	3.2	B
	Right Turn	12	13	108.3%	4.7	2.7	A
	Subtotal	480	496	103.3%	16.6	2.4	B
Total		2,172	2,100	96.7%	17.4	3.3	B

Intersection 1 **Las Gallinas Ave/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	158	155	98.2%	29.9	8.1	C
	Through	153	162	105.6%	26.6	7.3	C
	Right Turn	146	142	97.4%	4.8	3.1	A
	Subtotal	457	459	100.4%	21.2	4.7	C
SB	Left Turn	88	83	94.1%	72.7	59.1	E
	Through	97	97	99.9%	50.6	53.2	D
	Right Turn	22	19	88.2%	17.2	30.7	B
	Subtotal	207	199	96.2%	57.9	54.8	E
EB	Left Turn	13	13	103.1%	110.4	88.2	F
	Through	356	343	96.3%	117.4	92.4	F
	Right Turn	74	76	103.2%	85.8	84.0	F
	Subtotal	443	433	97.7%	111.1	90.2	F
WB	Left Turn	108	106	98.1%	30.0	7.5	C
	Through	377	365	96.9%	11.6	0.9	B
	Right Turn	109	116	106.1%	3.0	0.6	A
	Subtotal	594	587	98.8%	13.3	1.8	B
Total		1,701	1,678	98.6%	46.6	30.2	D

Intersection 2 **Los Gamos Dr/Lucas Valley Rd** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	64	52	80.9%	369.4	67.9	F
	Through						
	Right Turn	480	396	82.5%	361.5	28.4	F
	Subtotal	544	448	82.3%	362.0	30.6	F
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	579	496	85.6%	200.1	17.6	F
	Right Turn	77	64	82.5%	182.0	21.1	F
	Subtotal	656	559	85.2%	198.0	17.4	F
WB	Left Turn	190	187	98.3%	8.8	1.1	A
	Through	614	625	101.8%	2.0	0.3	A
	Right Turn						
	Subtotal	804	812	101.0%	3.6	0.5	A
Total		2,004	1,819	90.8%	151.5	8.4	F

Intersection 3 US-101 SB Ramps/Lucas Valley Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	154	157	101.7%	27.9	4.5	C
	Through						
	Right Turn	255	252	99.0%	9.7	4.1	A
	Subtotal	409	409	100.0%	16.9	4.8	B
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	473	433	91.5%	492.4	24.1	F
	Right Turn	586	457	78.1%	410.1	20.4	F
	Subtotal	1,059	890	84.1%	450.1	22.7	F
WB	Left Turn	629	619	98.4%	38.9	2.9	D
	Through	650	654	100.6%	5.8	1.4	A
	Right Turn						
	Subtotal	1,279	1,273	99.5%	22.4	2.5	C
Total		2,747	2,572	93.6%	168.0	9.0	F

Intersection 4 US-101 NB Ramps/Smith Ranch Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	408	408	100.1%	25.3	3.7	C
	Through						
	Right Turn	442	449	101.5%	4.3	1.3	A
	Subtotal	850	857	100.8%	14.4	2.9	B
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	434	414	95.3%	10.8	1.6	B
	Right Turn	294	272	92.5%	8.0	0.4	A
	Subtotal	728	686	94.2%	9.7	1.0	A
WB	Left Turn						
	Through	871	867	99.5%	30.0	5.5	C
	Right Turn	682	677	99.3%	2.0	0.3	A
	Subtotal	1,553	1,544	99.4%	17.3	3.3	B
Total		3,131	3,087	98.6%	14.8	2.1	B

Intersection 5 Redwood Dr/Smith Ranch Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	675	665	98.5%	25.1	5.0	C
	Through	35	35	100.0%	23.6	7.8	C
	Right Turn	146	145	99.0%	2.5	2.6	A
	Subtotal	856	845	98.7%	21.2	4.6	C
SB	Left Turn	16	17	108.8%	39.3	15.7	D
	Through	47	49	105.1%	39.3	8.1	D
	Right Turn	249	248	99.4%	8.5	3.5	A
	Subtotal	312	314	100.8%	14.9	2.9	B
EB	Left Turn	140	133	95.1%	32.8	3.8	C
	Through	495	487	98.4%	22.5	3.3	C
	Right Turn	225	227	101.0%	5.1	1.6	A
	Subtotal	860	848	98.6%	19.5	2.3	B
WB	Left Turn	76	72	94.7%	90.0	57.5	F
	Through	629	632	100.5%	84.4	57.9	F
	Right Turn	14	13	93.6%	61.4	65.5	E
	Subtotal	719	717	99.7%	84.8	57.7	F
Total		2,747	2,724	99.2%	36.1	14.6	D

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Baseline Plus Project
AM Peak Hour

Intersection 1 **Las Gallinas Ave/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	97	89	92.0%	39.6	9.1	D
	Through	189	187	99.2%	35.0	4.0	C
	Right Turn	140	144	103.0%	9.9	4.8	A
	Subtotal	426	421	98.8%	27.6	3.0	C
SB	Left Turn	209	179	85.5%	318.7	65.4	F
	Through	395	342	86.6%	313.5	58.9	F
	Right Turn	20	18	89.5%	283.6	80.1	F
	Subtotal	624	538	86.3%	314.6	61.2	F
EB	Left Turn	40	38	95.0%	263.1	54.3	F
	Through	733	662	90.3%	245.9	38.9	F
	Right Turn	366	333	90.8%	233.9	36.9	F
	Subtotal	1,139	1,033	90.7%	242.8	37.3	F
WB	Left Turn	68	54	78.8%	44.2	11.3	D
	Through	292	235	80.5%	17.9	2.7	B
	Right Turn	82	69	83.9%	2.3	0.3	A
	Subtotal	442	358	80.9%	18.9	3.3	B
Total		2,631	2,349	89.3%	182.3	23.2	F

Intersection 2 **Los Gamos Dr/Lucas Valley Rd** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	23	10	41.3%	662.0	176.3	F
	Through						
	Right Turn	166	109	65.8%	519.1	235.1	F
	Subtotal	189	119	62.8%	463.1	279.3	F
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	901	808	89.7%	25.8	40.6	D
	Right Turn	220	202	92.0%	24.2	41.8	C
	Subtotal	1,121	1,011	90.1%	25.4	40.7	D
WB	Left Turn	566	472	83.4%	51.9	12.3	F
	Through	476	386	81.1%	16.5	7.3	C
	Right Turn						
	Subtotal	1,042	858	82.3%	35.6	9.7	E
Total		2,352	1,987	84.5%	41.1	19.7	E

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Baseline Plus Project
AM Peak Hour

Intersection 3 **US-101 SB Ramps/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	233	198	85.2%	202.4	44.0	F
	Through						
	Right Turn	631	518	82.1%	182.5	26.5	F
	Subtotal	864	717	82.9%	188.3	31.0	F
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	496	399	80.4%	94.4	95.0	F
	Right Turn	571	516	90.4%	59.2	73.4	E
	Subtotal	1,067	915	85.7%	75.4	85.9	E
WB	Left Turn	247	235	95.3%	22.0	3.5	C
	Through	809	660	81.6%	13.5	10.6	B
	Right Turn						
	Subtotal	1,056	895	84.8%	15.7	8.4	B
Total		2,987	2,527	84.6%	87.1	33.3	F

Intersection 4 **US-101 NB Ramps/Smith Ranch Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	661	509	77.0%	213.7	40.6	F
	Through						
	Right Turn	411	319	77.7%	162.2	21.6	F
	Subtotal	1,072	829	77.3%	193.8	33.3	F
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	979	805	82.2%	35.2	9.5	D
	Right Turn	148	114	77.0%	26.5	8.2	C
	Subtotal	1,127	919	81.5%	34.1	9.4	C
WB	Left Turn						
	Through	395	386	97.7%	14.1	10.3	B
	Right Turn	183	195	106.3%	0.4	0.1	A
	Subtotal	578	581	100.4%	9.6	6.6	A
Total		2,777	2,328	83.8%	84.1	5.4	F

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Baseline Plus Project
AM Peak Hour

Intersection 5 Redwood Dr/Smith Ranch Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	135	130	96.4%	15.4	2.4	B
	Through	12	14	115.8%	13.1	5.6	B
	Right Turn	59	57	96.6%	1.2	0.7	A
	Subtotal	206	201	97.6%	11.5	2.4	B
SB	Left Turn	6	7	121.7%	24.5	12.9	C
	Through	62	63	101.5%	18.6	2.8	B
	Right Turn	106	110	103.8%	0.8	0.2	A
	Subtotal	174	180	103.6%	8.7	2.4	A
EB	Left Turn	123	98	79.8%	19.1	2.6	B
	Through	413	340	82.4%	13.4	3.2	B
	Right Turn	779	632	81.1%	12.1	3.5	B
	Subtotal	1,315	1,070	81.4%	13.2	2.0	B
WB	Left Turn	139	136	97.6%	20.1	3.1	C
	Through	337	340	100.7%	12.7	2.6	B
	Right Turn	12	14	120.0%	6.3	4.7	A
	Subtotal	488	490	100.3%	14.6	2.0	B
Total		2,183	1,941	88.9%	13.0	1.1	B

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Baseline Plus Project
PM Peak Hour

Intersection 1 **Las Gallinas Ave/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	158	158	100.0%	22.6	5.7	C
	Through	153	155	101.0%	24.0	6.5	C
	Right Turn	149	148	99.6%	4.7	2.6	A
	Subtotal	460	461	100.2%	17.5	4.4	B
SB	Left Turn	89	83	93.6%	118.9	159.2	F
	Through	97	87	90.0%	90.2	129.1	F
	Right Turn	22	21	95.5%	44.4	83.0	D
	Subtotal	208	192	92.1%	100.5	143.2	F
EB	Left Turn	13	11	86.9%	83.9	102.3	F
	Through	363	353	97.4%	89.4	97.8	F
	Right Turn	74	70	94.7%	68.8	100.9	E
	Subtotal	450	435	96.6%	85.7	97.7	F
WB	Left Turn	114	105	92.2%	30.4	8.4	C
	Through	393	383	97.4%	11.7	1.9	B
	Right Turn	112	107	95.6%	3.0	0.5	A
	Subtotal	619	595	96.1%	13.5	2.4	B
Total		1,737	1,682	96.8%	38.4	31.4	D

Intersection 2 **Los Gamos Dr/Lucas Valley Rd** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	90	49	54.6%	374.4	31.1	F
	Through						
	Right Turn	778	410	52.8%	363.2	12.2	F
	Subtotal	868	460	52.9%	364.5	11.6	F
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	579	501	86.5%	195.1	13.1	F
	Right Turn	88	76	86.1%	170.7	16.4	F
	Subtotal	667	577	86.4%	191.9	12.6	F
WB	Left Turn	316	314	99.4%	11.2	1.9	B
	Through	614	623	101.5%	2.8	0.4	A
	Right Turn						
	Subtotal	930	937	100.8%	5.6	1.0	A
Total		2,465	1,973	80.0%	143.8	6.7	F

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Baseline Plus Project
PM Peak Hour

Intersection 3 **US-101 SB Ramps/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	220	227	103.0%	36.4	7.6	D
	Through						
	Right Turn	255	259	101.5%	14.9	8.9	B
	Subtotal	475	485	102.2%	25.0	9.0	C
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	641	426	66.4%	472.5	59.8	F
	Right Turn	716	483	67.4%	387.0	54.9	F
	Subtotal	1,357	908	66.9%	426.7	56.8	F
WB	Left Turn	629	610	97.0%	36.3	3.6	D
	Through	710	712	100.2%	5.7	0.7	A
	Right Turn						
	Subtotal	1,339	1,322	98.7%	20.0	1.8	B
Total		3,171	2,716	85.6%	155.6	16.3	F

Intersection 4 **US-101 NB Ramps/Smith Ranch Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	463	461	99.5%	23.4	7.2	C
	Through						
	Right Turn	442	439	99.3%	4.8	2.5	A
	Subtotal	905	899	99.4%	14.2	4.7	B
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	447	386	86.4%	10.0	1.3	A
	Right Turn	449	300	66.8%	7.9	0.3	A
	Subtotal	896	686	76.6%	9.1	0.8	A
WB	Left Turn						
	Through	876	862	98.4%	36.4	3.7	D
	Right Turn	682	684	100.2%	2.1	0.5	A
	Subtotal	1,558	1,546	99.2%	20.9	2.2	C
Total		3,359	3,131	93.2%	16.3	1.1	B

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Baseline Plus Project
PM Peak Hour

Intersection 5 Redwood Dr/Smith Ranch Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	675	676	100.2%	38.7	25.6	D
	Through	35	35	99.7%	35.4	24.0	D
	Right Turn	146	149	101.8%	7.3	10.0	A
	Subtotal	856	860	100.4%	33.1	22.6	C
SB	Left Turn	16	17	108.8%	34.7	10.5	C
	Through	47	46	97.0%	38.4	6.9	D
	Right Turn	249	248	99.6%	9.5	5.9	A
	Subtotal	312	311	99.7%	15.4	5.9	B
EB	Left Turn	140	131	93.8%	32.7	5.2	C
	Through	508	464	91.4%	23.2	3.3	C
	Right Turn	225	213	94.5%	5.0	1.5	A
	Subtotal	873	808	92.6%	19.9	1.6	B
WB	Left Turn	76	71	93.4%	138.1	88.3	F
	Through	634	624	98.5%	131.1	82.3	F
	Right Turn	14	14	99.3%	115.9	74.2	F
	Subtotal	724	709	98.0%	131.2	81.4	F
Total		2,765	2,688	97.2%	51.1	23.6	D

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative No Project
AM Peak Hour

Intersection 1 **Las Gallinas Ave/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	151	150	99.1%	53.4	24.4	D
	Through	224	228	101.6%	32.2	5.9	C
	Right Turn	161	166	102.9%	8.8	3.4	A
	Subtotal	536	543	101.3%	30.8	8.6	C
SB	Left Turn	218	137	62.7%	593.6	21.1	F
	Through	411	263	63.9%	581.6	31.6	F
	Right Turn	35	19	54.3%	572.0	66.6	F
	Subtotal	664	418	63.0%	584.1	23.2	F
EB	Left Turn	40	29	72.8%	407.4	66.4	F
	Through	798	633	79.3%	401.5	32.5	F
	Right Turn	381	309	81.2%	414.7	36.0	F
	Subtotal	1,219	971	79.7%	405.7	32.7	F
WB	Left Turn	72	72	99.3%	51.9	6.1	D
	Through	385	389	100.9%	16.9	2.3	B
	Right Turn	99	97	97.8%	3.5	0.6	A
	Subtotal	556	557	100.2%	19.3	1.9	B
Total		2,975	2,489	83.7%	267.0	10.1	F

Intersection 2 **Los Gamos Dr/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	22	25	111.8%	30.4	9.7	C
	Through						
	Right Turn	136	145	106.3%	8.4	2.3	A
	Subtotal	158	169	107.1%	11.8	2.9	B
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	1,019	819	80.4%	16.9	1.1	B
	Right Turn	203	160	78.8%	14.8	1.7	B
	Subtotal	1,222	979	80.1%	16.6	1.1	B
WB	Left Turn	522	529	101.4%	45.2	12.6	D
	Through	596	603	101.2%	3.0	0.6	A
	Right Turn						
	Subtotal	1,118	1,133	101.3%	23.4	7.2	C
Total		2,498	2,281	91.3%	19.7	3.7	B

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative No Project
AM Peak Hour

Intersection 3 **US-101 SB Ramps/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	238	237	99.5%	37.3	7.2	D
	Through						
	Right Turn	571	566	99.2%	27.6	5.4	C
	Subtotal	809	803	99.3%	30.5	5.9	C
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	590	504	85.4%	16.7	1.5	B
	Right Turn	565	464	82.2%	10.4	1.5	B
	Subtotal	1,155	968	83.8%	13.7	1.4	B
WB	Left Turn	338	322	95.3%	38.4	8.4	D
	Through	880	892	101.4%	5.7	2.6	A
	Right Turn						
	Subtotal	1,218	1,214	99.7%	14.6	4.5	B
Total		3,182	2,986	93.8%	18.7	2.7	B

Intersection 4 **US-101 NB Ramps/Smith Ranch Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	782	771	98.6%	25.7	2.9	C
	Through						
	Right Turn	452	446	98.7%	29.6	6.9	C
	Subtotal	1,234	1,217	98.6%	27.1	4.2	C
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	1,041	974	93.6%	25.9	14.8	C
	Right Turn	120	101	84.5%	20.5	9.1	C
	Subtotal	1,161	1,075	92.6%	25.4	14.2	C
WB	Left Turn						
	Through	436	439	100.6%	10.4	1.3	B
	Right Turn	190	185	97.5%	0.6	0.2	A
	Subtotal	626	624	99.7%	7.3	1.1	A
Total		3,021	2,916	96.5%	22.5	6.7	C

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative No Project
AM Peak Hour

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	156	149	95.6%	18.2	3.2	B
	Through	15	15	102.0%	19.9	3.9	B
	Right Turn	79	76	96.3%	3.0	1.0	A
	Subtotal	250	241	96.2%	13.5	2.1	B
SB	Left Turn	13	11	86.9%	20.8	8.8	C
	Through	59	59	99.5%	22.0	3.6	C
	Right Turn	125	130	103.9%	2.4	0.6	A
	Subtotal	197	200	101.5%	9.4	2.3	A
EB	Left Turn	135	130	96.2%	20.7	3.0	C
	Through	458	425	92.8%	13.6	2.4	B
	Right Turn	825	786	95.3%	18.5	6.4	B
	Subtotal	1,418	1,341	94.6%	17.4	3.9	B
WB	Left Turn	122	123	101.1%	26.7	5.0	C
	Through	345	341	98.9%	14.9	1.9	B
	Right Turn	12	15	127.5%	11.5	13.0	B
	Subtotal	479	480	100.2%	17.8	2.8	B
Total		2,344	2,262	96.5%	16.3	2.4	B

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative No Project
PM Peak Hour

Intersection 1 **Las Gallinas Ave/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	170	168	98.7%	33.1	14.6	C
	Through	240	240	100.0%	27.2	5.9	C
	Right Turn	149	145	97.0%	7.7	4.0	A
	Subtotal	559	552	98.8%	24.0	8.1	C
SB	Left Turn	98	101	102.9%	43.6	28.2	D
	Through	111	114	102.5%	28.5	6.7	C
	Right Turn	22	24	108.6%	13.9	15.3	B
	Subtotal	231	239	103.2%	34.1	17.3	C
EB	Left Turn	22	22	97.7%	48.2	18.9	D
	Through	396	399	100.7%	47.2	44.8	D
	Right Turn	141	138	97.6%	28.2	36.8	C
	Subtotal	559	558	99.8%	43.0	42.3	D
WB	Left Turn	153	146	95.1%	95.7	75.5	F
	Through	477	438	91.9%	38.7	46.6	D
	Right Turn	174	166	95.4%	24.9	46.8	C
	Subtotal	804	750	93.3%	47.6	53.6	D
Total		2,153	2,099	97.5%	38.2	32.0	D

Intersection 2 **Los Gamos Dr/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	91	63	69.7%	30.9	13.4	C
	Through						
	Right Turn	606	441	72.8%	63.9	38.4	E
	Subtotal	697	505	72.4%	60.2	35.6	E
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	643	600	93.3%	131.3	72.7	F
	Right Turn	66	63	95.2%	134.0	76.0	F
	Subtotal	709	663	93.5%	131.6	73.0	F
WB	Left Turn	215	214	99.4%	53.7	25.9	D
	Through	798	769	96.4%	23.5	25.0	C
	Right Turn						
	Subtotal	1,013	983	97.0%	30.3	25.2	C
Total		2,419	2,150	88.9%	66.7	30.0	E

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative No Project
PM Peak Hour

Intersection 3 **US-101 SB Ramps/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	201	198	98.4%	56.5	61.6	E
	Through						
	Right Turn	425	428	100.7%	37.3	57.7	D
	Subtotal	626	626	100.0%	43.3	58.9	D
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	316	441	139.4%	41.6	13.4	D
	Right Turn	933	594	63.6%	64.7	31.6	E
	Subtotal	1,249	1,034	82.8%	57.2	26.2	E
WB	Left Turn	827	681	82.3%	73.9	16.0	E
	Through	812	787	96.9%	20.0	20.3	B
	Right Turn						
	Subtotal	1,639	1,467	89.5%	45.8	14.9	D
Total		3,514	3,128	89.0%	46.5	13.5	D

Intersection 4 **US-101 NB Ramps/Smith Ranch Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	590	595	100.8%	26.2	2.2	C
	Through						
	Right Turn	559	560	100.1%	23.5	3.1	C
	Subtotal	1,149	1,154	100.5%	24.9	2.4	C
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	397	458	115.3%	16.9	5.0	B
	Right Turn	344	413	120.0%	9.6	2.3	A
	Subtotal	741	871	117.5%	13.7	3.4	B
WB	Left Turn						
	Through	1,049	872	83.1%	69.8	10.1	E
	Right Turn	721	593	82.2%	3.9	0.4	A
	Subtotal	1,770	1,465	82.7%	43.3	6.2	D
Total		3,660	3,489	95.3%	29.5	1.4	C

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative No Project
PM Peak Hour

Intersection 5 Redwood Dr/Smith Ranch Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	720	606	84.1%	303.6	94.6	F
	Through	37	30	80.0%	290.2	102.9	F
	Right Turn	149	132	88.5%	272.8	100.4	F
	Subtotal	906	767	84.7%	297.6	94.5	F
SB	Left Turn	14	13	90.7%	47.4	18.4	D
	Through	49	50	102.7%	47.8	10.3	D
	Right Turn	284	282	99.3%	18.4	8.6	B
	Subtotal	347	345	99.4%	24.0	8.3	C
EB	Left Turn	143	148	103.6%	37.5	5.6	D
	Through	553	583	105.3%	23.3	3.0	C
	Right Turn	244	266	109.0%	6.8	1.8	A
	Subtotal	940	997	106.0%	20.9	2.2	C
WB	Left Turn	88	67	76.4%	393.7	133.1	F
	Through	766	590	77.0%	398.1	133.1	F
	Right Turn	16	14	85.0%	402.5	146.4	F
	Subtotal	870	670	77.0%	398.1	133.0	F
Total		3,063	2,779	90.7%	184.5	36.2	F

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative No Project Ex Occ
AM Peak Hour

Intersection 1 **Las Gallinas Ave/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	151	154	101.7%	59.6	26.6	E
	Through	224	222	98.9%	35.8	4.7	D
	Right Turn	158	154	97.7%	9.4	3.8	A
	Subtotal	533	529	99.3%	35.2	9.1	D
SB	Left Turn	217	136	62.7%	581.8	34.3	F
	Through	411	259	63.1%	574.4	34.0	F
	Right Turn	35	19	55.1%	643.9	74.6	F
	Subtotal	663	415	62.5%	578.1	32.9	F
EB	Left Turn	40	29	72.0%	422.5	54.8	F
	Through	791	625	79.0%	408.6	43.8	F
	Right Turn	381	309	81.2%	409.5	52.2	F
	Subtotal	1,212	963	79.5%	409.3	44.7	F
WB	Left Turn	72	77	106.5%	54.9	15.6	D
	Through	384	393	102.3%	16.4	1.8	B
	Right Turn	99	98	98.5%	3.7	0.4	A
	Subtotal	555	567	102.2%	19.3	3.9	B
Total		2,963	2,474	83.5%	266.2	17.7	F

Intersection 2 **Los Gamos Dr/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	20	24	119.5%	31.4	8.6	C
	Through						
	Right Turn	119	118	99.2%	9.5	1.7	A
	Subtotal	139	142	102.1%	13.6	2.8	B
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	1,019	806	79.1%	16.2	2.0	B
	Right Turn	192	153	79.5%	14.2	2.2	B
	Subtotal	1,211	959	79.2%	15.8	2.0	B
WB	Left Turn	396	403	101.7%	30.1	4.1	C
	Through	596	608	102.0%	3.0	0.7	A
	Right Turn						
	Subtotal	992	1,011	101.9%	14.0	2.0	B
Total		2,342	2,112	90.2%	14.8	1.4	B

Intersection 3 US-101 SB Ramps/Lucas Valley Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	172	168	97.4%	33.5	15.8	C
	Through						
	Right Turn	571	577	101.0%	24.6	18.4	C
	Subtotal	743	744	100.2%	26.8	17.7	C
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	580	480	82.8%	17.4	3.4	B
	Right Turn	558	446	80.0%	10.2	1.2	B
	Subtotal	1,138	926	81.4%	13.9	2.3	B
WB	Left Turn	338	318	94.0%	34.1	9.0	C
	Through	820	838	102.2%	3.7	1.7	A
	Right Turn						
	Subtotal	1,158	1,156	99.8%	12.1	4.1	B
Total		3,039	2,826	93.0%	16.8	5.9	B

Intersection 4 US-101 NB Ramps/Smith Ranch Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	727	722	99.4%	25.3	3.6	C
	Through						
	Right Turn	452	458	101.3%	32.6	10.3	C
	Subtotal	1,179	1,180	100.1%	28.4	6.2	C
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	1,040	974	93.7%	24.5	14.9	C
	Right Turn	111	87	78.7%	20.2	11.5	C
	Subtotal	1,151	1,062	92.2%	24.2	14.5	C
WB	Left Turn						
	Through	431	428	99.3%	9.8	1.7	A
	Right Turn	190	182	95.7%	0.5	0.2	A
	Subtotal	621	610	98.2%	6.8	1.3	A
Total		2,951	2,852	96.6%	22.3	7.6	C

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative No Project Ex Occ
AM Peak Hour

Intersection 5 Redwood Dr/Smith Ranch Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	156	155	99.2%	17.3	2.6	B
	Through	15	14	92.0%	25.1	12.8	C
	Right Turn	79	76	96.3%	3.5	1.5	A
	Subtotal	250	245	97.9%	13.4	2.4	B
SB	Left Turn	13	12	93.8%	19.0	11.0	B
	Through	59	60	101.0%	21.6	6.3	C
	Right Turn	125	126	100.6%	2.3	0.6	A
	Subtotal	197	198	100.3%	9.2	2.5	A
EB	Left Turn	135	130	96.3%	23.7	4.8	C
	Through	457	435	95.3%	14.2	2.1	B
	Right Turn	825	789	95.6%	19.5	7.8	B
	Subtotal	1,417	1,354	95.6%	18.2	4.8	B
WB	Left Turn	122	126	103.2%	25.3	4.6	C
	Through	340	327	96.0%	16.1	2.3	B
	Right Turn	12	12	103.3%	7.5	7.6	A
	Subtotal	474	465	98.1%	18.7	2.6	B
Total		2,338	2,261	96.7%	17.0	3.2	B

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative No Project Ex Occ
PM Peak Hour

Intersection 1 **Las Gallinas Ave/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	170	169	99.6%	30.6	8.1	C
	Through	240	242	100.8%	26.7	6.5	C
	Right Turn	148	150	101.6%	6.9	3.9	A
	Subtotal	558	562	100.7%	22.4	5.5	C
SB	Left Turn	98	94	96.3%	55.2	62.1	E
	Through	111	109	98.5%	47.1	61.3	D
	Right Turn	22	22	101.8%	17.2	18.9	B
	Subtotal	231	226	97.9%	48.8	62.4	D
EB	Left Turn	22	23	102.3%	48.2	19.3	D
	Through	395	390	98.8%	35.2	18.3	D
	Right Turn	141	141	99.9%	17.0	8.8	B
	Subtotal	558	554	99.2%	31.2	15.4	C
WB	Left Turn	151	142	94.2%	92.6	69.8	F
	Through	474	439	92.7%	44.3	42.5	D
	Right Turn	173	161	93.1%	32.3	46.6	C
	Subtotal	798	743	93.1%	51.2	49.4	D
Total		2,145	2,084	97.2%	37.5	26.0	D

Intersection 2 **Los Gamos Dr/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	81	70	86.0%	33.0	10.4	C
	Through						
	Right Turn	492	409	83.2%	60.7	32.1	E
	Subtotal	573	479	83.6%	56.5	28.7	E
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	643	600	93.3%	113.1	74.5	F
	Right Turn	64	63	98.3%	118.0	80.5	F
	Subtotal	707	663	93.8%	113.3	74.9	F
WB	Left Turn	192	188	97.9%	45.5	9.3	D
	Through	801	769	96.0%	17.3	8.7	B
	Right Turn						
	Subtotal	993	957	96.4%	22.5	8.6	C
Total		2,273	2,099	92.3%	57.9	30.3	E

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative No Project Ex Occ
PM Peak Hour

Intersection 3 **US-101 SB Ramps/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	189	187	99.1%	36.6	4.6	D
	Through						
	Right Turn	425	428	100.8%	18.9	5.7	B
	Subtotal	614	616	100.2%	24.4	5.0	C
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	252	408	161.9%	45.1	12.5	D
	Right Turn	883	592	67.0%	70.3	22.4	E
	Subtotal	1,135	1,000	88.1%	61.3	19.5	E
WB	Left Turn	824	683	82.9%	67.5	11.3	E
	Through	804	772	96.0%	12.5	2.0	B
	Right Turn						
	Subtotal	1,628	1,455	89.4%	38.7	5.8	D
Total		3,377	3,070	90.9%	42.0	3.0	D

Intersection 4 **US-101 NB Ramps/Smith Ranch Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	580	562	96.9%	28.2	2.1	C
	Through						
	Right Turn	559	553	99.0%	21.2	2.9	C
	Subtotal	1,139	1,115	97.9%	24.7	1.6	C
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	392	450	114.8%	13.2	3.3	B
	Right Turn	285	385	135.2%	9.8	1.8	A
	Subtotal	677	836	123.4%	11.6	2.3	B
WB	Left Turn						
	Through	1,048	893	85.2%	69.2	16.9	E
	Right Turn	721	622	86.3%	3.8	0.6	A
	Subtotal	1,769	1,515	85.7%	42.7	10.1	D
Total		3,585	3,466	96.7%	28.5	3.5	C

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative No Project Ex Occ
PM Peak Hour

Intersection 5 Redwood Dr/Smith Ranch Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	720	643	89.3%	216.3	97.8	F
	Through	37	36	96.2%	225.5	90.1	F
	Right Turn	149	132	88.9%	187.5	99.8	F
	Subtotal	906	811	89.5%	212.2	98.3	F
SB	Left Turn	14	14	100.7%	32.2	10.3	C
	Through	49	47	95.9%	44.5	13.3	D
	Right Turn	284	284	100.1%	16.5	10.0	B
	Subtotal	347	345	99.5%	20.8	9.6	C
EB	Left Turn	143	151	105.7%	40.7	6.2	D
	Through	548	576	105.2%	21.9	3.1	C
	Right Turn	244	260	106.6%	5.6	0.9	A
	Subtotal	935	988	105.6%	20.2	3.0	C
WB	Left Turn	88	66	74.5%	384.2	125.0	F
	Through	765	603	78.8%	402.6	143.8	F
	Right Turn	16	12	76.9%	396.0	196.5	F
	Subtotal	869	681	78.4%	401.0	142.4	F
Total		3,057	2,825	92.4%	168.2	59.2	F

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative Plus Project
AM Peak Hour

Intersection 1 **Las Gallinas Ave/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	151	147	97.2%	56.1	20.0	E
	Through	224	230	102.5%	34.6	6.6	C
	Right Turn	163	162	99.5%	9.7	3.3	A
	Subtotal	538	539	100.1%	33.5	8.4	C
SB	Left Turn	219	136	62.3%	597.7	35.5	F
	Through	411	257	62.6%	584.4	32.0	F
	Right Turn	35	23	64.9%	573.2	76.6	F
	Subtotal	665	416	62.6%	588.1	32.3	F
EB	Left Turn	40	32	81.0%	425.1	63.9	F
	Through	802	630	78.6%	436.3	20.3	F
	Right Turn	381	300	78.7%	422.5	24.1	F
	Subtotal	1,223	962	78.7%	431.7	18.4	F
WB	Left Turn	73	73	99.6%	66.0	21.0	E
	Through	387	393	101.5%	19.3	7.2	B
	Right Turn	99	100	101.1%	5.1	4.3	A
	Subtotal	559	566	101.2%	22.8	8.0	C
Total		2,985	2,483	83.2%	278.1	10.5	F

Intersection 2 **Los Gamos Dr/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	26	26	100.0%	32.4	5.7	C
	Through						
	Right Turn	179	182	101.8%	9.2	2.4	A
	Subtotal	205	208	101.6%	12.1	2.1	B
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	1,019	804	78.9%	17.0	1.3	B
	Right Turn	209	168	80.5%	14.7	1.3	B
	Subtotal	1,228	972	79.1%	16.6	1.2	B
WB	Left Turn	594	605	101.8%	61.6	12.2	E
	Through	595	603	101.3%	4.1	1.0	A
	Right Turn						
	Subtotal	1,189	1,208	101.6%	32.9	6.6	C
Total		2,622	2,388	91.1%	24.7	3.7	C

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative Plus Project
AM Peak Hour

Intersection 3 **US-101 SB Ramps/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	275	268	97.3%	51.9	17.3	D
	Through						
	Right Turn	571	583	102.0%	39.8	16.4	D
	Subtotal	846	850	100.5%	43.7	16.7	D
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	614	529	86.2%	17.7	2.4	B
	Right Turn	584	461	79.0%	10.2	1.3	B
	Subtotal	1,198	990	82.7%	14.2	1.6	B
WB	Left Turn	338	328	97.1%	36.6	8.3	D
	Through	914	941	102.9%	7.1	3.3	A
	Right Turn						
	Subtotal	1,252	1,269	101.3%	14.6	3.6	B
Total		3,296	3,109	94.3%	22.7	4.9	C

Intersection 4 **US-101 NB Ramps/Smith Ranch Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	813	818	100.7%	26.7	3.6	C
	Through						
	Right Turn	452	457	101.1%	30.8	5.7	C
	Subtotal	1,265	1,275	100.8%	28.2	4.2	C
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	1,043	995	95.4%	30.0	10.4	C
	Right Turn	142	121	85.2%	25.1	9.2	C
	Subtotal	1,185	1,116	94.2%	29.4	10.2	C
WB	Left Turn						
	Through	439	442	100.6%	9.3	1.1	A
	Right Turn	190	180	94.9%	0.6	0.3	A
	Subtotal	629	622	98.9%	6.8	1.0	A
Total		3,079	3,013	97.9%	24.4	4.0	C

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative Plus Project
AM Peak Hour

Intersection 5 Redwood Dr/Smith Ranch Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	156	152	97.4%	18.1	2.0	B
	Through	15	16	106.7%	18.0	3.5	B
	Right Turn	79	81	102.5%	3.4	0.7	A
	Subtotal	250	249	99.6%	13.1	1.6	B
SB	Left Turn	13	14	106.9%	16.5	7.6	B
	Through	59	61	103.7%	21.2	5.3	C
	Right Turn	125	125	100.2%	2.6	0.8	A
	Subtotal	197	200	101.7%	9.3	1.9	A
EB	Left Turn	135	125	92.8%	22.2	3.1	C
	Through	460	449	97.6%	14.5	3.1	B
	Right Turn	825	799	96.9%	19.8	5.3	B
	Subtotal	1,420	1,373	96.7%	18.4	2.8	B
WB	Left Turn	122	120	98.0%	23.8	5.0	C
	Through	348	342	98.2%	14.5	1.0	B
	Right Turn	12	11	92.5%	4.3	3.1	A
	Subtotal	482	473	98.0%	16.6	2.0	B
Total		2,349	2,295	97.7%	16.7	1.6	B

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative Plus Project
PM Peak Hour

Intersection 1 **Las Gallinas Ave/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	170	168	98.7%	33.1	14.6	C
	Through	240	240	100.0%	27.2	5.9	C
	Right Turn	151	145	95.7%	7.7	4.0	A
	Subtotal	561	552	98.4%	24.0	8.1	C
SB	Left Turn	99	101	101.8%	43.6	28.2	D
	Through	111	114	102.5%	28.5	6.7	C
	Right Turn	22	24	108.6%	13.9	15.3	B
	Subtotal	232	239	102.8%	34.1	17.3	C
EB	Left Turn	22	22	97.7%	48.2	18.9	D
	Through	402	399	99.2%	47.2	44.8	D
	Right Turn	141	138	97.6%	28.2	36.8	C
	Subtotal	565	558	98.7%	43.0	42.3	D
WB	Left Turn	157	146	92.7%	95.7	75.5	F
	Through	487	438	90.0%	38.7	46.6	D
	Right Turn	176	166	94.3%	24.9	46.8	C
	Subtotal	820	750	91.5%	47.6	53.6	D
Total		2,178	2,099	96.3%	38.2	32.0	D

Intersection 2 **Los Gamos Dr/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	107	63	59.3%	30.9	13.4	C
	Through						
	Right Turn	790	441	55.8%	63.9	38.4	E
	Subtotal	897	505	56.2%	60.2	35.6	E
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	643	600	93.3%	131.3	72.7	F
	Right Turn	75	63	83.7%	134.0	76.0	F
	Subtotal	718	663	92.3%	131.6	73.0	F
WB	Left Turn	318	214	67.2%	53.7	25.9	D
	Through	798	769	96.4%	23.5	25.0	C
	Right Turn						
	Subtotal	1,116	983	88.1%	30.3	25.2	C
Total		2,731	2,150	78.7%	66.7	30.0	E

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative Plus Project
PM Peak Hour

Intersection 3 **US-101 SB Ramps/Lucas Valley Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	255	198	77.6%	56.5	61.6	E
	Through						
	Right Turn	425	428	100.7%	37.3	57.7	D
	Subtotal	680	626	92.0%	43.3	58.9	D
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	420	441	104.9%	41.6	13.4	D
	Right Turn	1,013	594	58.6%	64.7	31.6	E
	Subtotal	1,433	1,034	72.2%	57.2	26.2	E
WB	Left Turn	827	681	82.3%	73.9	16.0	E
	Through	861	787	91.4%	20.0	20.3	B
	Right Turn						
	Subtotal	1,688	1,467	86.9%	45.8	14.9	D
Total		3,801	3,128	82.3%	46.5	13.5	D

Intersection 4 **US-101 NB Ramps/Smith Ranch Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	635	595	93.6%	26.2	2.2	C
	Through						
	Right Turn	559	560	100.1%	23.5	3.1	C
	Subtotal	1,194	1,154	96.7%	24.9	2.4	C
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	405	458	113.0%	16.9	5.0	B
	Right Turn	440	413	93.8%	9.6	2.3	A
	Subtotal	845	871	103.0%	13.7	3.4	B
WB	Left Turn						
	Through	1,053	872	82.8%	69.8	10.1	E
	Right Turn	721	593	82.2%	3.9	0.4	A
	Subtotal	1,774	1,465	82.6%	43.3	6.2	D
Total		3,813	3,489	91.5%	29.5	1.4	C

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative Plus Project
PM Peak Hour

Intersection 5 Redwood Dr/Smith Ranch Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	720	606	84.1%	303.6	94.6	F
	Through	37	30	80.0%	290.2	102.9	F
	Right Turn	149	132	88.5%	272.8	100.4	F
	Subtotal	906	767	84.7%	297.6	94.5	F
SB	Left Turn	14	13	90.7%	47.4	18.4	D
	Through	49	50	102.7%	47.8	10.3	D
	Right Turn	284	282	99.3%	18.4	8.6	B
	Subtotal	347	345	99.4%	24.0	8.3	C
EB	Left Turn	143	148	103.6%	37.5	5.6	D
	Through	561	583	103.8%	23.3	3.0	C
	Right Turn	244	266	109.0%	6.8	1.8	A
	Subtotal	948	997	105.1%	20.9	2.2	C
WB	Left Turn	88	67	76.4%	393.7	133.1	F
	Through	770	590	76.6%	398.1	133.1	F
	Right Turn	16	14	85.0%	402.5	146.4	F
	Subtotal	874	670	76.7%	398.1	133.0	F
Total		3,075	2,779	90.4%	184.5	36.2	F

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative No Project
AM Peak Hour
PSR/PDS

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	151	140	92.6%	193.3	95.4	F
	Through	224	225	100.5%	76.1	49.3	E
	Right Turn	161	160	99.5%	48.8	56.5	D
	Subtotal	536	525	98.0%	101.5	59.4	F
SB	Left Turn	218	171	78.6%	458.4	45.3	F
	Through	411	309	75.3%	447.3	53.1	F
	Right Turn	35	28	79.4%	409.0	78.4	F
	Subtotal	664	509	76.6%	449.3	48.8	F
EB	Left Turn	40	28	71.0%	324.3	70.0	F
	Through	798	679	85.0%	344.5	37.3	F
	Right Turn	381	323	84.8%	331.9	39.0	F
	Subtotal	1,219	1,030	84.5%	339.9	37.6	F
WB	Left Turn	72	71	98.5%	66.5	31.6	E
	Through	385	393	102.1%	18.0	5.0	B
	Right Turn	99	102	103.4%	3.6	0.7	A
	Subtotal	556	566	101.8%	22.0	7.4	C
Total		2,975	2,630	88.4%	246.2	27.4	F

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	22	21	94.1%	41.6	12.0	D
	Through						
	Right Turn	136	137	100.9%	23.4	2.0	C
	Subtotal	158	158	99.9%	25.8	2.5	C
SB	Left Turn	571	547	95.8%	143.3	81.7	F
	Through	111	112	101.3%	90.3	68.8	F
	Right Turn	127	124	97.7%	62.3	65.1	E
	Subtotal	809	783	96.8%	122.9	78.7	F
EB	Left Turn						
	Through	1,019	855	83.9%	126.0	55.5	F
	Right Turn	203	169	83.3%	101.3	54.6	F
	Subtotal	1,222	1,024	83.8%	121.3	55.5	F
WB	Left Turn	411	402	97.8%	76.1	43.2	E
	Through	469	484	103.2%	31.4	18.1	C
	Right Turn						
	Subtotal	880	886	100.7%	52.2	29.6	D
Total		3,069	2,851	92.9%	95.1	29.4	F

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative No Project
AM Peak Hour
PSR/PDS

Intersection 3

US-101 SB Ramps/Lucas Valley Rd

Uncontrolled

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	1,161	1,055	90.9%	4.7	0.3	A
	Right Turn	565	484	85.6%	8.4	0.3	A
	Subtotal	1,726	1,539	89.2%	5.8	0.4	A
WB	Left Turn						
	Through	880	889	101.0%	18.5	15.7	C
	Right Turn	338	318	94.1%	10.7	11.1	B
	Subtotal	1,218	1,207	99.1%	16.6	14.5	C
Total		2,944	2,745	93.3%	10.6	6.7	B

Intersection 4

US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	782	781	99.8%	22.9	2.7	C
	Through						
	Right Turn	452	440	97.3%	24.1	4.9	C
	Subtotal	1,234	1,220	98.9%	23.3	2.5	C
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	1,041	937	90.0%	25.6	5.5	C
	Right Turn	120	115	96.2%	21.4	5.2	C
	Subtotal	1,161	1,052	90.6%	25.1	5.3	C
WB	Left Turn						
	Through	436	429	98.3%	14.1	1.7	B
	Right Turn	190	192	100.9%	3.1	0.2	A
	Subtotal	626	620	99.1%	10.6	1.3	B
Total		3,021	2,893	95.7%	21.3	2.3	C

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative No Project
AM Peak Hour
PSR/PDS

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	156	158	101.2%	18.4	4.5	B
	Through	15	15	97.3%	21.6	10.4	C
	Right Turn	79	75	94.4%	3.0	1.4	A
	Subtotal	250	247	98.8%	14.4	4.0	B
SB	Left Turn	13	13	99.2%	18.2	8.0	B
	Through	59	62	105.1%	20.4	4.6	C
	Right Turn	125	126	100.4%	1.9	0.5	A
	Subtotal	197	200	101.7%	9.5	1.9	A
EB	Left Turn	135	122	90.6%	20.0	4.1	B
	Through	458	424	92.5%	15.2	2.6	B
	Right Turn	825	755	91.5%	15.0	3.3	B
	Subtotal	1,418	1,301	91.7%	15.6	2.2	B
WB	Left Turn	122	121	99.3%	25.2	10.9	C
	Through	345	335	97.0%	16.5	2.7	B
	Right Turn	12	13	108.3%	10.7	8.2	B
	Subtotal	479	469	97.9%	18.6	3.8	B
Total		2,344	2,217	94.6%	15.5	1.5	B

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative No Project
PM Peak Hour
PSR/PDS

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	170	173	101.8%	53.5	35.2	D
	Through	240	245	102.2%	28.3	8.8	C
	Right Turn	149	152	102.1%	7.6	6.8	A
	Subtotal	559	570	102.0%	30.6	16.7	C
SB	Left Turn	98	96	97.8%	35.3	6.2	D
	Through	111	108	97.6%	29.0	4.0	C
	Right Turn	22	23	104.1%	9.6	8.2	A
	Subtotal	231	227	98.3%	29.8	4.4	C
EB	Left Turn	22	19	86.4%	42.1	14.0	D
	Through	396	393	99.3%	27.6	3.9	C
	Right Turn	141	141	100.1%	12.8	1.8	B
	Subtotal	559	554	99.0%	24.6	3.5	C
WB	Left Turn	153	147	95.9%	58.4	26.3	E
	Through	477	478	100.2%	18.8	3.2	B
	Right Turn	174	180	103.3%	5.9	1.1	A
	Subtotal	804	805	100.1%	22.5	6.3	C
Total		2,153	2,155	100.1%	25.8	5.2	C

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	91	92	100.9%	46.1	7.4	D
	Through						
	Right Turn	606	611	100.8%	31.0	4.4	C
	Subtotal	697	703	100.8%	33.0	4.0	C
SB	Left Turn	425	422	99.2%	45.8	9.4	D
	Through	43	45	103.5%	34.7	9.6	C
	Right Turn	158	162	102.2%	8.7	2.1	A
	Subtotal	626	628	100.3%	36.1	6.9	D
EB	Left Turn						
	Through	643	642	99.8%	70.9	25.5	E
	Right Turn	66	63	94.7%	35.0	21.5	C
	Subtotal	709	704	99.3%	67.6	24.9	E
WB	Left Turn	172	169	98.3%	49.9	2.8	D
	Through	640	637	99.6%	28.5	3.0	C
	Right Turn						
	Subtotal	812	806	99.3%	33.1	2.8	C
Total		2,844	2,841	99.9%	43.1	7.7	D

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative No Project
PM Peak Hour
PSR/PDS

Intersection 3

US-101 SB Ramps/Lucas Valley Rd

Uncontrolled

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	741	742	100.1%	3.5	0.5	A
	Right Turn	933	932	99.9%	10.6	1.3	B
	Subtotal	1,674	1,674	100.0%	7.4	1.0	A
WB	Left Turn						
	Through	812	810	99.8%	12.6	1.8	B
	Right Turn	827	828	100.1%	9.4	1.8	A
	Subtotal	1,639	1,638	99.9%	11.0	1.8	B
Total		3,313	3,311	100.0%	9.2	1.1	A

Intersection 4

US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	590	580	98.3%	25.0	2.7	C
	Through						
	Right Turn	559	561	100.4%	17.2	4.0	B
	Subtotal	1,149	1,141	99.3%	21.2	2.7	C
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	397	391	98.6%	21.4	3.7	C
	Right Turn	344	352	102.2%	19.9	3.7	B
	Subtotal	741	743	100.3%	20.7	3.4	C
WB	Left Turn						
	Through	1,049	1,057	100.7%	23.7	2.4	C
	Right Turn	721	719	99.8%	9.3	0.7	A
	Subtotal	1,770	1,776	100.4%	17.8	1.6	B
Total		3,660	3,660	100.0%	19.5	1.7	B

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative No Project
PM Peak Hour
PSR/PDS

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	720	719	99.8%	36.7	5.6	D
	Through	37	39	106.5%	38.4	9.7	D
	Right Turn	149	151	101.1%	11.7	2.1	B
	Subtotal	906	909	100.3%	32.5	5.3	C
SB	Left Turn	14	15	104.3%	37.9	9.6	D
	Through	49	47	95.9%	33.8	6.7	C
	Right Turn	284	282	99.3%	15.1	6.7	B
	Subtotal	347	344	99.0%	18.4	6.2	B
EB	Left Turn	143	149	104.3%	35.1	3.9	D
	Through	553	546	98.6%	22.7	2.5	C
	Right Turn	244	243	99.4%	4.4	0.7	A
	Subtotal	940	937	99.7%	20.0	2.1	C
WB	Left Turn	88	79	89.3%	48.6	8.8	D
	Through	766	776	101.3%	36.7	5.1	D
	Right Turn	16	18	112.5%	32.7	7.4	C
	Subtotal	870	872	100.3%	37.9	4.8	D
Total		3,063	3,062	100.0%	28.7	2.7	C

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative Plus Project
AM Peak Hour
PSR/PDS
Signal

Intersection 1 Las Gallinas Ave/Lucas Valley Rd

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	151	146	96.8%	80.2	53.0	F
	Through	224	229	102.4%	37.1	6.1	D
	Right Turn	163	161	98.8%	11.1	3.0	B
	Subtotal	538	537	99.7%	41.3	16.6	D
SB	Left Turn	219	117	53.2%	613.7	39.9	F
	Through	411	217	52.7%	614.8	61.2	F
	Right Turn	35	18	51.1%	603.2	65.4	F
	Subtotal	665	351	52.8%	612.8	52.1	F
EB	Left Turn	40	34	85.0%	371.4	53.0	F
	Through	802	657	81.9%	384.2	40.5	F
	Right Turn	381	310	81.3%	384.5	51.0	F
	Subtotal	1,223	1,001	81.8%	384.0	42.6	F
WB	Left Turn	73	71	97.0%	60.4	14.1	E
	Through	387	388	100.2%	19.4	5.5	B
	Right Turn	99	101	102.1%	4.8	0.9	A
	Subtotal	559	560	100.1%	21.7	5.5	C
Total		2,985	2,448	82.0%	259.7	21.8	F

Intersection 2 Los Gamos Dr/Lucas Valley Rd

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	26	27	102.3%	46.1	15.7	D
	Through						
	Right Turn	179	175	97.9%	21.3	2.3	C
	Subtotal	205	202	98.4%	24.1	2.9	C
SB	Left Turn	571	559	97.9%	161.1	82.9	F
	Through	148	150	101.3%	124.6	80.4	F
	Right Turn	127	125	98.2%	76.6	73.9	E
	Subtotal	846	834	98.5%	141.4	80.4	F
EB	Left Turn						
	Through	1,019	813	79.8%	97.3	51.4	F
	Right Turn	209	160	76.7%	75.4	51.7	E
	Subtotal	1,228	973	79.3%	93.9	51.1	F
WB	Left Turn	445	438	98.4%	131.2	58.1	F
	Through	469	472	100.6%	68.6	49.2	E
	Right Turn						
	Subtotal	914	910	99.6%	99.1	53.3	F
Total		3,193	2,919	91.4%	104.5	33.4	F

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative Plus Project
AM Peak Hour
PSR/PDS
Uncontrolled

Intersection 3 US-101 SB Ramps/Lucas Valley Rd

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	1,185	1,069	90.2%	4.3	0.4	A
	Right Turn	584	478	81.8%	7.7	0.6	A
	Subtotal	1,769	1,547	87.5%	5.3	0.4	A
WB	Left Turn						
	Through	914	921	100.8%	34.9	30.6	D
	Right Turn	338	325	96.1%	26.5	25.4	D
	Subtotal	1,252	1,246	99.5%	32.5	29.0	D
Total		3,021	2,793	92.4%	17.7	13.3	C

Intersection 4 US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	813	813	100.0%	38.0	27.0	D
	Through						
	Right Turn	452	451	99.8%	33.5	11.9	C
	Subtotal	1,265	1,264	99.9%	36.7	20.5	D
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	1,043	936	89.8%	20.0	2.3	B
	Right Turn	142	132	93.0%	18.2	3.0	B
	Subtotal	1,185	1,068	90.1%	19.7	2.2	B
WB	Left Turn						
	Through	439	441	100.4%	29.0	27.9	C
	Right Turn	190	196	103.2%	3.9	1.8	A
	Subtotal	629	637	101.3%	21.7	20.1	C
Total		3,079	2,969	96.4%	27.3	12.6	C

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative Plus Project
AM Peak Hour
PSR/PDS
Signal

Intersection 5 Redwood Dr/Smith Ranch Rd

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	156	163	104.2%	18.1	3.2	B
	Through	15	16	104.0%	21.4	7.0	C
	Right Turn	79	78	98.4%	3.4	1.3	A
	Subtotal	250	256	102.3%	13.7	2.4	B
SB	Left Turn	13	12	93.8%	20.3	10.7	C
	Through	59	57	96.6%	20.9	4.4	C
	Right Turn	125	130	103.8%	2.0	0.6	A
	Subtotal	197	199	101.0%	8.4	2.2	A
EB	Left Turn	135	127	94.0%	22.2	3.9	C
	Through	460	419	91.1%	14.2	1.8	B
	Right Turn	825	766	92.8%	17.9	4.2	B
	Subtotal	1,420	1,312	92.4%	17.1	3.0	B
WB	Left Turn	122	122	100.2%	22.7	5.2	C
	Through	348	346	99.3%	15.5	3.3	B
	Right Turn	12	14	114.2%	8.1	6.4	A
	Subtotal	482	481	99.9%	17.1	3.1	B
Total		2,349	2,248	95.7%	15.9	2.4	B

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative Plus Project
PM Peak Hour
PSR/PDS
Signal

Intersection 1 Las Gallinas Ave/Lucas Valley Rd

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	170	169	99.1%	48.9	19.7	D
	Through	240	253	105.4%	26.8	5.9	C
	Right Turn	151	157	103.6%	6.0	3.0	A
	Subtotal	561	578	103.0%	28.0	7.0	C
SB	Left Turn	99	95	95.6%	33.7	6.0	C
	Through	111	108	97.2%	27.0	4.8	C
	Right Turn	22	23	106.4%	9.2	5.0	A
	Subtotal	232	226	97.4%	28.3	4.0	C
EB	Left Turn	22	24	107.3%	44.8	11.0	D
	Through	402	407	101.2%	28.7	1.3	C
	Right Turn	141	140	99.2%	13.5	1.9	B
	Subtotal	565	570	100.9%	26.0	1.0	C
WB	Left Turn	157	157	99.7%	102.2	50.7	F
	Through	487	485	99.5%	35.1	27.7	D
	Right Turn	176	179	101.4%	21.8	27.7	C
	Subtotal	820	820	100.0%	45.4	32.6	D
Total		2,178	2,194	100.7%	34.1	11.7	C

Intersection 2 Los Gamos Dr/Lucas Valley Rd

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	107	103	96.4%	52.0	19.3	D
	Through						
	Right Turn	790	781	98.8%	50.3	27.8	D
	Subtotal	897	884	98.5%	50.5	26.8	D
SB	Left Turn	425	423	99.6%	28.3	4.0	C
	Through	97	95	97.6%	25.1	4.3	C
	Right Turn	158	157	99.4%	11.5	1.7	B
	Subtotal	680	675	99.3%	23.8	2.6	C
EB	Left Turn						
	Through	643	640	99.6%	98.5	52.2	F
	Right Turn	75	75	100.1%	54.8	43.7	D
	Subtotal	718	715	99.6%	94.1	52.0	F
WB	Left Turn	221	228	102.9%	34.9	3.8	C
	Through	640	653	102.0%	17.4	2.7	B
	Right Turn						
	Subtotal	861	881	102.3%	22.0	2.9	C
Total		3,156	3,155	100.0%	47.3	16.4	D

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative Plus Project
PM Peak Hour
PSR/PDS

Intersection 3

US-101 SB Ramps/Lucas Valley Rd

Uncontrolled

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	845	845	100.0%	3.7	0.4	A
	Right Turn	1,013	996	98.3%	10.4	0.9	B
	Subtotal	1,858	1,841	99.1%	7.3	0.7	A
WB	Left Turn						
	Through	861	875	101.7%	12.6	3.0	B
	Right Turn	827	811	98.1%	10.1	2.4	B
	Subtotal	1,688	1,687	99.9%	11.4	2.7	B
Total		3,546	3,528	99.5%	9.3	1.2	A

Intersection 4

US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	635	624	98.3%	19.3	2.8	B
	Through						
	Right Turn	559	547	97.9%	16.0	2.5	B
	Subtotal	1,194	1,172	98.1%	17.8	1.9	B
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	405	407	100.4%	14.0	1.7	B
	Right Turn	440	448	101.8%	12.4	1.4	B
	Subtotal	845	855	101.1%	13.1	1.5	B
WB	Left Turn						
	Through	1,053	1,065	101.2%	20.3	2.6	C
	Right Turn	721	716	99.3%	9.0	0.9	A
	Subtotal	1,774	1,781	100.4%	15.8	2.0	B
Total		3,813	3,808	99.9%	15.8	0.7	B

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Los Gamos Kaiser
Cumulative Plus Project
PM Peak Hour
PSR/PDS
Signal

Intersection 5 Redwood Dr/Smith Ranch Rd

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	720	712	98.8%	35.5	3.9	D
	Through	37	37	100.5%	37.8	9.3	D
	Right Turn	149	147	98.3%	12.0	1.8	B
	Subtotal	906	895	98.8%	31.8	3.5	C
SB	Left Turn	14	14	102.1%	43.3	29.3	D
	Through	49	49	99.0%	43.7	12.3	D
	Right Turn	284	286	100.5%	26.0	20.1	C
	Subtotal	347	348	100.4%	29.2	18.9	C
EB	Left Turn	143	142	99.3%	40.5	7.8	D
	Through	561	549	97.9%	21.5	2.2	C
	Right Turn	244	244	100.1%	4.1	0.5	A
	Subtotal	948	936	98.7%	19.7	2.1	B
WB	Left Turn	88	89	101.6%	53.5	7.6	D
	Through	770	776	100.7%	38.8	12.3	D
	Right Turn	16	18	112.5%	31.4	21.1	C
	Subtotal	874	883	101.0%	40.3	11.4	D
Total		3,075	3,062	99.6%	30.5	6.5	C

APPENDIX C: PEAK HOUR SIGNAL WARRANTS





Major Street Lucas Valley Rd
 Minor Street Los Gamos Dr

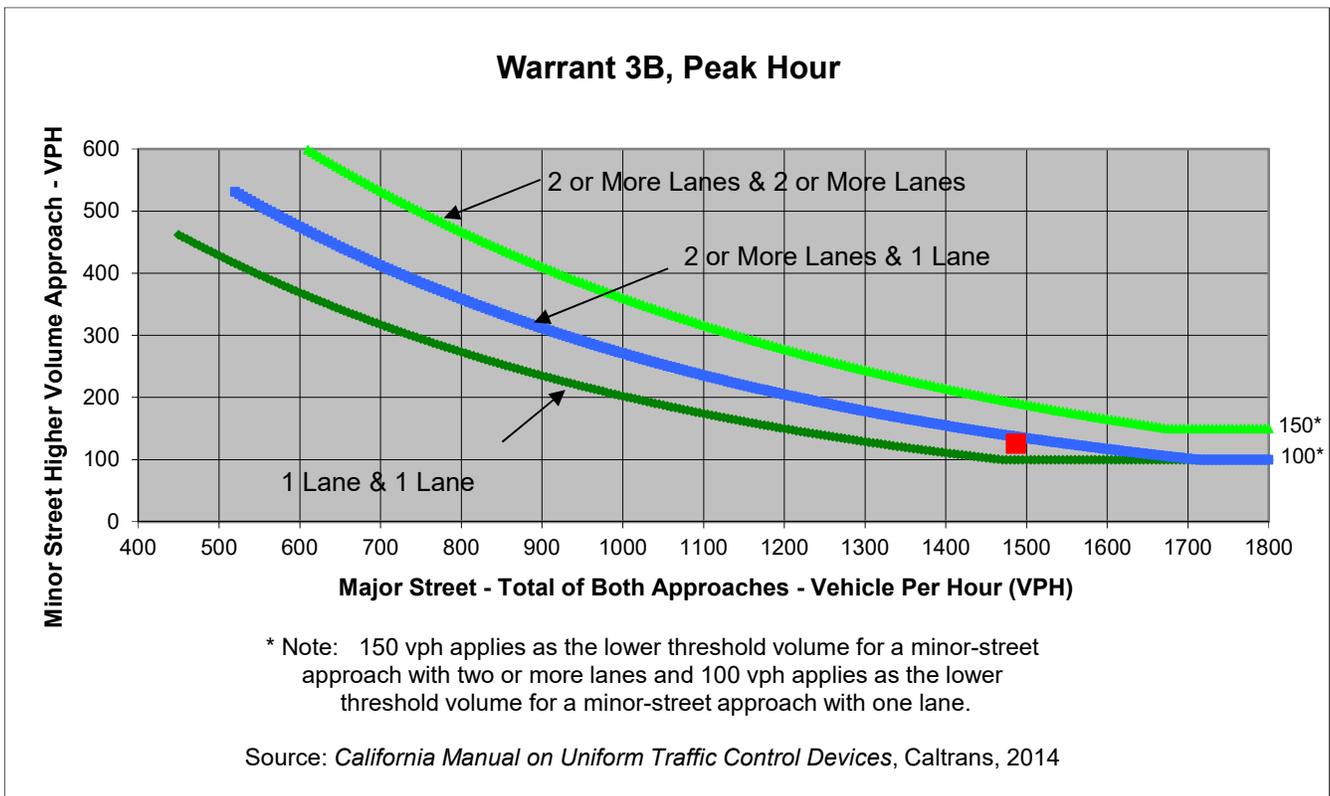
Project Los Gamos Kaiser
 Scenario Existing Conditions
 Peak Hour AM

Turn Movement Volumes

	NB	SB	EB	WB
Left	19	0	0	239
Through	0	0	760	387
Right	107	0	101	0
Total	126	0	861	626

Major Street Direction

 North/South
 x East/West



	Major Street	Minor Street	Warrant Met
	Lucas Valley Rd	Los Gamos Dr	
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,487	126	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.



Major Street Lucas Valley Rd
 Minor Street Los Gamos Dr

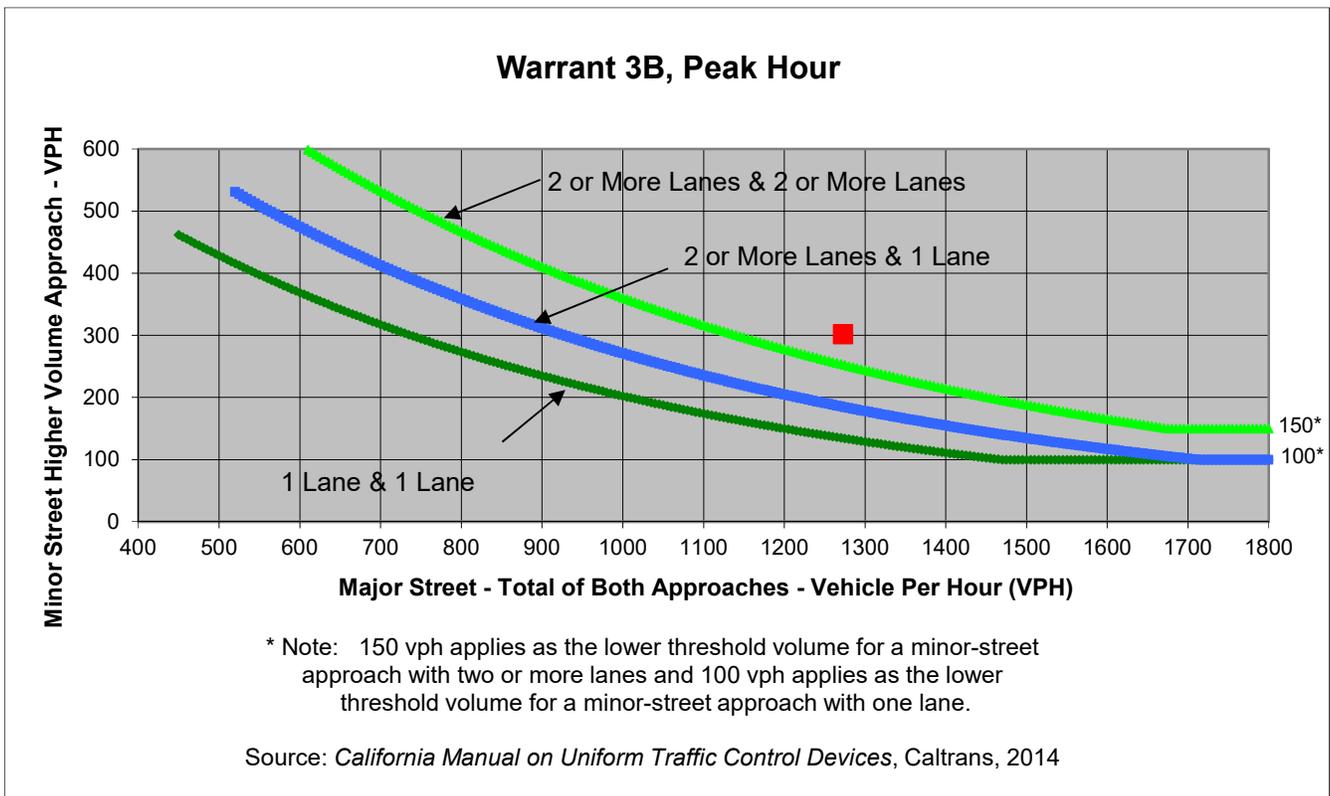
Project Los Gamos Kaiser
 Scenario Existing Conditions
 Peak Hour PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	45	0	0	173
Through	0	0	514	559
Right	257	0	27	0
Total	302	0	541	732

Major Street Direction

	North/South
x	East/West



	Major Street	Minor Street	Warrant Met
	Lucas Valley Rd	Los Gamos Dr	
Number of Approach Lanes	1	1	YES
Traffic Volume (VPH) *	1,273	302	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

APPENDIX D: DETAILED FREEWAY LOS RESULTS



Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas off-on
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3540	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	922	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1260	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1260	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	19.4	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas on/Redwood on
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3882	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1011	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1036	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1036	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	15.9	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/16/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Redwood Highway On
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	3882	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	101	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3882	101		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1011	26		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4145	108	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.204 Using Equation 4

FM

v = v (P) = 847 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	4253	9400	No
FO			
v or v	1649 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 1658	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	1766	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 18.0 pc/mi/ln

R R 12 A B

Level of service for ramp-freeway junction areas of influence B

----- Speed Estimation -----

Intermediate speed variable,	M = 0.331	
	S	
Space mean speed in ramp influence area,	S = 57.4	mph
	R	
Space mean speed in outer lanes,	S = 62.3	mph
	0	
Space mean speed for all vehicles,	S = 60.2	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Smith Ranch Road off
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3983	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1037	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1063	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1063	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	16.4	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/21/2016
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Smith Ranch Rd off/Lucas Rd on
 Jurisdiction: San Rafael
 Analysis Year: Existing
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3284	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	855	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1169	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1169	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	18.0-	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/21/2016
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Lucas Rd on/Smith Ranch Rd on
 Jurisdiction: San Rafael
 Analysis Year: Existing
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3400	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	885	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	908	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	908	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	14.0	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
 E-mail:

-----Merge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/21/2016
 Analysis time period: AM Peak Hour
 Freeway/Dir of Travel: 101 NB
 Junction: Smith Ranch Rd WB on
 Jurisdiction: San Rafael
 Analysis Year: Existing
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	3400	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	134	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3400	134		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	885	35		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3630	143	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.200 Using Equation 4

FM

v = v (P) = 726 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	3773	9400	No
FO			
v or v	1452 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 1452	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	1595	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 16.7 pc/mi/ln

R R 12 A B

Level of service for ramp-freeway junction areas of influence B

----- Speed Estimation -----

Intermediate speed variable,	M = 0.327	
	S	
Space mean speed in ramp influence area,	S = 57.5	mph
	R	
Space mean speed in outer lanes,	S = 62.9	mph
	0	
Space mean speed for all vehicles,	S = 60.5	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3534	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	920	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	943	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	943	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	14.5	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3407	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	887	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1213	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1213	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	18.7	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Period
Freeway/Direction: 101 SB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3616	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	942	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1287	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1287	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	19.8	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/21/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Miller Creek on
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3616	vph

-----On Ramp Data-----

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	838	vph
Length of first accel/decel lane	110	ft
Length of second accel/decel lane		ft

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3616	838		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	942	218		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3861	895	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.581 Using Equation 1

FM

v = v (P) = 2242 pc/h

12 F FM

----- Capacity Checks -----

v	Actual	Maximum	LOS F?
FO	4756	7050	No
v or v	1619 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2242	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

v	Actual	Max Desirable	Violation?
12A	3137	4600	No

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 28.8 pc/mi/ln

R R 12 A

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.403	
Space mean speed in ramp influence area,	S = 55.7	mph
Space mean speed in outer lanes,	S = 61.0	mph
Space mean speed for all vehicles,	S = 57.4	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Period
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd off
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4454	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1160	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1189	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1189	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	18.3	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd on/off
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	4002	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1042	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1424	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1424	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	21.9	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Lucas Valley On
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	3999	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	596	vph	
Length of first accel/decel lane	150	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3999	596		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1041	155		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4270	636	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.582 Using Equation 1

FM

v = v (P) = 2484 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	4906	7050	No
FO			
v or v	1786 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2484	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3120	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 28.6$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.399	
	S	
Space mean speed in ramp influence area,	S = 55.8	mph
	R	
Space mean speed in outer lanes,	S = 60.4	mph
	0	
Space mean speed for all vehicles,	S = 57.4	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyON/ManuelFreitasOFF
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4595	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1197	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1635	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1635	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.2	mi/h
Number of lanes, N	3	
Density, D	25.5	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Diverge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Manuel T Freitas off
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4595	vph	

-----Off Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	679	vph	
Length of first accel/decel lane	120	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4595	679		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1197	177		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00	%	0.00	%
Length	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4906	725	pcph

----- Estimation of V12 Diverge Areas -----

L = (Equation 13-12 or 13-13)

EQ

P = 0.604 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3250$ pc/h

----- Capacity Checks -----

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4906	7050	No
$v_{FO} = v_F - v_R$	4181	7050	No
v_R	725	2000	No
v_3 or v_{av34}	1656 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or $v_{av34} > 2700$ pc/h?		No	
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3250$		(Equation 13-15, 13-16, 13-18, or 13-19)	

----- Flow Entering Diverge Influence Area -----

	Actual	Max Desirable	Violation?
v_{12}	3250	4400	No

----- Level of Service Determination (if not F) -----

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 31.1$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	D = 0.493	
Space mean speed in ramp influence area,	S _R = 53.7	mph
Space mean speed in outer lanes,	S ₀ = 68.7	mph
Space mean speed for all vehicles,	S = 57.9	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: Manuel T Freitas on / off
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3916	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1020	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1394	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1394	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	21.4	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas off-on
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5040	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1313	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1794	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1794	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.8	mi/h
Number of lanes, N	3	
Density, D	28.6	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: ManuelTFreitasON/RedwoodHwyON
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5654	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1472	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2012	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2012	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	59.7	mi/h
Number of lanes, N	3	
Density, D	33.7	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Redwood Highway on
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5654	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	301	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5654	301		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1472	78		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6037	321	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.178 Using Equation 4

FM

v = v (P) = 1073 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	6358	9400	No
FO			
v or v	2482 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2414	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2735	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 25.5 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.368	
	S	
Space mean speed in ramp influence area,	S = 56.5	mph
	R	
Space mean speed in outer lanes,	S = 60.3	mph
	0	
Space mean speed for all vehicles,	S = 58.6	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Smith Ranch Rd off
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5955	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1551	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1590	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1590	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.5	mi/h
Number of lanes, N	4	
Density, D	24.7	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 NB
 From/To: SmithRanchRd off/LucasRdEB on
 Jurisdiction: San Rafael
 Analysis Year: Existing
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5274	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1373	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1408	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1408	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	21.7	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: LucasValleyRdON/SmithRanchRdON
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5456	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1421	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1456	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1456	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	22.4	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
 E-mail:

-----Merge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/22/2016
 Analysis time period: PM Peak Hour
 Freeway/Dir of Travel: 101 NB
 Junction: Smith Ranch Rd WB on
 Jurisdiction: San Rafael
 Analysis Year: Existing
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5456	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	388	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5456	388		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1421	101		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5825	414	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.166 Using Equation 4

FM

v = v (P) = 967 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	6239	9400	No
FO			
v or v	2429 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2330	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2744	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 25.5 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.368	
	S	
Space mean speed in ramp influence area,	S = 56.5	mph
	R	
Space mean speed in outer lanes,	S = 60.5	mph
	0	
Space mean speed for all vehicles,	S = 58.7	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5844	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1522	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1560	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1560	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.6	mi/h
Number of lanes, N	4	
Density, D	24.1	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5567	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1450	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1981	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1981	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	60.2	mi/h
Number of lanes, N	3	
Density, D	32.9	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
 E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: AM Peak Period
 Freeway/Direction: 101 SB
 From/To: Miller Creek off / on
 Jurisdiction: San Rafael
 Analysis Year: Existing
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3849	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1002	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1370	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1370	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	21.1	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Miller Creek on
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	3849	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	164	vph	
Length of first accel/decel lane	110	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3849	164		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1002	43		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4110	175	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.581 Using Equation 1

FM

v = v (P) = 2386 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	4285	7050	No
FO			
v or v	1724 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2386	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2561	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 24.7 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.364	
	S	
Space mean speed in ramp influence area,	S = 56.6	mph
	R	
Space mean speed in outer lanes,	S = 60.6	mph
	0	
Space mean speed for all vehicles,	S = 58.2	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd off
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4013	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1045	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1071	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1071	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	16.5	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
 E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 SB
 From/To: LucasValleyRd off/on
 Jurisdiction: San Rafael
 Analysis Year: Existing
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3745	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	975	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1333	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1333	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	20.5	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: LucasValleyON
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	3745	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	740	vph	
Length of first accel/decel lane	150	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3745	740		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	975	193		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3999	790	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.582 Using Equation 1

FM

v = v (P) = 2326 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	4789	7050	No
FO			
v or v	1673 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2326	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3116	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 28.5$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.398	
	S	
Space mean speed in ramp influence area,	S = 55.8	mph
	R	
Space mean speed in outer lanes,	S = 60.8	mph
	0	
Space mean speed for all vehicles,	S = 57.5	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyON/ManuelFreitasOFF
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4485	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1168	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1596	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1596	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.5	mi/h
Number of lanes, N	3	
Density, D	24.8	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Diverge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Manuel T Freitas off
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4485	vph	

-----Off Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	584	vph	
Length of first accel/decel lane	120	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4485	584		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1168	152		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4789	624	pcph

----- Estimation of V12 Diverge Areas -----

L = (Equation 13-12 or 13-13)

EQ

P = 0.612 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3171 \text{ pc/h}$

----- Capacity Checks -----

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4789	7050	No
$v_{FO} = v_F - v_R$	4165	7050	No
v_R	624	2000	No
$v_3 \text{ or } v_{av34}$	1618 pc/h	(Equation 13-14 or 13-17)	
Is $v_3 \text{ or } v_{av34} > 2700 \text{ pc/h?}$		No	
Is $v_3 \text{ or } v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3171$		(Equation 13-15, 13-16, 13-18, or 13-19)	

----- Flow Entering Diverge Influence Area -----

	Actual	Max Desirable	Violation?
v_{12}	3171	4400	No

----- Level of Service Determination (if not F) -----

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 30.4 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	D = 0.484	
Space mean speed in ramp influence area,	S _R = 53.9	mph
Space mean speed in outer lanes,	S ₀ = 68.9	mph
Space mean speed for all vehicles,	S = 58.2	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: Manuel T Freitas on / off
Jurisdiction: San Rafael
Analysis Year: Existing
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3901	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1016	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1388	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1388	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	21.4	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas off-on
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3702	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	964	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1318	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1318	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	20.3	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas on/Redwood on
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4044	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1053	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1079	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1079	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	16.6	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/16/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Redwood Highway On
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4044	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	101	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4044	101		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1053	26		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4318	108	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.204 Using Equation 4

FM

v = v (P) = 882 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	4426	9400	No
FO			
v or v	1718 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 1727	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	1835	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 18.5 pc/mi/ln

R R 12 A B

Level of service for ramp-freeway junction areas of influence B

----- Speed Estimation -----

Intermediate speed variable,	M = 0.332	
	S	
Space mean speed in ramp influence area,	S = 57.4	mph
	R	
Space mean speed in outer lanes,	S = 62.1	mph
	0	
Space mean speed for all vehicles,	S = 60.1	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Smith Ranch Road off
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4145	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1079	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1106	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1106	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	17.0	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
 E-mail:

----- Operational Analysis -----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/21/2016
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Smith Ranch Rd off/Lucas Rd on
 Jurisdiction: San Rafael
 Analysis Year: Existing Plus Project
 Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	3378	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	880	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1202	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1202	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	18.5	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Lucas Rd on/Smith Ranch Rd on
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3519	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	916	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	939	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	939	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	14.4	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
 E-mail:

-----Merge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/21/2016
 Analysis time period: AM Peak Hour
 Freeway/Dir of Travel: 101 NB
 Junction: Smith Ranch Rd WB on
 Jurisdiction: San Rafael
 Analysis Year: Existing Plus Project
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	3519	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	134	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3519	134		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	916	35		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3757	143	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.200 Using Equation 4

FM

v = v (P) = 751 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	3900	9400	No
FO			
v or v	1503 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 1502	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	1645	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 17.0 pc/mi/ln

R R 12 A B

Level of service for ramp-freeway junction areas of influence B

----- Speed Estimation -----

Intermediate speed variable,	M = 0.328	
	S	
Space mean speed in ramp influence area,	S = 57.5	mph
	R	
Space mean speed in outer lanes,	S = 62.7	mph
	0	
Space mean speed for all vehicles,	S = 60.4	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3653	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	951	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	975	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	975	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	15.0	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3526	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	918	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1255	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1255	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	19.3	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Period
Freeway/Direction: 101 SB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	3694	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	962	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1315	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1315	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	20.2	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/21/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Miller Creek on
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	3694	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	838	vph	
Length of first accel/decel lane	110	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3694	838		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	962	218		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	%
Length	mi	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3944	895	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.581 Using Equation 1

FM

v = v (P) = 2290 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	4839	7050	No
FO			
v or v	1654 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2290	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3185	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 29.2$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.408	
	S	
Space mean speed in ramp influence area,	S = 55.6	mph
	R	
Space mean speed in outer lanes,	S = 60.8	mph
	0	
Space mean speed for all vehicles,	S = 57.3	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Period
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd off
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4532	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1180	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1210	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1210	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	18.6	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd on/off
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4002	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1042	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1424	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1424	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	21.9	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Lucas Valley On
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4002	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	616	vph	
Length of first accel/decel lane	150	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4002	616		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1042	160		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4273	658	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.582 Using Equation 1

FM

v = v (P) = 2486 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	4931	7050	No
FO			
v or v	1787 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2486	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3144	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 28.8 pc/mi/ln

R R 12 A

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.401	
	S	
Space mean speed in ramp influence area,	S = 55.8	mph
	R	
Space mean speed in outer lanes,	S = 60.4	mph
	0	
Space mean speed for all vehicles,	S = 57.4	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyON/ManuelFreitasOFF
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4615	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1202	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1642	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1642	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.2	mi/h
Number of lanes, N	3	
Density, D	25.6	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
 E-mail:

-----Diverge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/22/2016
 Analysis time period: AM Peak Hour
 Freeway/Dir of Travel: 101 SB
 Junction: Manuel T Freitas off
 Jurisdiction: San Rafael
 Analysis Year: Existing Plus Project
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4615	vph	

-----Off Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	679	vph	
Length of first accel/decel lane	120	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4615	679		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1202	177		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00	%	0.00	%
Length	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4927	725	pcph

----- Estimation of V12 Diverge Areas -----

L = (Equation 13-12 or 13-13)

EQ

P = 0.603 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3261$ pc/h

12 R F R FD

----- Capacity Checks -----

	Actual	Maximum	LOS F?
$v_{12} = v_{12}$	4927	7050	No
$v_{FO} = v_{FO} - v_{R3}$	4202	7050	No
v_{R3}	725	2000	No
$v_{3} \text{ or } v_{34}$	1666 pc/h	(Equation 13-14 or 13-17)	
Is $v_{3} \text{ or } v_{34} > 2700$ pc/h?		No	
Is $v_{3} \text{ or } v_{34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3261$		(Equation 13-15, 13-16, 13-18, or 13-19)	

----- Flow Entering Diverge Influence Area -----

	Actual	Max Desirable	Violation?
v_{12}	3261	4400	No

----- Level of Service Determination (if not F) -----

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 31.2$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	D = 0.493	
Space mean speed in ramp influence area,	S _R = 53.7	mph
Space mean speed in outer lanes,	S ₀ = 68.7	mph
Space mean speed for all vehicles,	S = 57.9	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: Manuel T Freitas on / off
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3936	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1025	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1401	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1401	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	21.6	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas off-on
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5085	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1324	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1810	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1810	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.6	mi/h
Number of lanes, N	3	
Density, D	28.9	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: ManuelTFreitasON/RedwoodHwyON
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5699	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1484	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2028	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2028	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	59.4	mi/h
Number of lanes, N	3	
Density, D	34.1	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Redwood Highway on
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5699	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	301	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5699	301		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1484	78		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6085	321	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.178 Using Equation 4

FM

v = v (P) = 1081 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	6406	9400	No
FO			
v or v	2502 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2434	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2755	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 25.6 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.369	
	S	
Space mean speed in ramp influence area,	S = 56.5	mph
	R	
Space mean speed in outer lanes,	S = 60.2	mph
	0	
Space mean speed for all vehicles,	S = 58.6	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Smith Ranch Rd off
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	6000	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1563	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1602	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1602	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.4	mi/h
Number of lanes, N	4	
Density, D	24.9	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 NB
 From/To: SmithRanchRd off/LucasRdEB on
 Jurisdiction: San Rafael
 Analysis Year: Existing Plus Project
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5274	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1373	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1408	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1408	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	21.7	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: LucasValleyRdON/SmithRanchRdON
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	5584	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1454	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1491	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1491	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	4	
Density, D	23.0	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
 E-mail:

-----Merge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/22/2016
 Analysis time period: PM Peak Hour
 Freeway/Dir of Travel: 101 NB
 Junction: Smith Ranch Rd WB on
 Jurisdiction: San Rafael
 Analysis Year: Existing Plus Project
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5584	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	388	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5584	388		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1454	101		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5962	414	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.166 Using Equation 4

FM

v = v (P) = 990 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	6376	9400	No
FO			
v or v	2486 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2384	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2798	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 25.9 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.372	
	S	
Space mean speed in ramp influence area,	S = 56.5	mph
	R	
Space mean speed in outer lanes,	S = 60.4	mph
	0	
Space mean speed for all vehicles,	S = 58.6	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5972	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1555	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1594	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1594	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.5	mi/h
Number of lanes, N	4	
Density, D	24.7	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
 E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/21/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Miller Creek off / on
 Jurisdiction: San Rafael
 Analysis Year: Existing Plus Project
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5695	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1483	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2027	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2027	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	59.4	mi/h
Number of lanes, N	3	
Density, D	34.1	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Period
Freeway/Direction: 101 SB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3799	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	989	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1352	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1352	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	20.8	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Miller Creek on
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	3799	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	164	vph	
Length of first accel/decel lane	110	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3799	164		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	989	43		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4056	175	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.581 Using Equation 1

FM

v = v (P) = 2355 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	4231	7050	No
FO			
v or v	1701 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2355	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2530	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 24.4 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.362	
	S	
Space mean speed in ramp influence area,	S = 56.7	mph
	R	
Space mean speed in outer lanes,	S = 60.7	mph
	0	
Space mean speed for all vehicles,	S = 58.2	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd off
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3963	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1032	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1058	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1058	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	16.3	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyRd off/on
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3644	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	949	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1297	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1297	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	20.0	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: LucasValleyON
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	3644	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	841	vph	
Length of first accel/decel lane	150	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3644	841		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	949	219		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3891	898	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.582 Using Equation 1

FM

v = v (P) = 2263 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	4789	7050	No
FO			
v or v	1628 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2263	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3161	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 28.8 pc/mi/ln

R R 12 A

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.403	
	S	
Space mean speed in ramp influence area,	S = 55.7	mph
	R	
Space mean speed in outer lanes,	S = 60.9	mph
	0	
Space mean speed for all vehicles,	S = 57.4	mph

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyON/ManuelFreitasOFF
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	4485	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1168	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1596	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1596	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.5	mi/h
Number of lanes, N	3	
Density, D	24.8	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
 E-mail:

-----Diverge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/22/2016
 Analysis time period: PM Peak Hour
 Freeway/Dir of Travel: 101 SB
 Junction: Manuel T Freitas off
 Jurisdiction: San Rafael
 Analysis Year: Existing Plus Project
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4485	vph	

-----Off Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	584	vph	
Length of first accel/decel lane	120	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4485	584		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1168	152		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00	%	0.00	%
Length	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4789	624	pcph

----- Estimation of V12 Diverge Areas -----

L = (Equation 13-12 or 13-13)

EQ

P = 0.612 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3171 \text{ pc/h}$

----- Capacity Checks -----

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4789	7050	No
$v_{FO} = v_F - v_R$	4165	7050	No
v_R	624	2000	No
$v_3 \text{ or } v_{av34}$	1618 pc/h	(Equation 13-14 or 13-17)	
Is $v_3 \text{ or } v_{av34} > 2700 \text{ pc/h?}$		No	
Is $v_3 \text{ or } v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3171$		(Equation 13-15, 13-16, 13-18, or 13-19)	

----- Flow Entering Diverge Influence Area -----

	Actual	Max Desirable	Violation?
v_{12}	3171	4400	No

----- Level of Service Determination (if not F) -----

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 30.4 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	D = 0.484	
Space mean speed in ramp influence area,	S _R = 53.9	mph
Space mean speed in outer lanes,	S ₀ = 68.9	mph
Space mean speed for all vehicles,	S = 58.2	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: Manuel T Freitas on / off
Jurisdiction: San Rafael
Analysis Year: Existing Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3901	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1016	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1388	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1388	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	21.4	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas off-on
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3764	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	980	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1340	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1340	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	20.6	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas on/Redwood on
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4123	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1074	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1101	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1101	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	16.9	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/16/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Redwood Highway On
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occ No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4123	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	106	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4123	106		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1074	28		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4402	113	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.204 Using Equation 4

FM

v = v (P) = 897 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	4515	9400	No
FO			
v or v	1752 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 1760	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	1873	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 18.8 pc/mi/ln

R R 12 A B

Level of service for ramp-freeway junction areas of influence B

----- Speed Estimation -----

Intermediate speed variable,	M = 0.333	
	S	
Space mean speed in ramp influence area,	S = 57.3	mph
	R	
Space mean speed in outer lanes,	S = 62.0	mph
	0	
Space mean speed for all vehicles,	S = 60.0	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Smith Ranch Road off
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4229	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1101	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1129	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1129	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	17.4	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/21/2016
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Smith Ranch Rd off/Lucas Rd on
 Jurisdiction: San Rafael
 Analysis Year: Baseline 100% Occ No Project
 Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	3449	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	898	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1228	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1228	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	18.9	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Lucas Rd on/Smith Ranch Rd on
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3578	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	932	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	955	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	955	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	14.7	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/21/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Smith Ranch Rd WB on
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occ No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	3578	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	141	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3578	141		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	932	37		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3820	151	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.199 Using Equation 4

FM

v = v (P) = 760 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	3971	9400	No
FO			
v or v	1530 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 1528	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	1679	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 17.3 pc/mi/ln

R R 12 A B

Level of service for ramp-freeway junction areas of influence B

----- Speed Estimation -----

Intermediate speed variable,	M = 0.329	
	S	
Space mean speed in ramp influence area,	S = 57.4	mph
	R	
Space mean speed in outer lanes,	S = 62.7	mph
	0	
Space mean speed for all vehicles,	S = 60.4	mph

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/21/2016
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Miller Creek off
 Jurisdiction: San Rafael
 Analysis Year: Baseline 100% Occ No Project
 Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	3719	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	968	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	993	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	993	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	15.3	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3586	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	934	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1276	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1276	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	19.6	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Period
Freeway/Direction: 101 SB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occupancy NP
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	3966	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1033	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1412	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1412	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	21.7	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/21/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Miller Creek on
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occ No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	3966	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	881	vph	
Length of first accel/decel lane	110	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3966	881		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1033	229		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4235	941	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.581 Using Equation 1

FM

v = v (P) = 2459 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	5176	7050	No
FO			
v or v	1776 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2459	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3400	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 30.9$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.430	
	S	
Space mean speed in ramp influence area,	S = 55.1	mph
	R	
Space mean speed in outer lanes,	S = 60.4	mph
	0	
Space mean speed for all vehicles,	S = 56.8	mph

Phone: Fax:
E-mail:

Operational Analysis

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: AM Peak Period
 Freeway/Direction: 101 SB
 From/To: Lucas Valley Rd off
 Jurisdiction: San Rafael
 Analysis Year: Baseline 100% Occ No Project
 Description: 1650 Los Gamos

Flow Inputs and Adjustments

Volume, V	4847	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1262	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1294	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

LOS and Performance Measures

Flow rate, vp	1294	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	19.9	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd on/off
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occ No Project
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	4221	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1099	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1502	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1502	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	3	
Density, D	23.2	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/22/2016
 Analysis time period: AM Peak Hour
 Freeway/Dir of Travel: 101 SB
 Junction: Lucas Valley On
 Jurisdiction: San Rafael
 Analysis Year: Baseline 100% Occ No Project
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4221	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	633	vph	
Length of first accel/decel lane	150	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4221	633		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1099	165		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	%
Length	mi	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4507	676	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.582 Using Equation 1

FM

v = v (P) = 2622 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	5183	7050	No
FO			
v or v	1885 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2622	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3298	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 29.9$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.416	
	S	
Space mean speed in ramp influence area,	S = 55.4	mph
	R	
Space mean speed in outer lanes,	S = 60.0	mph
	0	
Space mean speed for all vehicles,	S = 57.0	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: 101 SB
 From/To: LucasValleyON/ManuelFreitasOFF
 Jurisdiction: San Rafael
 Analysis Year: Baseline 100% Occ No Project
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4826	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1257	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1718	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1718	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.6	mi/h
Number of lanes, N	3	
Density, D	27.0	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
 E-mail:

-----Diverge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/22/2016
 Analysis time period: AM Peak Hour
 Freeway/Dir of Travel: 101 SB
 Junction: Manuel T Freitas off
 Jurisdiction: San Rafael
 Analysis Year: Baseline 100% Occ No Project
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4826	vph	

-----Off Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	714	vph	
Length of first accel/decel lane	120	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4826	714		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1257	186		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00	%	0.00	%
Length	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5153	762	pcph

----- Estimation of V12 Diverge Areas -----

L = (Equation 13-12 or 13-13)

EQ

P = 0.596 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3380$ pc/h

----- Capacity Checks -----

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5153	7050	No
$v_{FO} = v_F - v_R$	4391	7050	No
v_R	762	2000	No
v_3 or v_{av34}	1773 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or $v_{av34} > 2700$ pc/h?		No	
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3380$		(Equation 13-15, 13-16, 13-18, or 13-19)	

----- Flow Entering Diverge Influence Area -----

	Actual	Max Desirable	Violation?
v_{12}	3380	4400	No

----- Level of Service Determination (if not F) -----

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 32.2$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	D = 0.497	
Space mean speed in ramp influence area,	S _R = 53.6	mph
Space mean speed in outer lanes,	S ₀ = 68.3	mph
Space mean speed for all vehicles,	S = 57.9	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: Manuel T Freitas on / off
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4112	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1071	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1463	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1463	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	3	
Density, D	22.5	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas off-on
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5302	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1381	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1887	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1887	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	61.6	mi/h
Number of lanes, N	3	
Density, D	30.6	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 NB
 From/To: ManuelTFreitasON/RedwoodHwyON
 Jurisdiction: San Rafael
 Analysis Year: Baseline 100% Occ No Project
 Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	5947	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1549	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2117	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	2117	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	57.7	mi/h
Number of lanes, N	3	
Density, D	36.7	pc/mi/ln
Level of service, LOS	E	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/22/2016
 Analysis time period: PM Peak Hour
 Freeway/Dir of Travel: 101 NB
 Junction: Redwood Highway on
 Jurisdiction: San Rafael
 Analysis Year: Baseline 100% Occ No Project
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5947	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	316	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5947	316		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1549	82		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6350	337	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.176 Using Equation 4

FM

v = v (P) = 1116 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	6687	9400	No
FO			
v or v	2617 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2540	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2877	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 26.6 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.377	
	S	
Space mean speed in ramp influence area,	S = 56.3	mph
	R	
Space mean speed in outer lanes,	S = 59.9	mph
	0	
Space mean speed for all vehicles,	S = 58.3	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Smith Ranch Rd off
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	6263	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1631	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1672	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1672	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.0	mi/h
Number of lanes, N	4	
Density, D	26.1	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 NB
 From/To: SmithRanchRd off/LucasRdEB on
 Jurisdiction: San Rafael
 Analysis Year: Baseline 100% Occ No Project
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5539	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1442	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1479	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1479	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	4	
Density, D	22.8	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 NB
 From/To: LucasValleyRdON/SmithRanchRdON
 Jurisdiction: San Rafael
 Analysis Year: Baseline 100% Occ No Project
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5782	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1506	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1543	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1543	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.7	mi/h
Number of lanes, N	4	
Density, D	23.8	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Smith Ranch Rd WB on
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occ No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5782	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	407	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5782	407		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1506	106		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6173	435	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.163 Using Equation 4

FM

v = v (P) = 1009 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	6608	9400	No
FO			
v or v	2582 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2469	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2904	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 26.7 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.379	
	S	
Space mean speed in ramp influence area,	S = 56.3	mph
	R	
Space mean speed in outer lanes,	S = 60.1	mph
	0	
Space mean speed for all vehicles,	S = 58.4	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	6189	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1612	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1652	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1652	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.1	mi/h
Number of lanes, N	4	
Density, D	25.8	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5898	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1536	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2099	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2099	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	58.1	mi/h
Number of lanes, N	3	
Density, D	36.1	pc/mi/ln
Level of service, LOS	E	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Period
Freeway/Direction: 101 SB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4013	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1045	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1428	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1428	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	22.0	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Miller Creek on
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occ No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4013	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	172	vph	
Length of first accel/decel lane	110	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4013	172		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1045	45		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4285	184	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.581 Using Equation 1

FM

v = v (P) = 2488 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	4469	7050	No
FO			
v or v	1797 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2488	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2672	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 25.5 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.370	
	S	
Space mean speed in ramp influence area,	S = 56.5	mph
	R	
Space mean speed in outer lanes,	S = 60.3	mph
	0	
Space mean speed for all vehicles,	S = 58.0	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd off
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4185	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1090	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1117	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1117	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	17.2	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyRd off/on
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3893	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1014	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1386	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1386	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	21.3	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/22/2016
 Analysis time period: PM Peak Hour
 Freeway/Dir of Travel: 101 SB
 Junction: LucasValleyON
 Jurisdiction: San Rafael
 Analysis Year: Baseline 100% Occ No Project
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	3893	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	818	vph	
Length of first accel/decel lane	150	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3893	818		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1014	213		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4157	873	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.582 Using Equation 1

FM

v = v (P) = 2418 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	5030	7050	No
FO			
v or v	1739 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2418	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3291	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 29.8$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.415	
	S	
Space mean speed in ramp influence area,	S = 55.4	mph
	R	
Space mean speed in outer lanes,	S = 60.5	mph
	0	
Space mean speed for all vehicles,	S = 57.1	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 SB
 From/To: LucasValleyON/ManuelFreitasOFF
 Jurisdiction: San Rafael
 Analysis Year: Baseline 100% Occ No Project
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4711	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1227	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1677	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1677	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.9	mi/h
Number of lanes, N	3	
Density, D	26.2	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Diverge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/22/2016
 Analysis time period: PM Peak Hour
 Freeway/Dir of Travel: 101 SB
 Junction: Manuel T Freitas off
 Jurisdiction: San Rafael
 Analysis Year: Baseline 100% Occ No Project
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4711	vph	

-----Off Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	613	vph	
Length of first accel/decel lane	120	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4711	613		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1227	160		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00	%	0.00	%
Length	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5030	655	pcph

----- Estimation of V12 Diverge Areas -----

L = (Equation 13-12 or 13-13)

EQ

P = 0.604 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3298 \text{ pc/h}$

----- Capacity Checks -----

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5030	7050	No
$v_{FO} = v_F - v_R$	4375	7050	No
v_R	655	2000	No
$v_3 \text{ or } v_{av34}$	1732 pc/h	(Equation 13-14 or 13-17)	
Is $v_3 \text{ or } v_{av34} > 2700 \text{ pc/h?}$		No	
Is $v_3 \text{ or } v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3298$		(Equation 13-15, 13-16, 13-18, or 13-19)	

----- Flow Entering Diverge Influence Area -----

	Actual	Max Desirable	Violation?
v_{12}	3298	4400	No

----- Level of Service Determination (if not F) -----

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 31.5 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	D = 0.487	
Space mean speed in ramp influence area,	S _R = 53.8	mph
Space mean speed in outer lanes,	S ₀ = 68.5	mph
Space mean speed for all vehicles,	S = 58.1	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: Manuel T Freitas on / off
Jurisdiction: San Rafael
Analysis Year: Baseline 100% Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4098	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1067	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1458	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1458	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	22.4	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas off-on
Jurisdiction: San Rafael
Analysis Year: Baseline Existing Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3718	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	968	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1323	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1323	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	20.4	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/16/2016
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Manuel T Freitas on/Redwood on
 Jurisdiction: San Rafael
 Analysis Year: Baseline No Project
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4077	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1062	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1088	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1088	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	16.7	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/16/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Redwood Highway On
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4077	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	106	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4077	106		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1062	28		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4353	113	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.204 Using Equation 4

FM

v = v (P) = 887 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	4466	9400	No
FO			
v or v	1733 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 1741	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	1854	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 18.7 pc/mi/ln

R R 12 A B

Level of service for ramp-freeway junction areas of influence B

----- Speed Estimation -----

Intermediate speed variable,	M = 0.333	
	S	
Space mean speed in ramp influence area,	S = 57.4	mph
	R	
Space mean speed in outer lanes,	S = 62.1	mph
	0	
Space mean speed for all vehicles,	S = 60.0	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Smith Ranch Road off
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4183	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1089	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1117	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1117	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	17.2	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/21/2016
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Smith Ranch Rd off/Lucas Rd on
 Jurisdiction: San Rafael
 Analysis Year: Baseline No Project
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3449	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	898	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1228	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1228	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	18.9	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Lucas Rd on/Smith Ranch Rd on
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3570	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	930	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	953	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	953	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	14.7	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/21/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Smith Ranch Rd WB on
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	3570	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	141	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3570	141		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	930	37		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3812	151	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.199 Using Equation 4

FM

v = v (P) = 758 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	3963	9400	No
FO			
v or v	1527 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 1524	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	1675	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 17.3 pc/mi/ln

R R 12 A B

Level of service for ramp-freeway junction areas of influence B

----- Speed Estimation -----

Intermediate speed variable,	M = 0.329	
	S	
Space mean speed in ramp influence area,	S = 57.4	mph
	R	
Space mean speed in outer lanes,	S = 62.7	mph
	0	
Space mean speed for all vehicles,	S = 60.4	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3711	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	966	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	991	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	991	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	15.2	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Baseline Existing Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3578	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	932	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1273	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1273	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	19.6	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Period
Freeway/Direction: 101 SB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Baseline Existing Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3917	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1020	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1394	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1394	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	21.4	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/21/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Miller Creek on
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	3917	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	881	vph	
Length of first accel/decel lane	110	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3917	881		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1020	229		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	%
Length	mi	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4182	941	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.581 Using Equation 1

FM

v = v (P) = 2428 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	5123	7050	No
FO			
v or v	1754 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2428	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3369	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 30.6$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.427	
	S	
Space mean speed in ramp influence area,	S = 55.2	mph
	R	
Space mean speed in outer lanes,	S = 60.5	mph
	0	
Space mean speed for all vehicles,	S = 56.9	mph

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Period
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd off
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	4798	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1249	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1281	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1281	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	19.7	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd on/off
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	4222	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1099	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1503	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1503	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.8	mi/h
Number of lanes, N	3	
Density, D	23.2	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Lucas Valley On
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4222	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	626	vph	
Length of first accel/decel lane	150	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4222	626		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1099	163		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	%
Length	mi	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4508	668	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.582 Using Equation 1

FM

v = v (P) = 2622 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	5176	7050	No
FO			
v or v	1886 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2622	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3290	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 29.9 pc/mi/ln

R R 12 A

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.415	
	S	
Space mean speed in ramp influence area,	S = 55.5	mph
	R	
Space mean speed in outer lanes,	S = 60.0	mph
	0	
Space mean speed for all vehicles,	S = 57.0	mph

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyON/ManuelFreitasOFF
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	4821	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1255	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1716	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1716	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.6	mi/h
Number of lanes, N	3	
Density, D	27.0	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Diverge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Manuel T Freitas off
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4821	vph	

-----Off Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	714	vph	
Length of first accel/decel lane	120	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4821		714			vph
Peak-hour factor, PHF	0.96		0.96			
Peak 15-min volume, v15	1255		186			v
Trucks and buses	5		5			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5147	762	pcph

----- Estimation of V12 Diverge Areas -----

L = (Equation 13-12 or 13-13)

EQ

P = 0.596 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3377$ pc/h

12 R F R FD

----- Capacity Checks -----

	Actual	Maximum	LOS F?
$v_{12} = v_{12}$	5147	7050	No
$v_{FO} = v_{FO} - v_{R3}$	4385	7050	No
v_{R3}	762	2000	No
$v_{3} \text{ or } v_{34}$	1770 pc/h	(Equation 13-14 or 13-17)	
Is $v_{3} \text{ or } v_{34} > 2700$ pc/h?		No	
Is $v_{3} \text{ or } v_{34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3377$		(Equation 13-15, 13-16, 13-18, or 13-19)	

----- Flow Entering Diverge Influence Area -----

	Actual	Max Desirable	Violation?
v_{12}	3377	4400	No

----- Level of Service Determination (if not F) -----

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 32.2$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	D = 0.497	
Space mean speed in ramp influence area,	S = 53.6	mph
Space mean speed in outer lanes,	S = 68.3	mph
Space mean speed for all vehicles,	S = 57.9	mph

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: Manuel T Freitas on / off
Jurisdiction: San Rafael
Analysis Year: Baseline Existing Occupancy NP
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	4107	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1070	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1462	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1462	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	3	
Density, D	22.5	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas off-on
Jurisdiction: San Rafael
Analysis Year: Baseline Existing Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5293	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1378	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1884	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1884	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	61.7	mi/h
Number of lanes, N	3	
Density, D	30.5	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 NB
 From/To: ManuelTFreitasON/RedwoodHwyON
 Jurisdiction: San Rafael
 Analysis Year: Baseline No Project
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5938	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1546	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2113	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2113	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	57.8	mi/h
Number of lanes, N	3	
Density, D	36.6	pc/mi/ln
Level of service, LOS	E	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Redwood Highway on
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5938	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	316	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5938	316		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1546	82		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6340	337	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.176 Using Equation 4

FM

v = v (P) = 1114 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	6677	9400	No
FO			
v or v	2613 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2536	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2873	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 26.5 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.377	
	S	
Space mean speed in ramp influence area,	S = 56.3	mph
	R	
Space mean speed in outer lanes,	S = 60.0	mph
	0	
Space mean speed for all vehicles,	S = 58.3	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Smith Ranch Rd off
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	6254	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1629	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1669	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1669	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.0	mi/h
Number of lanes, N	4	
Density, D	26.1	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
 E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 NB
 From/To: SmithRanchRd off/LucasRdEB on
 Jurisdiction: San Rafael
 Analysis Year: Baseline No Project
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5539	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1442	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1479	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1479	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	4	
Density, D	22.8	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: LucasValleyRdON/SmithRanchRdON
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5730	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1492	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1529	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1529	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.8	mi/h
Number of lanes, N	4	
Density, D	23.6	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
 E-mail:

-----Merge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/22/2016
 Analysis time period: PM Peak Hour
 Freeway/Dir of Travel: 101 NB
 Junction: Smith Ranch Rd WB on
 Jurisdiction: San Rafael
 Analysis Year: Baseline No Project
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5730	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	407	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5730	407		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1492	106		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6118	435	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.163 Using Equation 4

FM

v = v (P) = 1000 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	6553	9400	No
FO			
v or v	2559 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2447	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2882	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 26.6 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.377	
	S	
Space mean speed in ramp influence area,	S = 56.3	mph
	R	
Space mean speed in outer lanes,	S = 60.2	mph
	0	
Space mean speed for all vehicles,	S = 58.4	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	6137	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1598	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1638	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1638	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.2	mi/h
Number of lanes, N	4	
Density, D	25.5	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
 E-mail:

----- Operational Analysis -----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/21/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Miller Creek off / on
 Jurisdiction: San Rafael
 Analysis Year: Baseline Existing Occupancy NP
 Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	5846	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1522	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2081	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	2081	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	58.4	mi/h
Number of lanes, N	3	
Density, D	35.6	pc/mi/ln
Level of service, LOS	E	

Phone: Fax:
 E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Period
 Freeway/Direction: 101 SB
 From/To: Miller Creek off / on
 Jurisdiction: San Rafael
 Analysis Year: Baseline Existing Occupancy NP
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4044	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1053	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1439	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1439	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	22.1	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Miller Creek on
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4044	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	172	vph	
Length of first accel/decel lane	110	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4044	172		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1053	45		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4318	184	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.581 Using Equation 1

FM

v = v (P) = 2507 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	4502	7050	No
FO			
v or v	1811 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2507	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2691	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 25.7 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.371	
	S	
Space mean speed in ramp influence area,	S = 56.5	mph
	R	
Space mean speed in outer lanes,	S = 60.3	mph
	0	
Space mean speed for all vehicles,	S = 57.9	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd off
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4216	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1098	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1125	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1125	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	17.3	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyRd off/on
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3934	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1024	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1400	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1400	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	21.5	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: LucasValleyON
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	3934	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	777	vph	
Length of first accel/decel lane	150	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3934	777		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1024	202		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4200	830	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.582 Using Equation 1

FM

v = v (P) = 2443 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	5030	7050	No
FO			
v or v	1757 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2443	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3273	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 29.7$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.413	
	S	
Space mean speed in ramp influence area,	S = 55.5	mph
	R	
Space mean speed in outer lanes,	S = 60.5	mph
	0	
Space mean speed for all vehicles,	S = 57.1	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyON/ManuelFreitasOFF
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4711	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1227	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1677	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1677	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.9	mi/h
Number of lanes, N	3	
Density, D	26.2	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Diverge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Manuel T Freitas off
Jurisdiction: San Rafael
Analysis Year: Baseline No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4711	vph	

-----Off Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	613	vph	
Length of first accel/decel lane	120	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4711	613		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1227	160		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00	%	0.00	%
Length	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5030	655	pcph

----- Estimation of V12 Diverge Areas -----

L = (Equation 13-12 or 13-13)

EQ

P = 0.604 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3298$ pc/h

----- Capacity Checks -----

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5030	7050	No
$v_{FO} = v_F - v_R$	4375	7050	No
v_R	655	2000	No
v_3 or v_{av34}	1732 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or $v_{av34} > 2700$ pc/h?		No	
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3298$		(Equation 13-15, 13-16, 13-18, or 13-19)	

----- Flow Entering Diverge Influence Area -----

	Actual	Max Desirable	Violation?
v_{12}	3298	4400	No

----- Level of Service Determination (if not F) -----

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 31.5$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	D = 0.487	
Space mean speed in ramp influence area,	S _R = 53.8	mph
Space mean speed in outer lanes,	S ₀ = 68.5	mph
Space mean speed for all vehicles,	S = 58.1	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: Manuel T Freitas on / off
Jurisdiction: San Rafael
Analysis Year: Baseline Existing Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4098	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1067	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1458	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1458	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	22.4	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas off-on
Jurisdiction: San Rafael
Analysis Year: Basline Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3785	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	986	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1347	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1347	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	20.7	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas on/Redwood on
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4144	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1079	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1106	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1106	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	17.0	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/16/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Redwood Highway On
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4144	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	106	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4144	106		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1079	28		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4425	113	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.204 Using Equation 4

FM

v = v (P) = 901 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	4538	9400	No
FO			
v or v	1762 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 1770	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	1883	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 18.9 pc/mi/ln

R R 12 A B

Level of service for ramp-freeway junction areas of influence B

----- Speed Estimation -----

Intermediate speed variable,	M = 0.333	
	S	
Space mean speed in ramp influence area,	S = 57.3	mph
	R	
Space mean speed in outer lanes,	S = 62.0	mph
	0	
Space mean speed for all vehicles,	S = 60.0	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Smith Ranch Road off
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4250	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1107	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1134	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1134	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	17.4	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/21/2016
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Smith Ranch Rd off/Lucas Rd on
 Jurisdiction: San Rafael
 Analysis Year: Baseline Plus Project
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3492	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	909	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1243	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1243	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	19.1	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Lucas Rd on/Smith Ranch Rd on
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3632	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	946	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	969	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	969	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	14.9	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
 E-mail:

-----Merge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/21/2016
 Analysis time period: AM Peak Hour
 Freeway/Dir of Travel: 101 NB
 Junction: Smith Ranch Rd WB on
 Jurisdiction: San Rafael
 Analysis Year: Baseline Plus Project
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	3632	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	141	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3632	141		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	946	37		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3878	151	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.199 Using Equation 4

FM

v = v (P) = 771 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	4029	9400	No
FO			
v or v	1553 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 1551	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	1702	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 17.5 pc/mi/ln

R R 12 A B

Level of service for ramp-freeway junction areas of influence B

----- Speed Estimation -----

Intermediate speed variable,	M = 0.329	
	S	
Space mean speed in ramp influence area,	S = 57.4	mph
	R	
Space mean speed in outer lanes,	S = 62.6	mph
	0	
Space mean speed for all vehicles,	S = 60.3	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3773	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	983	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1007	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1007	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	15.5	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3640	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	948	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1295	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1295	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	19.9	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Period
Freeway/Direction: 101 SB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	3994	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1040	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1421	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1421	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	21.9	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/21/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Miller Creek on
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	3994	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	881	vph	
Length of first accel/decel lane	110	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3994	881		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1040	229		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4264	941	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)
EQ
P = 0.581 Using Equation 1
FM
 $v_{12} = v_{F \text{ FM}} = 2476 \text{ pc/h}$

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	5205	7050	No
FO			
v or v	1788 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2476	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3417	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 31.0 \text{ pc/mi/ln}$
Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.432	
Space mean speed in ramp influence area,	S = 55.1	mph
Space mean speed in outer lanes,	S = 60.4	mph
Space mean speed for all vehicles,	S = 56.8	mph

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Period
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd off
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	4875	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1270	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1301	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1301	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	20.0	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd on/off
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4221	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1099	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1502	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1502	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	3	
Density, D	23.2	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Lucas Valley On
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4221	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	641	vph	
Length of first accel/decel lane	150	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4221	641		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1099	167		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4507	684	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.582 Using Equation 1

FM

v = v (P) = 2622 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	5191	7050	No
FO			
v or v	1885 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2622	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3306	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v_R + 0.0078 v₁₂ - 0.00627 L_A = 30.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.417	
	S	
Space mean speed in ramp influence area,	S = 55.4	mph
	R	
Space mean speed in outer lanes,	S = 60.0	mph
	0	
Space mean speed for all vehicles,	S = 57.0	mph

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyON/ManuelFreitasOFF
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	4840	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1260	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1723	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1723	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.5	mi/h
Number of lanes, N	3	
Density, D	27.1	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Diverge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Manuel T Freitas off
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4840	vph	

-----Off Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	714	vph	
Length of first accel/decel lane	120	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4840	714		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1260	186		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00	%	0.00	%
Length	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5168	762	pcph

----- Estimation of V12 Diverge Areas -----

L = (Equation 13-12 or 13-13)

EQ

P = 0.596 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3387$ pc/h

12 R F R FD

----- Capacity Checks -----

	Actual	Maximum	LOS F?
$v_{12} = v_{12}$	5168	7050	No
$v_{FO} = v_{FO} - v_{R3}$	4406	7050	No
v_{R3}	762	2000	No
$v_{3} \text{ or } v_{34}$	1781 pc/h	(Equation 13-14 or 13-17)	
Is $v_{3} \text{ or } v_{34} > 2700$ pc/h?		No	
Is $v_{3} \text{ or } v_{34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3387$		(Equation 13-15, 13-16, 13-18, or 13-19)	

----- Flow Entering Diverge Influence Area -----

	Actual	Max Desirable	Violation?
v_{12}	3387	4400	No

----- Level of Service Determination (if not F) -----

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 32.3$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	D = 0.497	
Space mean speed in ramp influence area,	S = 53.6	mph
Space mean speed in outer lanes,	S = 68.3	mph
Space mean speed for all vehicles,	S = 57.9	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: Manuel T Freitas on / off
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4126	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1074	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1468	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1468	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	3	
Density, D	22.6	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas off-on
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5446	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1418	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1938	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1938	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	60.9	mi/h
Number of lanes, N	3	
Density, D	31.8	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: ManuelTFreitasON/RedwoodHwyON
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	6091	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1586	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2168	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2168	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	56.6	mi/h
Number of lanes, N	3	
Density, D	38.3	pc/mi/ln
Level of service, LOS	E	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Redwood Highway on
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	6091	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	316	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6091	316		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1586	82		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6503	337	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.176 Using Equation 4

FM

v = v (P) = 1142 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	6840	9400	No
FO			
v or v	2680 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2601	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2938	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 27.0 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.381	
	S	
Space mean speed in ramp influence area,	S = 56.2	mph
	R	
Space mean speed in outer lanes,	S = 59.8	mph
	0	
Space mean speed for all vehicles,	S = 58.2	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Smith Ranch Rd off
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	6407	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1668	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1710	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1710	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.6	mi/h
Number of lanes, N	4	
Density, D	26.9	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: SmithRanchRd off/LucasRdEB on
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5655	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1473	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1509	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1509	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.8	mi/h
Number of lanes, N	4	
Density, D	23.3	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 NB
 From/To: LucasValleyRdON/SmithRanchRdON
 Jurisdiction: San Rafael
 Analysis Year: Baseline Plus Project
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5925	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1543	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1582	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1582	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.5	mi/h
Number of lanes, N	4	
Density, D	24.5	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Smith Ranch Rd WB on
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5925	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	407	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5925	407		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1543	106		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6326	435	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.163 Using Equation 4

FM

v = v (P) = 1034 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	6761	9400	No
FO			
v or v	2646 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2530	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2965	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 27.2 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.383	
	S	
Space mean speed in ramp influence area,	S = 56.2	mph
	R	
Space mean speed in outer lanes,	S = 60.0	mph
	0	
Space mean speed for all vehicles,	S = 58.2	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	6332	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1649	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1690	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1690	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.8	mi/h
Number of lanes, N	4	
Density, D	26.5	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	6041	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1573	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2150	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2150	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	57.0	mi/h
Number of lanes, N	3	
Density, D	37.7	pc/mi/ln
Level of service, LOS	E	

Phone: Fax:
 E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Period
 Freeway/Direction: 101 SB
 From/To: Miller Creek off / on
 Jurisdiction: San Rafael
 Analysis Year: Baseline Plus Project
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4127	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1075	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1469	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1469	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	3	
Density, D	22.6	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Miller Creek on
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4127	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	172	vph	
Length of first accel/decel lane	110	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4127	172		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1075	45		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4406	184	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.581 Using Equation 1

FM

v = v (P) = 2558 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	4590	7050	No
FO			
v or v	1848 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2558	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2742	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 26.1 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.374	
	S	
Space mean speed in ramp influence area,	S = 56.4	mph
	R	
Space mean speed in outer lanes,	S = 60.1	mph
	0	
Space mean speed for all vehicles,	S = 57.9	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd off
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4299	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1120	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1148	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1148	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	17.7	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyRd off/on
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	3975	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1035	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1415	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1415	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	3	
Density, D	21.8	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: LucasValleyON
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	3975	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	839	vph	
Length of first accel/decel lane	150	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3975	839		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1035	218		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4244	896	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.582 Using Equation 1

FM

v = v (P) = 2469 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	5140	7050	No
FO			
v or v	1775 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2469	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3365	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 30.4$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.423	
	S	
Space mean speed in ramp influence area,	S = 55.3	mph
	R	
Space mean speed in outer lanes,	S = 60.4	mph
	0	
Space mean speed for all vehicles,	S = 56.9	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyON/ManuelFreitasOFF
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4814	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1254	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1713	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1713	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.6	mi/h
Number of lanes, N	3	
Density, D	26.9	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
 E-mail:

-----Diverge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/22/2016
 Analysis time period: PM Peak Hour
 Freeway/Dir of Travel: 101 SB
 Junction: Manuel T Freitas off
 Jurisdiction: San Rafael
 Analysis Year: Baseline Plus Project
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4814	vph	

-----Off Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	613	vph	
Length of first accel/decel lane	120	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4814	613		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1254	160		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5140	655	pcph

----- Estimation of V12 Diverge Areas -----

L = (Equation 13-12 or 13-13)

EQ

P = 0.601 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3352$ pc/h

----- Capacity Checks -----

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5140	7050	No
$v_{FO} = v_F - v_R$	4485	7050	No
v_R	655	2000	No
v_3 or v_{av34}	1788 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or $v_{av34} > 2700$ pc/h?		No	
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3352$		(Equation 13-15, 13-16, 13-18, or 13-19)	

----- Flow Entering Diverge Influence Area -----

	Actual	Max Desirable	Violation?
v_{12}	3352	4400	No

----- Level of Service Determination (if not F) -----

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 32.0$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	D = 0.487	
Space mean speed in ramp influence area,	S _R = 53.8	mph
Space mean speed in outer lanes,	S ₀ = 68.2	mph
Space mean speed for all vehicles,	S = 58.1	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: Manuel T Freitas on / off
Jurisdiction: San Rafael
Analysis Year: Baseline Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4201	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1094	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1495	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1495	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	3	
Density, D	23.0	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/16/2016
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Manuel T Freitas off-on
 Jurisdiction: San Rafael
 Analysis Year: Cumulative 100% Occupancy NP
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4579	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1192	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1630	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1630	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.2	mi/h
Number of lanes, N	3	
Density, D	25.4	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 NB
 From/To: ManuelTFreitasON/RedwoodHwyON
 Jurisdiction: San Rafael
 Analysis Year: Cumulative 100 Occ No Project
 Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	5016	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1306	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1785	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1785	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.9	mi/h
Number of lanes, N	3	
Density, D	28.4	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/16/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Redwood Highway On
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5016	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	129	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5016	129		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1306	34		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5356	138	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.201 Using Equation 4

FM

v = v (P) = 1074 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	5494	9400	No
FO			
v or v	2141 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2142	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2280	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 22.0 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.346	
	S	
Space mean speed in ramp influence area,	S = 57.0	mph
	R	
Space mean speed in outer lanes,	S = 61.0	mph
	0	
Space mean speed for all vehicles,	S = 59.3	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Smith Ranch Road off
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5145	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1340	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1373	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1373	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	21.1	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Smith Ranch Rd off/Lucas Rd on
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4196	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1093	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1493	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1493	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	3	
Density, D	23.0	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Lucas Rd on/Smith Ranch Rd on
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	4353	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1134	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1162	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1162	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	17.9	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/21/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Smith Ranch Rd WB on
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4353	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	171	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4353	171		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1134	45		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4648	183	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.195 Using Equation 4

FM

v = v (P) = 906 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	4831	9400	No
FO			
v or v	1871 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 1859	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2042	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 20.1 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.338	
	S	
Space mean speed in ramp influence area,	S = 57.2	mph
	R	
Space mean speed in outer lanes,	S = 61.8	mph
	0	
Space mean speed for all vehicles,	S = 59.8	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4524	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1178	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1208	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1208	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	18.6	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/21/2016
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Miller Creek off / on
 Jurisdiction: San Rafael
 Analysis Year: Cumulative 100% Occupancy NP
 Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	4362	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1136	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1552	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1552	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.7	mi/h
Number of lanes, N	3	
Density, D	24.0	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Period
Freeway/Direction: 101 SB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Cumulative 100% Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4729	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1232	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1683	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1683	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.9	mi/h
Number of lanes, N	3	
Density, D	26.4	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/21/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Miller Creek on
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4729	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	1071	vph	
Length of first accel/decel lane	110	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4729	1071		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1232	279		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	%
Length	mi	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5049	1144	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)
EQ
P = 0.581 Using Equation 1
FM
 $v_{12} = v_{F} (P_{FM}) = 2931 \text{ pc/h}$

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v _{FO}	6193	7050	No
v ₃ or v _{3 av34}	2118 pc/h	(Equation 13-14 or 13-17)	
Is v ₃ or v _{3 av34} > 2700 pc/h?		No	
Is v ₃ or v _{3 av34} > 1.5 v ₁₂ / 2		Yes	
If yes, v _{12A} = 2931		(Equation 13-15, 13-16, 13-18, or 13-19)	

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v _{12A}	4075	4600	No

----- Level of Service Determination (if not F) -----

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 36.0 \text{ pc/mi/ln}$
Level of service for ramp-freeway junction areas of influence E

----- Speed Estimation -----

Intermediate speed variable,	M = 0.543	
Space mean speed in ramp influence area,	S _R = 52.5	mph
Space mean speed in outer lanes,	S ₀ = 59.2	mph
Space mean speed for all vehicles,	S = 54.6	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Period
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd off
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5800	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1510	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1548	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1548	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.7	mi/h
Number of lanes, N	4	
Density, D	23.9	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd on/off
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5188	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1351	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1846	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1846	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.2	mi/h
Number of lanes, N	3	
Density, D	29.7	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Lucas Valley On
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5188	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	770	vph	
Length of first accel/decel lane	150	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5188	770		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1351	201		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	%
Length	mi	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5539	822	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.582 Using Equation 1

FM

v = v (P) = 3222 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	6361	7050	No
FO			
v or v	2317 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 3222	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	4044	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 35.7$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence E

----- Speed Estimation -----

Intermediate speed variable,	M = 0.533	
	S	
Space mean speed in ramp influence area,	S = 52.7	mph
	R	
Space mean speed in outer lanes,	S = 58.4	mph
	0	
Space mean speed for all vehicles,	S = 54.7	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyON/ManuelFreitasOFF
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5871	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1529	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2090	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2090	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	58.2	mi/h
Number of lanes, N	3	
Density, D	35.9	pc/mi/ln
Level of service, LOS	E	

Phone: Fax:
E-mail:

-----Diverge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Manuel T Freitas off
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5871	vph	

-----Off Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	868	vph	
Length of first accel/decel lane	120	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5871	868		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1529	226		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00	%	0.00	%
Length	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6269	927	pcph

----- Estimation of V12 Diverge Areas -----

L = (Equation 13-12 or 13-13)

EQ

P = 0.561 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3922 \text{ pc/h}$

----- Capacity Checks -----

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6269	7050	No
$v_{FO} = v_F - v_R$	5342	7050	No
v_R	927	2000	No
$v_3 \text{ or } v_{av34}$	2347 pc/h	(Equation 13-14 or 13-17)	
Is $v_3 \text{ or } v_{av34} > 2700 \text{ pc/h?}$		No	
Is $v_3 \text{ or } v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3922$		(Equation 13-15, 13-16, 13-18, or 13-19)	

----- Flow Entering Diverge Influence Area -----

	Actual	Max Desirable	Violation?
v_{12}	3922	4400	No

----- Level of Service Determination (if not F) -----

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 36.9 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence E

----- Speed Estimation -----

Intermediate speed variable,	D = 0.511	
Space mean speed in ramp influence area,	S _R = 53.2	mph
Space mean speed in outer lanes,	S ₀ = 66.1	mph
Space mean speed for all vehicles,	S = 57.4	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: Manuel T Freitas on / off
Jurisdiction: San Rafael
Analysis Year: Cumulative 100% Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5003	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1303	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1781	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1781	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.9	mi/h
Number of lanes, N	3	
Density, D	28.3	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas off-on
Jurisdiction: San Rafael
Analysis Year: Cumulative 100% Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	6451	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1680	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2296	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2296	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	53.6	mi/h
Number of lanes, N	3	
Density, D	42.8	pc/mi/ln
Level of service, LOS	E	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: ManuelTFreitasON/RedwoodHwyON
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	7236	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1884	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2575	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2575	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	45.4	mi/h
Number of lanes, N	3	
Density, D	56.7	pc/mi/ln
Level of service, LOS	F	

Phone: Fax:
 E-mail:

-----Merge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/22/2016
 Analysis time period: PM Peak Hour
 Freeway/Dir of Travel: 101 NB
 Junction: Redwood Highway on
 Jurisdiction: San Rafael
 Analysis Year: Cumulative 100 Occ No Project
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	7236	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	384	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7236	384		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1884	100		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	7726	410	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.167 Using Equation 4

FM

v = v (P) = 1287 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	8136	9400	No
FO			
v or v	3219 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	Yes	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 3090	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3500	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 31.4 pc/mi/ln

R R 12 A

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.437	
	S	
Space mean speed in ramp influence area,	S = 55.0	mph
	R	
Space mean speed in outer lanes,	S = 58.4	mph
	0	
Space mean speed for all vehicles,	S = 56.8	mph

Phone: Fax:
 E-mail:

----- Operational Analysis -----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Smith Ranch Rd off
 Jurisdiction: San Rafael
 Analysis Year: Cumulative 100 Occ No Project
 Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	7620	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1984	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2034	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	2034	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	59.3	mi/h
Number of lanes, N	4	
Density, D	34.3	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 NB
 From/To: SmithRanchRd off/LucasRdEB on
 Jurisdiction: San Rafael
 Analysis Year: Cumulative 100 Occ No Project
 Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	6739	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1755	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1799	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1799	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.7	mi/h
Number of lanes, N	4	
Density, D	28.7	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: LucasValleyRdON/SmithRanchRdON
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	7035	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1832	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1878	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1878	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	61.8	mi/h
Number of lanes, N	4	
Density, D	30.4	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Smith Ranch Rd WB on
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	7035	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	495	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7035	495		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1832	129		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	7511	529	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.152 Using Equation 4

FM

v = v (P) = 1139 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	8040	9400	No
FO			
v or v	3186 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	Yes	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 3004	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3533	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 31.6 pc/mi/ln

R R 12 A

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.441	
	S	
Space mean speed in ramp influence area,	S = 54.9	mph
	R	
Space mean speed in outer lanes,	S = 58.7	mph
	0	
Space mean speed for all vehicles,	S = 56.9	mph

Phone: Fax:
 E-mail:

----- Operational Analysis -----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Miller Creek off
 Jurisdiction: San Rafael
 Analysis Year: Cumulative 100 Occ No Project
 Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	7530	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1961	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2010	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	2010	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	59.7	mi/h
Number of lanes, N	4	
Density, D	33.7	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/21/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Miller Creek off / on
 Jurisdiction: San Rafael
 Analysis Year: Cumulative 100% Occupancy NP
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	7177	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1869	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2554	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2554	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	46.1	mi/h
Number of lanes, N	3	
Density, D	55.4	pc/mi/ln
Level of service, LOS	F	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Period
Freeway/Direction: 101 SB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Cumulative 100% Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4882	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1271	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1738	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1738	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.4	mi/h
Number of lanes, N	3	
Density, D	27.4	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
 E-mail:

-----Merge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/22/2016
 Analysis time period: PM Peak Hour
 Freeway/Dir of Travel: 101 SB
 Junction: Miller Creek on
 Jurisdiction: San Rafael
 Analysis Year: Cumulative 100 Occ No Project
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4882	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	209	vph	
Length of first accel/decel lane	110	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4882	209		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1271	54		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5213	223	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.581 Using Equation 1

FM

v = v (P) = 3027 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	5436	7050	No
FO			
v or v	2186 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 3027	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3250	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 30.0$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.414	
	S	
Space mean speed in ramp influence area,	S = 55.5	mph
	R	
Space mean speed in outer lanes,	S = 58.9	mph
	0	
Space mean speed for all vehicles,	S = 56.8	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd off
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5091	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1326	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1359	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1359	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	20.9	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyRd off/on
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4736	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1233	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1686	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1686	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.8	mi/h
Number of lanes, N	3	
Density, D	26.4	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/22/2016
 Analysis time period: PM Peak Hour
 Freeway/Dir of Travel: 101 SB
 Junction: LucasValleyON
 Jurisdiction: San Rafael
 Analysis Year: Cumulative 100 Occ No Project
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4736	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	995	vph	
Length of first accel/decel lane	150	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4736	995		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1233	259		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5057	1062	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.582 Using Equation 1

FM

v = v (P) = 2942 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	6119	7050	No
FO			
v or v	2115 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2942	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	4004	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 35.3 pc/mi/ln

R R 12 A E

Level of service for ramp-freeway junction areas of influence E

----- Speed Estimation -----

Intermediate speed variable,	M = 0.524	
	S	
Space mean speed in ramp influence area,	S = 52.9	mph
	R	
Space mean speed in outer lanes,	S = 59.2	mph
	0	
Space mean speed for all vehicles,	S = 54.9	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyON/ManuelFreitasOFF
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5731	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1492	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2040	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2040	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	59.2	mi/h
Number of lanes, N	3	
Density, D	34.5	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Diverge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Manuel T Freitas off
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5731	vph	

-----Off Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	746	vph	
Length of first accel/decel lane	120	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5731	746		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1492	194		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00	%	0.00	%
Length	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6119	797	pcph

----- Estimation of V12 Diverge Areas -----

L = (Equation 13-12 or 13-13)

EQ

P = 0.570 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3832 \text{ pc/h}$

----- Capacity Checks -----

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6119	7050	No
$v_{FO} = v_F - v_R$	5322	7050	No
v_R	797	2000	No
$v_3 \text{ or } v_{av34}$	2287 pc/h	(Equation 13-14 or 13-17)	
Is $v_3 \text{ or } v_{av34} > 2700 \text{ pc/h?}$		No	
Is $v_3 \text{ or } v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3832$		(Equation 13-15, 13-16, 13-18, or 13-19)	

----- Flow Entering Diverge Influence Area -----

	Actual	Max Desirable	Violation?
v_{12}	3832	4400	No

----- Level of Service Determination (if not F) -----

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 36.1 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence E

----- Speed Estimation -----

Intermediate speed variable,	D = 0.500	
Space mean speed in ramp influence area,	S _R = 53.5	mph
Space mean speed in outer lanes,	S ₀ = 66.3	mph
Space mean speed for all vehicles,	S = 57.7	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: Manuel T Freitas on / off
Jurisdiction: San Rafael
Analysis Year: Cumulative 100% Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4985	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1298	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1774	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1774	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.0	mi/h
Number of lanes, N	3	
Density, D	28.2	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas off-on
Jurisdiction: San Rafael
Analysis Year: Cumulative Exist Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4523	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1178	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1610	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1610	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.4	mi/h
Number of lanes, N	3	
Density, D	25.0	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: ManuelTFreitasON/RedwoodHwyON
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4960	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1292	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1765	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1765	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.1	mi/h
Number of lanes, N	3	
Density, D	28.0	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/16/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Redwood Highway On
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4960	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	129	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4960	129		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1292	34		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5296	138	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.201 Using Equation 4

FM

v = v (P) = 1062 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	5434	9400	No
FO			
v or v	2117 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2118	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2256	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 21.8 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.345	
	S	
Space mean speed in ramp influence area,	S = 57.1	mph
	R	
Space mean speed in outer lanes,	S = 61.1	mph
	0	
Space mean speed for all vehicles,	S = 59.3	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Smith Ranch Road off
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5089	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1325	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1358	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1358	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	20.9	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Smith Ranch Rd off/Lucas Rd on
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4196	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1093	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1493	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1493	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	3	
Density, D	23.0	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/21/2016
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Lucas Rd on/Smith Ranch Rd on
 Jurisdiction: San Rafael
 Analysis Year: Cumulative No Project
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4344	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1131	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1160	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1160	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	17.8	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
 E-mail:

-----Merge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/21/2016
 Analysis time period: AM Peak Hour
 Freeway/Dir of Travel: 101 NB
 Junction: Smith Ranch Rd WB on
 Jurisdiction: San Rafael
 Analysis Year: Cumulative No Project
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4344	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	171	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4344	171		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1131	45		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4638	183	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.195 Using Equation 4

FM

v = v (P) = 904 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	4821	9400	No
FO			
v or v	1867 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 1855	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2038	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 20.1 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.338	
	S	
Space mean speed in ramp influence area,	S = 57.2	mph
	R	
Space mean speed in outer lanes,	S = 61.8	mph
	0	
Space mean speed for all vehicles,	S = 59.8	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4515	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1176	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1205	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1205	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	18.5	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/21/2016
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Miller Creek off / on
 Jurisdiction: San Rafael
 Analysis Year: Cumulative Exist Occupancy NP
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4353	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1134	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1549	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1549	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.7	mi/h
Number of lanes, N	3	
Density, D	23.9	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Period
Freeway/Direction: 101 SB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Cumulative Exist Occupancy NP
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	4679	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1218	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1665	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1665	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.0	mi/h
Number of lanes, N	3	
Density, D	26.0+	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/21/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Miller Creek on
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4679	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	1071	vph	
Length of first accel/decel lane	110	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4679	1071		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1218	279		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	%
Length	mi	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4996	1144	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.581 Using Equation 1

FM

v = v (P) = 2901 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	6140	7050	No
FO			
v or v	2095 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2901	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	4045	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 35.8 pc/mi/ln

R R 12 A E

Level of service for ramp-freeway junction areas of influence E

----- Speed Estimation -----

Intermediate speed variable,	M = 0.536	
	S	
Space mean speed in ramp influence area,	S = 52.7	mph
	R	
Space mean speed in outer lanes,	S = 59.3	mph
	0	
Space mean speed for all vehicles,	S = 54.7	mph

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Period
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd off
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	5750	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1497	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1535	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1535	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.7	mi/h
Number of lanes, N	4	
Density, D	23.7	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd on/off
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	5188	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1351	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1846	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1846	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.2	mi/h
Number of lanes, N	3	
Density, D	29.7	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Lucas Valley On
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5188	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	762	vph	
Length of first accel/decel lane	150	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5188	762		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1351	198		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	%
Length	mi	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5539	814	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.582 Using Equation 1

FM

v = v (P) = 3222 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	6353	7050	No
FO			
v or v	2317 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 3222	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	4036	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 35.6 pc/mi/ln

R R 12 A E

Level of service for ramp-freeway junction areas of influence E

----- Speed Estimation -----

Intermediate speed variable,	M = 0.531	
	S	
Space mean speed in ramp influence area,	S = 52.8	mph
	R	
Space mean speed in outer lanes,	S = 58.4	mph
	0	
Space mean speed for all vehicles,	S = 54.7	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyON/ManuelFreitasOFF
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5866	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1528	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2088	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2088	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	58.3	mi/h
Number of lanes, N	3	
Density, D	35.8	pc/mi/ln
Level of service, LOS	E	

Phone: Fax:
E-mail:

-----Diverge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Manuel T Freitas off
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	5866	vph

-----Off Ramp Data-----

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	868	vph
Length of first accel/decel lane	120	ft
Length of second accel/decel lane		ft

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5866	868		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1528	226		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00	%	0.00	%
Length	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6263	927	pcph

----- Estimation of V12 Diverge Areas -----

L = (Equation 13-12 or 13-13)

EQ

P = 0.561 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3919$ pc/h

12 R F R FD

----- Capacity Checks -----

	Actual	Maximum	LOS F?
$v_{12} = v_{12}$	6263	7050	No
$v_{FO} = v_{FO} - v_{R3}$	5336	7050	No
v_{R3}	927	2000	No
$v_{3} \text{ or } v_{34}$	2344 pc/h	(Equation 13-14 or 13-17)	
Is $v_{3} \text{ or } v_{34} > 2700$ pc/h?		No	
Is $v_{3} \text{ or } v_{34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3919$		(Equation 13-15, 13-16, 13-18, or 13-19)	

----- Flow Entering Diverge Influence Area -----

	Actual	Max Desirable	Violation?
v_{12}	3919	4400	No

----- Level of Service Determination (if not F) -----

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 36.9$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence E

----- Speed Estimation -----

Intermediate speed variable,	D = 0.511	
Space mean speed in ramp influence area,	S _R = 53.2	mph
Space mean speed in outer lanes,	S ₀ = 66.1	mph
Space mean speed for all vehicles,	S = 57.4	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: Manuel T Freitas on / off
Jurisdiction: San Rafael
Analysis Year: Cumulative Exist Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4998	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1302	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1779	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1779	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.0	mi/h
Number of lanes, N	3	
Density, D	28.3	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas off-on
Jurisdiction: San Rafael
Analysis Year: Cumulative Exist Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	6440	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1677	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2292	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2292	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	53.7	mi/h
Number of lanes, N	3	
Density, D	42.7	pc/mi/ln
Level of service, LOS	E	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 NB
 From/To: ManuelTFreitasON/RedwoodHwyON
 Jurisdiction: San Rafael
 Analysis Year: Cumulative No Project
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	7225	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1882	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2571	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2571	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	45.6	mi/h
Number of lanes, N	3	
Density, D	56.4	pc/mi/ln
Level of service, LOS	F	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Redwood Highway on
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	7225	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	384	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7225	384		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1882	100		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	7714	410	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.167 Using Equation 4

FM

v = v (P) = 1285 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	8124	9400	No
FO			
v or v	3214 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	Yes	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 3085	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3495	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, $D = 5.475 + 0.00734 \frac{v}{R} + 0.0078 \frac{v}{12} - 0.00627 \frac{L}{A} = 31.4$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.436	
	S	
Space mean speed in ramp influence area,	S = 55.0	mph
	R	
Space mean speed in outer lanes,	S = 58.4	mph
	0	
Space mean speed for all vehicles,	S = 56.9	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Smith Ranch Rd off
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	7609	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1982	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2031	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2031	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	59.4	mi/h
Number of lanes, N	4	
Density, D	34.2	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: SmithRanchRd off/LucasRdEB on
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	6739	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1755	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1799	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1799	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.7	mi/h
Number of lanes, N	4	
Density, D	28.7	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: LucasValleyRdON/SmithRanchRdON
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	6971	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1815	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1861	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1861	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.0	mi/h
Number of lanes, N	4	
Density, D	30.0	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
 E-mail:

-----Merge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/22/2016
 Analysis time period: PM Peak Hour
 Freeway/Dir of Travel: 101 NB
 Junction: Smith Ranch Rd WB on
 Jurisdiction: San Rafael
 Analysis Year: Cumulative No Project
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	6971	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	495	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6971	495		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1815	129		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	7443	529	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.152 Using Equation 4

FM

v = v (P) = 1129 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	7972	9400	No
FO			
v or v	3157 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	Yes	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2977	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3506	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 31.4 pc/mi/ln

R R 12 A

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.438	
	S	
Space mean speed in ramp influence area,	S = 54.9	mph
	R	
Space mean speed in outer lanes,	S = 58.8	mph
	0	
Space mean speed for all vehicles,	S = 57.0	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	7466	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1944	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1993	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1993	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	4	
Density, D	33.2	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/21/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Miller Creek off / on
 Jurisdiction: San Rafael
 Analysis Year: Cumulative Exist Occupancy NP
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	7113	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1852	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2532	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2532	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	46.8	mi/h
Number of lanes, N	3	
Density, D	54.1	pc/mi/ln
Level of service, LOS	F	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Period
Freeway/Direction: 101 SB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Cumulative Exist Occupancy NP
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4919	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1281	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1751	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1751	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.3	mi/h
Number of lanes, N	3	
Density, D	27.7	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Miller Creek on
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4919	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	209	vph	
Length of first accel/decel lane	110	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4919	209		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1281	54		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5252	223	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.581 Using Equation 1

FM

v = v (P) = 3049 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	5475	7050	No
FO			
v or v	2203 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 3049	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3272	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 30.2$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.416	
	S	
Space mean speed in ramp influence area,	S = 55.4	mph
	R	
Space mean speed in outer lanes,	S = 58.9	mph
	0	
Space mean speed for all vehicles,	S = 56.8	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd off
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5128	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1335	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1369	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1369	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	21.1	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyRd off/on
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4785	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1246	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1703	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1703	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.7	mi/h
Number of lanes, N	3	
Density, D	26.7	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: LucasValleyON
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4785	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	946	vph	
Length of first accel/decel lane	150	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4785	946		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1246	246		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5109	1010	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.582 Using Equation 1

FM

v = v (P) = 2972 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	6119	7050	No
FO			
v or v	2137 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2972	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3982	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 35.1 pc/mi/ln

R R 12 A E

Level of service for ramp-freeway junction areas of influence E

----- Speed Estimation -----

Intermediate speed variable,	M = 0.520	
	S	
Space mean speed in ramp influence area,	S = 53.0	mph
	R	
Space mean speed in outer lanes,	S = 59.1	mph
	0	
Space mean speed for all vehicles,	S = 55.0	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 SB
 From/To: LucasValleyON/ManuelFreitasOFF
 Jurisdiction: San Rafael
 Analysis Year: Cumulative No Project
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5731	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1492	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2040	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2040	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	59.2	mi/h
Number of lanes, N	3	
Density, D	34.5	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Diverge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Manuel T Freitas off
Jurisdiction: San Rafael
Analysis Year: Cumulative No Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5731	vph	

-----Off Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	746	vph	
Length of first accel/decel lane	120	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5731	746		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1492	194		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00	%	0.00	%
Length	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6119	797	pcph

----- Estimation of V12 Diverge Areas -----

L = (Equation 13-12 or 13-13)

EQ

P = 0.570 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3832$ pc/h

12 R F R FD

----- Capacity Checks -----

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6119	7050	No
$v_{FO} = v_F - v_R$	5322	7050	No
v_R	797	2000	No
v_3 or v_{av34}	2287 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or $v_{av34} > 2700$ pc/h?		No	
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3832$		(Equation 13-15, 13-16, 13-18, or 13-19)	

----- Flow Entering Diverge Influence Area -----

	Actual	Max Desirable	Violation?
v_{12}	3832	4400	No

----- Level of Service Determination (if not F) -----

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 36.1$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence E

----- Speed Estimation -----

Intermediate speed variable,	D = 0.500	
Space mean speed in ramp influence area,	S _R = 53.5	mph
Space mean speed in outer lanes,	S ₀ = 66.3	mph
Space mean speed for all vehicles,	S = 57.7	mph

Phone: Fax:
 E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 SB
 From/To: Manuel T Freitas on / off
 Jurisdiction: San Rafael
 Analysis Year: Cumulative Exist Occupancy NP
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4985	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1298	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1774	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1774	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.0	mi/h
Number of lanes, N	3	
Density, D	28.2	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas off-on
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4590	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1195	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1634	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1634	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.2	mi/h
Number of lanes, N	3	
Density, D	25.4	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: ManuelTFreitasON/RedwoodHwyON
Jurisdiction: San Rafael
Analysis Year: Cumulative 100 Occ No Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5027	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1309	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1789	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1789	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.9	mi/h
Number of lanes, N	3	
Density, D	28.5	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/16/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Redwood Highway On
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5027	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	129	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5027	129		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1309	34		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5367	138	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.201 Using Equation 4

FM

v = v (P) = 1076 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	5505	9400	No
FO			
v or v	2145 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2146	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	2284	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 22.0 pc/mi/ln

R R 12 A C

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.346	
	S	
Space mean speed in ramp influence area,	S = 57.0	mph
	R	
Space mean speed in outer lanes,	S = 61.0	mph
	0	
Space mean speed for all vehicles,	S = 59.3	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Smith Ranch Road off
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5156	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1343	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1376	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1376	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	21.2	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Smith Ranch Rd off/Lucas Rd on
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4239	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1104	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1509	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1509	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.8	mi/h
Number of lanes, N	3	
Density, D	23.3	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/21/2016
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: 101 NB
 From/To: Lucas Rd on/Smith Ranch Rd on
 Jurisdiction: San Rafael
 Analysis Year: Cumulative Plus Project
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4405	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1147	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1176	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1176	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	18.1	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/21/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Smith Ranch Rd WB on
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4405	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	171	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4405	171		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1147	45		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4703	183	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.195 Using Equation 4

FM

$v_{12} = v_F (P_{FM}) = 917 \text{ pc/h}$

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v _{FO}	4886	9400	No
v ₃ or v _{av34}	1893 pc/h	(Equation 13-14 or 13-17)	
Is v ₃ or v _{av34} > 2700 pc/h?		No	
Is v ₃ or v _{av34} > 1.5 v ₁₂ / 2		Yes	
If yes, v _{12A} = 1881		(Equation 13-15, 13-16, 13-18, or 13-19)	

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v _{12A}	2064	4600	No

----- Level of Service Determination (if not F) -----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 20.3 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence C

----- Speed Estimation -----

Intermediate speed variable,	M = 0.338	
Space mean speed in ramp influence area,	S _R = 57.2	mph
Space mean speed in outer lanes,	S ₀ = 61.7	mph
Space mean speed for all vehicles,	S = 59.7	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4576	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1192	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1221	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1221	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	18.8	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4414	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1149	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1571	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1571	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.6	mi/h
Number of lanes, N	3	
Density, D	24.3	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Period
Freeway/Direction: 101 SB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	4757	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1239	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1693	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1693	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.8	mi/h
Number of lanes, N	3	
Density, D	26.5	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/21/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Miller Creek on
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4757	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	1071	vph	
Length of first accel/decel lane	110	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4757	1071		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1239	279		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	%
Length	mi	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5079	1144	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.581 Using Equation 1

FM

v = v (P) = 2949 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	6223	7050	No
FO			
v or v	2130 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2949	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	4093	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 36.2 pc/mi/ln

R R 12 A E

Level of service for ramp-freeway junction areas of influence E

----- Speed Estimation -----

Intermediate speed variable,	M = 0.547	
	S	
Space mean speed in ramp influence area,	S = 52.4	mph
	R	
Space mean speed in outer lanes,	S = 59.1	mph
	0	
Space mean speed for all vehicles,	S = 54.5	mph

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Period
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd off
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	5828	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1518	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1556	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1556	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.7	mi/h
Number of lanes, N	4	
Density, D	24.1	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd on/off
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	5188	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1351	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1846	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1846	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.2	mi/h
Number of lanes, N	3	
Density, D	29.7	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Lucas Valley On
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5188	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	776	vph	
Length of first accel/decel lane	150	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5188	776		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1351	202		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	%
Length	mi	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5539	829	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.582 Using Equation 1

FM

v = v (P) = 3222 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	6368	7050	No
FO			
v or v	2317 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 3222	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	4051	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 35.8 pc/mi/ln

R R 12 A E

Level of service for ramp-freeway junction areas of influence E

----- Speed Estimation -----

Intermediate speed variable,	M = 0.535	
	S	
Space mean speed in ramp influence area,	S = 52.7	mph
	R	
Space mean speed in outer lanes,	S = 58.4	mph
	0	
Space mean speed for all vehicles,	S = 54.6	mph

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyON/ManuelFreitasOFF
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	5886	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1533	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2095	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	2095	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	58.2	mi/h
Number of lanes, N	3	
Density, D	36.0	pc/mi/ln
Level of service, LOS	E	

Phone: Fax:
E-mail:

-----Diverge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Manuel T Freitas off
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5886	vph	

-----Off Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	868	vph	
Length of first accel/decel lane	120	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5886	868		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1533	226		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00	%	0.00	%
Length	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6285	927	pcph

----- Estimation of V12 Diverge Areas -----

L = (Equation 13-12 or 13-13)

EQ

P = 0.560 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3929$ pc/h

12 R F R FD

----- Capacity Checks -----

	Actual	Maximum	LOS F?
$v_{12} = v_{12}$	6285	7050	No
$v_{FO} = v_{FO} - v_{R3}$	5358	7050	No
v_{R3}	927	2000	No
$v_{3} \text{ or } v_{34}$	2356 pc/h	(Equation 13-14 or 13-17)	
Is $v_{3} \text{ or } v_{34} > 2700$ pc/h?		No	
Is $v_{3} \text{ or } v_{34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3929$		(Equation 13-15, 13-16, 13-18, or 13-19)	

----- Flow Entering Diverge Influence Area -----

	Actual	Max Desirable	Violation?
v_{12}	3929	4400	No

----- Level of Service Determination (if not F) -----

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 37.0$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence E

----- Speed Estimation -----

Intermediate speed variable,	D = 0.511	
Space mean speed in ramp influence area,	S = 53.2	mph
Space mean speed in outer lanes,	S = 66.0	mph
Space mean speed for all vehicles,	S = 57.4	mph

Phone: Fax:
E-mail:

----- Operational Analysis -----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: AM Peak Hour
Freeway/Direction: 101 SB
From/To: Manuel T Freitas on / off
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

----- Flow Inputs and Adjustments -----

Volume, V	5018	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1307	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1786	pc/h/ln

----- Speed Inputs and Adjustments -----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

----- LOS and Performance Measures -----

Flow rate, vp	1786	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.9	mi/h
Number of lanes, N	3	
Density, D	28.4	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/16/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Manuel T Freitas off-on
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	6764	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1761	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2407	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2407	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	50.6	mi/h
Number of lanes, N	3	
Density, D	47.5	pc/mi/ln
Level of service, LOS	F	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: ManuelTFreitasON/RedwoodHwyON
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	7378	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1921	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2626	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2626	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	43.7	mi/h
Number of lanes, N	3	
Density, D	60.1	pc/mi/ln
Level of service, LOS	F	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Redwood Highway on
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	7378	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	384	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7378	384		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1921	100		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	7878	410	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.167 Using Equation 4

FM

v = v (P) = 1312 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	8288	9400	No
FO			
v or v	3283 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	Yes	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 3151	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3561	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 31.9$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.445	
	S	
Space mean speed in ramp influence area,	S = 54.8	mph
	R	
Space mean speed in outer lanes,	S = 58.1	mph
	0	
Space mean speed for all vehicles,	S = 56.6	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Smith Ranch Rd off
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	7762	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	2021	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2072	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2072	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	58.6	mi/h
Number of lanes, N	4	
Density, D	35.4	pc/mi/ln
Level of service, LOS	E	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
 Agency or Company: Fehr & Peers
 Date Performed: 9/22/2016
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: 101 NB
 From/To: SmithRanchRd off/LucasRdEB on
 Jurisdiction: San Rafael
 Analysis Year: Cumulative Plus Project
 Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	6855	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1785	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1830	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1830	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.4	mi/h
Number of lanes, N	4	
Density, D	29.3	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: LucasValleyRdON/SmithRanchRdON
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	7167	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1866	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1913	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1913	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	61.3	mi/h
Number of lanes, N	4	
Density, D	31.2	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 NB
Junction: Smith Ranch Rd WB on
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	4		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	7167	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	495	vph	
Length of first accel/decel lane	190	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7167	495		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1866	129		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	7652	529	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.152 Using Equation 4

FM

v = v (P) = 1161 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	8181	9400	No
FO			
v or v	3245 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	Yes	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 3060	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3589	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 32.0 pc/mi/ln

R R 12 A

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.449	
	S	
Space mean speed in ramp influence area,	S = 54.7	mph
	R	
Space mean speed in outer lanes,	S = 58.5	mph
	0	
Space mean speed for all vehicles,	S = 56.8	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	7662	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1995	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2045	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2045	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	59.1	mi/h
Number of lanes, N	4	
Density, D	34.6	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/21/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 NB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	7309	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1903	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2601	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2601	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	44.5	mi/h
Number of lanes, N	3	
Density, D	58.4	pc/mi/ln
Level of service, LOS	F	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Period
Freeway/Direction: 101 SB
From/To: Miller Creek off / on
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5004	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1303	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1781	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1781	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.9	mi/h
Number of lanes, N	3	
Density, D	28.3	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: Miller Creek on
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5004	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	209	vph	
Length of first accel/decel lane	110	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5004	209		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1303	54		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5343	223	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.581 Using Equation 1

FM

v = v (P) = 3102 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	5566	7050	No
FO			
v or v	2241 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 3102	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	3325	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 30.6$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

----- Speed Estimation -----

Intermediate speed variable,	M = 0.422	
	S	
Space mean speed in ramp influence area,	S = 55.3	mph
	R	
Space mean speed in outer lanes,	S = 58.7	mph
	0	
Space mean speed for all vehicles,	S = 56.6	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: Lucas Valley Rd off
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5213	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1358	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1391	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1391	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	4	
Density, D	21.4	pc/mi/ln
Level of service, LOS	C	

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyRd off/on
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	4828	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1257	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1718	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1718	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.6	mi/h
Number of lanes, N	3	
Density, D	27.0	pc/mi/ln
Level of service, LOS	D	

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: LP
Agency/Co.: Fehr & Peers
Date performed: 9/22/2016
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: 101 SB
Junction: LucasValleyON
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4828	vph	

-----On Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	1007	vph	
Length of first accel/decel lane	150	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4828	1007		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1257	262		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5155	1075	pcph

----- Estimation of V12 Merge Areas -----

L = (Equation 13-6 or 13-7)

EQ

P = 0.582 Using Equation 1

FM

v = v (P) = 2999 pc/h

12 F FM

----- Capacity Checks -----

	Actual	Maximum	LOS F?
v	6230	7050	No
FO			
v or v	2156 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	Yes	
3 av34	12		
If yes, v	= 2999	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

----- Flow Entering Merge Influence Area -----

	Actual	Max Desirable	Violation?
v	4074	4600	No
12A			

----- Level of Service Determination (if not F) -----

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 35.8 pc/mi/ln

R R 12 A E

Level of service for ramp-freeway junction areas of influence E

----- Speed Estimation -----

Intermediate speed variable,	M = 0.540	
	S	
Space mean speed in ramp influence area,	S = 52.6	mph
	R	
Space mean speed in outer lanes,	S = 59.0	mph
	0	
Space mean speed for all vehicles,	S = 54.7	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: LucasValleyON/ManuelFreitasOFF
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5835	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1520	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	2077	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	2077	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	58.5	mi/h
Number of lanes, N	3	
Density, D	35.5	pc/mi/ln
Level of service, LOS	E	

Phone: Fax:
 E-mail:

-----Diverge Analysis-----

Analyst: LP
 Agency/Co.: Fehr & Peers
 Date performed: 9/22/2016
 Analysis time period: PM Peak Hour
 Freeway/Dir of Travel: 101 SB
 Junction: Manuel T Freitas off
 Jurisdiction: San Rafael
 Analysis Year: Cumulative Plus Project
 Description: 1650 Los Gamos

-----Freeway Data-----

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5835	vph	

-----Off Ramp Data-----

Side of freeway	Right		
Number of lanes in ramp	1		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	746	vph	
Length of first accel/decel lane	120	ft	
Length of second accel/decel lane		ft	

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5835	746		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v15	1520	194		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00	%	0.00	%
Length	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6230	797	pcph

----- Estimation of V12 Diverge Areas -----

L = (Equation 13-12 or 13-13)

EQ

P = 0.568 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3881 \text{ pc/h}$

----- Capacity Checks -----

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6230	7050	No
$v_{FO} = v_F - v_R$	5433	7050	No
v_R	797	2000	No
$v_3 \text{ or } v_{av34}$	2349 pc/h	(Equation 13-14 or 13-17)	
Is $v_3 \text{ or } v_{av34} > 2700 \text{ pc/h?}$		No	
Is $v_3 \text{ or } v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3881$		(Equation 13-15, 13-16, 13-18, or 13-19)	

----- Flow Entering Diverge Influence Area -----

	Actual	Max Desirable	Violation?
v_{12}	3881	4400	No

----- Level of Service Determination (if not F) -----

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 36.5 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence E

----- Speed Estimation -----

Intermediate speed variable,	D = 0.500	
Space mean speed in ramp influence area,	S _R = 53.5	mph
Space mean speed in outer lanes,	S ₀ = 66.0	mph
Space mean speed for all vehicles,	S = 57.6	mph

Phone: Fax:
E-mail:

-----Operational Analysis-----

Analyst: LP
Agency or Company: Fehr & Peers
Date Performed: 9/22/2016
Analysis Time Period: PM Peak Hour
Freeway/Direction: 101 SB
From/To: Manuel T Freitas on / off
Jurisdiction: San Rafael
Analysis Year: Cumulative Plus Project
Description: 1650 Los Gamos

-----Flow Inputs and Adjustments-----

Volume, V	5089	veh/h
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v15	1325	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1811	pc/h/ln

-----Speed Inputs and Adjustments-----

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

-----LOS and Performance Measures-----

Flow rate, vp	1811	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.6	mi/h
Number of lanes, N	3	
Density, D	28.9	pc/mi/ln
Level of service, LOS	D	

APPENDIX E: DETAILED VMT COMPARISON TABLE



APPENDIX F:

AVERAGE VMT PER EMPLOYEE BY KAISER LOCATION VS. MTC/ABAG MODEL PROJECTIONS

Facility Name	2020 MTC / ABAG Model		Kaiser Permanente	
	Estimated Average VMT / Employee ¹	Maximum Average VMT/Employee ²	Empirically Derived Estimated Average VMT / Employee ^{3,4}	Below 2020 Maximum Average VMT / Employee?
Downtown San Rafael	25	21	21	Yes
Novato	31	26	19	Yes
San Rafael Medical Center	30	26	11	Yes
San Rafael Los Gamos	32	27	20	Yes

Notes

1. 2020 VMT/Employee estimates are determined by the MTC regional travel model for the TAZ zone where the facility is located.
2. Maximum average VMT/Employee based on 15-percent reduction from baseline per OPR's Technical Advisory.
3. Average VMT/Kaiser Employee at existing facilities is based on anonymous employee home zip code data provided by Kaiser Permanente.
4. Average VMT/Kaiser Employee at Proposed Project is based on Average VMT/Kaiser Employee at existing facilities and the planned number of employees to be moved to the Proposed Project from each existing facility.

Source: Kaiser Permanente, MTC <http://analytics.mtc.ca.gov/foswiki/Main/PlanBayAreaVmtPerWorker> (data collected on 11/8/2016)

APPENDIX F: DETAILED INTERSECTION QUEUE SUMMARY



Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	20	4	60	18	120	74	0%	0%
	Through	980	220	21	360	54	460	79	15%	0%
	Right Turn	160	60	12	200	22	220	0	0%	0%
NB	Left Turn	320	80	5	140	14	160	35	0%	0%
	Through	1,240	60	5	100	12	140	23	2%	0%
	Right Turn	100	20	7	60	36	120	59	1%	0%
SB	Left Turn	60	100	8	140	5	120	0	31%	0%
	Through	980	200	40	340	93	420	132	41%	0%
	Right Turn	120	20	4	40	30	60	73	0%	0%
WB	Left Turn	160	40	4	80	14	120	50	0%	0%
	Through	960	100	8	200	18	260	38	2%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Side-street Stop

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,080	20	1	20	5	20	13	0%	0%
	Right Turn	140	20	2	60	8	80	14	0%	0%
NB	Left Turn	1,060	40	2	60	6	80	14	0%	0%
	Right Turn	160	20	0	20	0	20	0	0%	0%
WB	Left Turn	160	100	6	160	13	180	24	2%	0%
	Through	520	20	9	60	68	140	168	0%	0%

Intersection 3

US-101 NB Ramps/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	520	160	15	260	15	320	37	0%	0%
	Right Turn	520	140	11	240	22	280	29	0%	0%
NB	Left Turn	1,100	180	22	360	52	420	98	7%	0%
	Right Turn	120	140	7	200	5	180	0	20%	0%
WB	Left Turn	440	80	15	160	22	180	36	0%	0%
	Through	680	20	3	60	9	60	18	0%	0%

Intersection 4

US-101 SB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	680	240	20	420	53	500	91	11%	0%
	Right Turn	200	60	20	200	47	240	1	0%	0%
NB	Left Turn	1,520	360	55	640	163	820	310	14%	0%
	Right Turn	320	120	35	400	61	380	0	0%	0%
WB	Through	360	100	9	180	18	220	33	0%	0%
	Right Turn	360	20	1	20	5	20	12	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	80	6	120	14	160	43	0%	0%
	Through	400	60	9	140	34	240	67	1%	0%
	Right Turn	120	40	14	120	33	160	4	1%	0%
NB	Left Turn	260	40	4	80	5	80	2	0%	0%
	Left/Through	520	20	3	60	8	80	20	0%	0%
	Right Turn	260	20	1	20	6	20	19	0%	0%
SB	Left/Through	440	20	1	40	5	40	15	0%	0%
WB	Left Turn	120	40	3	60	10	80	26	0%	0%
	Through	780	80	7	120	13	140	20	1%	0%
	Through/Right	780	60	2	100	10	120	20	0%	0%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	20	2	60	4	60	7	0%	0%
	Through	980	120	8	180	19	220	30	2%	0%
	Right Turn	160	20	3	20	25	40	74	0%	0%
NB	Left Turn	320	80	5	120	10	140	21	0%	0%
	Through	1,240	80	5	120	11	140	24	2%	0%
	Right Turn	100	20	3	40	29	80	77	0%	0%
SB	Left Turn	60	40	3	80	7	100	17	3%	0%
	Through	980	60	7	120	15	160	31	13%	0%
	Right Turn	120	20	2	20	17	40	49	0%	0%
WB	Left Turn	160	60	6	100	16	140	46	0%	0%
	Through	960	100	11	180	27	240	54	1%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Side-street Stop

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,080	20	0	20	3	20	10	0%	0%
	Right Turn	140	20	1	20	6	20	18	0%	0%
NB	Left Turn	1,080	40	5	80	5	100	12	0%	0%
	Right Turn	160	20	0	20	0	20	0	0%	0%
WB	Left Turn	160	60	3	80	10	100	19	0%	0%

Intersection 3

US-101 SB Ramps/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	520	180	12	280	43	360	95	0%	0%
	Right Turn	520	160	12	280	21	320	79	0%	0%
NB	Left Turn	1,000	100	11	180	22	240	71	9%	0%
	Right Turn	120	80	10	140	18	200	19	2%	0%
WB	Left Turn	440	260	19	380	29	440	54	0%	0%
	Through	680	60	5	140	41	200	138	0%	0%

Intersection 4

US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through/Right	200	20	0	20	0	20	0	0%	0%
	Right Turn	200	20	3	20	29	40	85	0%	0%
NB	Left Turn	1,500	240	22	400	79	540	173	3%	0%
	Right Turn	320	40	23	200	92	360	1	0%	0%
WB	Through	360	200	16	340	33	360	22	0%	0%
	Right Turn	360	20	3	40	11	60	21	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	40	4	80	8	100	11	0%	0%
	Through	400	80	8	140	15	160	42	4%	0%
	Right Turn	120	20	2	20	19	40	78	0%	0%
NB	Left Turn	260	100	6	160	13	200	36	0%	0%
	Left/Through	520	80	9	120	13	140	15	0%	0%
	Right Turn	260	20	2	20	9	40	17	0%	0%
SB	Left/Through	440	20	2	40	5	40	7	0%	0%
	Right Turn	80	20	5	60	11	80	15	1%	0%
WB	Left Turn	120	20	3	40	15	80	50	0%	0%
	Through	780	100	8	180	26	220	40	5%	0%
	Through/Right	780	100	10	160	23	200	39	0%	0%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	40	8	80	32	200	60	0%	0%
	Through	980	220	22	380	49	460	88	16%	0%
	Right Turn	160	60	18	200	32	220	0	0%	0%
NB	Left Turn	320	80	7	120	14	160	32	0%	0%
	Through	1,240	60	7	120	20	180	57	2%	0%
	Right Turn	100	20	6	60	29	120	61	0%	0%
SB	Left Turn	60	100	4	140	3	120	0	32%	0%
	Through	980	200	25	320	54	380	90	43%	0%
	Right Turn	120	20	4	40	31	120	76	0%	0%
WB	Left Turn	160	40	8	80	16	100	43	0%	0%
	Through	960	100	9	160	24	180	40	1%	0%
	Right Turn	260	20	0	20	0	20	0	0%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Side-street Stop

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,080	20	1	20	5	20	14	0%	0%
	Right Turn	140	20	6	60	14	100	30	0%	0%
NB	Left Turn	1,080	60	14	120	34	140	37	2%	0%
	Right Turn	160	20	2	20	22	40	65	0%	0%
WB	Left Turn	160	160	15	240	9	220	1	21%	0%
	Through	520	100	50	360	121	500	70	0%	1%

Intersection 3

US-101 SB Ramps/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	520	180	16	280	29	340	49	0%	0%
	Right Turn	520	140	11	240	20	300	53	0%	0%
NB	Left Turn	1,020	400	129	700	265	740	239	31%	3%
	Right Turn	120	160	5	200	12	180	0	29%	0%
WB	Left Turn	440	80	14	180	60	260	130	0%	0%
	Through	680	40	26	140	123	260	245	1%	0%

Intersection 4

US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	680	260	44	480	81	560	101	14%	0%
	Right Turn	200	60	14	220	28	260	0	0%	0%
NB	Left Turn	1,500	1,100	252	1,780	272	1,560	12	46%	32%
	Right Turn	320	320	46	500	50	380	0	0%	0%
WB	Through	360	100	11	180	20	220	44	0%	0%
	Right Turn	360	20	1	20	7	40	18	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	80	6	120	11	140	30	0%	0%
	Through	400	60	12	140	45	220	77	1%	0%
	Right Turn	120	40	13	120	34	160	8	2%	0%
NB	Left Turn	260	40	2	60	4	80	11	0%	0%
	Left/Through	520	20	5	60	10	80	17	0%	0%
	Right Turn	260	20	0	20	3	20	8	0%	0%
SB	Left/Through	440	20	2	40	4	40	16	0%	0%
	Right Turn	80	20	0	20	0	20	0	0%	0%
WB	Left Turn	120	40	5	80	16	100	33	0%	0%
	Through	780	80	7	140	13	160	24	1%	0%
	Through/Right	780	60	4	100	12	140	30	0%	0%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	20	4	60	5	60	15	0%	0%
	Through	980	120	11	180	27	220	34	2%	0%
	Right Turn	160	20	4	20	28	60	75	0%	0%
NB	Left Turn	320	80	5	120	11	140	24	0%	0%
	Through	1,240	60	4	120	14	140	26	2%	0%
	Right Turn	100	20	4	40	31	60	72	0%	0%
SB	Left Turn	60	40	4	80	10	100	23	5%	0%
	Through	980	60	7	120	15	140	26	13%	0%
	Right Turn	120	20	2	20	22	60	65	0%	0%
WB	Left Turn	160	60	3	100	6	120	12	0%	0%
	Through/Right	260	20	0	20	0	20	0	0%	0%
	Right Turn	260	20	4	20	35	60	103	0%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Side-street Stop

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,080	200	93	520	237	660	275	27%	0%
	Right Turn	140	60	18	180	42	220	0	0%	0%
NB	Left Turn	1,060	560	197	1,200	280	1,060	58	14%	25%
	Right Turn	160	160	20	300	9	220	0	49%	0%
WB	Left Turn	160	100	11	180	15	220	25	4%	0%
	Through	520	20	10	100	69	240	169	0%	0%

Intersection 3

US-101 SB Ramps/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	520	480	32	660	24	580	11	0%	24%
	Right Turn	520	500	37	740	24	620	0	0%	48%
NB	Left Turn	1,040	140	18	260	43	320	57	24%	0%
	Right Turn	120	100	11	200	19	200	0	3%	0%
WB	Left Turn	440	280	10	380	22	420	62	0%	0%
	Through	680	60	7	120	16	160	31	0%	0%

Intersection 4

US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	680	80	10	160	19	200	38	0%	0%
	Right Turn	200	20	0	20	0	20	0	0%	0%
NB	Left Turn	1,560	260	23	400	65	520	128	4%	0%
	Right Turn	320	60	31	200	122	300	152	0%	0%
WB	Through	360	220	12	360	16	380	6	0%	1%
	Right Turn	360	20	2	40	12	60	29	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	40	6	80	16	120	32	0%	0%
	Through	400	80	9	140	14	180	38	4%	0%
	Right Turn	120	20	3	40	32	120	93	0%	0%
NB	Left Turn	260	100	7	160	9	200	22	0%	0%
	Left/Through	520	80	5	120	7	140	22	0%	0%
	Right Turn	260	20	1	20	7	60	21	0%	0%
SB	Left/Through	440	20	2	40	6	60	15	0%	0%
	Right Turn	80	20	4	60	10	100	16	1%	0%
WB	Left Turn	120	20	3	60	15	80	49	0%	0%
	Through	780	120	7	180	23	220	41	6%	0%
	Through/Right	780	100	7	180	11	200	22	0%	0%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	60	10	140	26	180	1	0%	0%
	Through	980	1,000	12	1,060	44	1,040	6	45%	58%
	Right Turn	160	160	11	240	12	180	0	2%	0%
NB	Left Turn	320	80	7	140	26	200	79	0%	0%
	Through	1,240	140	11	260	21	320	33	19%	0%
	Right Turn	100	60	9	160	10	120	0	1%	0%
SB	Left Turn	60	80	1	100	3	80	0	60%	0%
	Through	980	1,000	9	1,040	48	1,020	0	42%	93%
	Right Turn	120	20	7	100	22	140	0	0%	0%
WB	Left Turn	160	60	9	120	19	140	39	0%	0%
	Through	960	100	6	200	33	260	99	2%	0%
	Right Turn	260	20	4	40	34	100	101	0%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Side-street Stop

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,080	240	158	780	321	1,040	86	15%	2%
	Right Turn	140	80	19	160	28	160	0	1%	0%
NB	Left Turn	1,000	80	27	160	90	240	168	6%	0%
	Right Turn	160	20	10	80	51	120	82	0%	0%
WB	Left Turn	160	160	8	220	8	180	0	29%	0%
	Through	520	220	75	540	130	520	6	0%	5%

Intersection 3

US-101 SB Ramps/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	520	360	27	520	41	520	11	0%	12%
	Right Turn	520	280	42	580	53	560	23	0%	2%
NB	Left Turn	1,000	920	103	1,160	110	1,040	0	19%	62%
	Right Turn	120	140	3	140	18	140	0	45%	0%
WB	Left Turn	440	100	36	220	112	300	158	0%	0%
	Through	680	120	82	380	239	520	262	5%	2%

Intersection 4

US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	680	600	49	840	61	700	2	38%	4%
	Right Turn	200	40	16	160	43	220	0	0%	0%
NB	Left Turn	1,460	1,460	52	1,620	109	1,520	0	53%	70%
	Right Turn	320	320	10	400	46	340	0	1%	0%
WB	Through	360	140	21	240	53	280	70	0%	1%
	Right Turn	360	20	1	20	6	20	19	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	60	8	100	17	120	28	0%	0%
	Through	400	200	23	360	34	360	77	2%	0%
	Right Turn	120	100	9	180	4	140	0	14%	0%
NB	Left Turn	260	60	4	100	7	100	8	0%	0%
	Left/Through	520	40	3	60	9	80	14	0%	0%
	Right Turn	260	20	1	20	6	20	16	0%	0%
SB	Left/Through	440	40	6	80	15	100	26	2%	0%
	Right Turn	80	20	4	40	14	80	11	0%	0%
WB	Left Turn	120	60	6	120	16	140	14	1%	0%
	Through	780	80	10	160	21	200	37	2%	0%
	Through/Right	780	60	7	120	18	160	37	0%	0%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	20	10	100	50	180	102	0%	0%
	Through	980	380	176	820	385	900	226	40%	15%
	Right Turn	160	80	34	240	68	260	0	0%	0%
NB	Left Turn	320	100	6	160	13	200	26	0%	0%
	Through	1,240	100	14	180	30	240	57	6%	0%
	Right Turn	100	20	10	100	36	140	47	2%	0%
SB	Left Turn	60	80	11	120	14	120	1	43%	0%
	Through	980	140	89	360	245	460	270	18%	0%
	Right Turn	120	20	7	60	46	100	84	0%	0%
WB	Left Turn	160	80	9	120	15	160	40	0%	0%
	Through	960	100	8	180	14	220	45	2%	0%
	Right Turn	260	20	1	20	9	40	26	0%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Side-street Stop

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,080	960	65	1,360	67	1,100	1	84%	23%
	Right Turn	140	180	14	320	5	220	0	0%	0%
NB	Left Turn	920	920	47	1,040	91	960	0	0%	90%
	Right Turn	160	220	1	220	5	220	0	99%	0%
WB	Left Turn	160	80	6	120	9	140	19	0%	0%
		160	20	0	20	0	20	0	0%	0%

Intersection 3

US-101 SB Ramps/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	520	520	4	520	5	520	5	0%	52%
	Right Turn	520	580	2	600	4	620	0	0%	94%
NB	Left Turn	1,080	100	9	180	15	220	31	10%	0%
	Right Turn	120	80	9	160	17	180	21	2%	0%
WB	Left Turn	440	320	13	440	34	500	44	2%	0%
	Through	680	100	24	220	109	380	245	0%	0%

Intersection 4

US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	680	100	5	160	13	200	25	0%	0%
NB	Left Turn	1,480	200	13	340	38	440	99	1%	0%
	Right Turn	320	40	20	140	100	260	174	0%	0%
WB	Through	360	320	17	440	17	400	12	0%	10%
	Right Turn	360	20	7	80	24	120	40	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	80	9	140	18	160	23	0%	0%
	Through	400	120	7	180	17	220	39	14%	0%
	Right Turn	120	20	7	100	35	200	3	0%	0%
NB	Left Turn	260	180	7	280	14	300	18	2%	0%
	Left/Through	520	180	14	280	29	360	83	1%	0%
	Right Turn	260	20	9	80	54	200	128	0%	0%
SB	Left/Through	440	60	10	140	39	200	62	5%	0%
	Right Turn	80	60	4	120	9	120	1	10%	0%
WB	Left Turn	120	100	21	220	31	220	1	0%	0%
	Through	780	280	94	500	200	560	157	47%	3%
	Through/Right	780	260	91	480	204	520	146	0%	3%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	60	10	140	20	180	0	0%	0%
	Through	980	1,000	25	1,080	80	1,040	0	43%	57%
	Right Turn	160	160	11	240	15	180	0	2%	0%
NB	Left Turn	320	80	4	140	13	180	57	0%	0%
	Through	1,240	140	22	220	47	260	56	15%	0%
	Right Turn	100	40	11	140	18	120	0	1%	0%
SB	Left Turn	60	80	2	100	4	80	0	59%	0%
	Through	980	1,000	8	1,020	24	1,020	0	45%	95%
	Right Turn	120	20	7	100	18	140	0	0%	0%
WB	Left Turn	160	60	4	120	13	160	34	0%	0%
	Through	960	120	14	200	32	260	68	3%	0%
	Right Turn	260	20	9	60	56	120	120	0%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Side-street Stop

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,080	140	250	340	544	380	500	8%	1%
	Right Turn	140	60	29	120	51	120	36	0%	0%
NB	Left Turn	980	40	7	80	15	100	28	0%	0%
	Right Turn	20	20	0	20	0	20	0	0%	0%
WB	Left Turn	160	140	17	200	16	180	3	12%	0%
	Through	520	80	68	260	184	380	166	0%	2%

Intersection 3

US-101 SB Ramps/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	520	280	113	440	166	440	113	0%	6%
	Right Turn	520	200	120	380	199	400	155	0%	1%
NB	Left Turn	1,100	520	219	820	273	880	208	8%	4%
	Right Turn	120	140	2	140	13	140	0	41%	0%
WB	Left Turn	440	80	15	160	65	220	127	0%	0%
	Through	680	60	33	160	145	240	253	1%	0%

Intersection 4

US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	680	520	87	760	84	680	18	31%	2%
	Right Turn	200	20	7	60	48	120	106	0%	0%
NB	Left Turn	1,480	1,160	232	1,720	153	1,520	0	46%	42%
	Right Turn	320	300	33	420	61	340	0	1%	0%
WB	Through	360	120	12	200	25	260	50	0%	0%
	Right Turn	360	20	2	20	11	40	21	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	60	11	120	41	180	72	0%	0%
	Through	400	260	54	480	85	440	22	2%	5%
	Right Turn	120	120	6	180	2	140	0	19%	0%
NB	Left Turn	260	60	6	80	10	120	18	0%	0%
	Left/Through	520	40	5	60	10	80	18	0%	0%
	Right Turn	260	20	1	20	9	20	23	0%	0%
SB	Left/Through	440	40	6	80	11	100	19	2%	0%
	Right Turn	80	20	5	40	18	80	17	0%	0%
WB	Left Turn	120	60	10	120	19	140	15	1%	0%
	Through	780	80	7	140	20	180	44	1%	0%
	Through/Right	780	60	9	100	22	140	40	0%	0%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	20	11	80	43	120	73	0%	0%
	Through	980	180	122	340	271	420	268	13%	1%
	Right Turn	160	40	32	100	81	140	70	0%	0%
NB	Left Turn	320	100	17	160	47	200	59	0%	0%
	Through	1,240	100	38	180	130	240	211	5%	0%
	Right Turn	100	20	16	80	37	120	4	2%	0%
SB	Left Turn	60	60	10	100	7	80	0	22%	0%
	Through	980	140	173	260	356	260	268	14%	3%
	Right Turn	120	20	13	60	47	80	52	0%	0%
WB	Left Turn	160	80	7	120	17	160	32	0%	0%
	Through	960	100	11	180	27	240	44	2%	0%
	Right Turn	260	20	3	20	29	60	82	0%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Side-street Stop

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,080	720	195	1,280	268	1,100	12	67%	13%
	Right Turn	140	100	20	220	8	160	0	0%	0%
NB	Left Turn	900	760	110	1,160	87	960	0	2%	65%
	Right Turn	160	180	18	220	39	180	0	88%	0%
WB	Left Turn	160	60	6	120	13	160	27	0%	0%
	Right Turn	160	20	0	20	0	20	0	0%	0%

Intersection 3

US-101 SB Ramps/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	520	520	16	520	39	520	7	0%	45%
	Right Turn	520	560	23	640	68	600	1	0%	86%
NB	Left Turn	1,000	120	11	200	30	280	62	9%	0%
	Right Turn	120	100	9	160	7	140	0	3%	0%
WB	Left Turn	440	320	22	420	33	440	24	1%	0%
	Through	680	100	20	220	100	340	206	0%	0%

Intersection 4

US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	680	100	11	180	23	240	51	0%	0%
	Right Turn	200	20	9	80	52	180	86	0%	0%
NB	Left Turn	1,520	220	16	360	78	500	256	2%	0%
	Right Turn	320	40	20	160	89	280	125	0%	0%
WB	Through	360	320	29	440	25	380	2	0%	9%
	Right Turn	360	20	6	60	23	100	26	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	80	9	140	19	180	35	0%	0%
	Through	400	140	11	220	21	280	41	16%	0%
	Right Turn	120	60	11	160	12	140	0	0%	0%
NB	Left Turn	260	180	17	260	29	260	21	2%	0%
	Left/Through	520	180	34	320	94	380	138	2%	1%
	Right Turn	260	20	16	100	65	200	103	0%	0%
SB	Left/Through	440	60	9	140	25	200	54	5%	0%
	Right Turn	80	60	6	120	5	100	0	10%	0%
WB	Left Turn	120	80	10	160	14	160	0	1%	0%
	Through	780	260	70	400	145	460	146	42%	0%
	Through/Right	780	220	64	380	140	420	147	0%	0%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	60	8	120	23	180	32	0%	0%
	Through	3,640	3,020	265	4,440	228	3,700	0	45%	53%
	Right Turn	160	160	11	260	5	180	0	2%	0%
NB	Left Turn	320	80	8	140	24	200	76	0%	0%
	Through	3,380	140	18	260	45	320	102	17%	0%
	Right Turn	100	60	15	160	16	120	0	2%	0%
SB	Left Turn	60	80	1	100	5	80	0	63%	0%
	Through	2,780	2,420	166	3,360	133	2,820	0	42%	64%
	Right Turn	120	20	9	100	34	120	40	0%	0%
WB	Left Turn	160	60	10	100	23	160	36	0%	0%
	Through	960	100	10	200	25	240	53	2%	0%
	Right Turn	260	20	4	20	30	60	84	0%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Side-street Stop

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,080	220	160	740	425	880	350	14%	3%
	Right Turn	140	60	17	160	28	160	2	1%	0%
NB	Left Turn	960	220	207	520	451	540	411	23%	7%
	Right Turn	160	40	29	120	82	140	73	4%	0%
WB	Left Turn	160	160	11	220	12	180	0	34%	0%
	Through	520	240	89	560	94	520	31	0%	6%

Intersection 3

US-101 SB Ramps/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	520	340	65	520	95	520	48	0%	10%
	Right Turn	520	260	81	540	148	540	88	0%	5%
NB	Left Turn	1,000	1,020	14	1,080	45	1,040	0	28%	83%
	Right Turn	120	140	3	160	18	140	0	44%	0%
WB	Left Turn	440	100	35	240	114	320	148	0%	0%
	Through	680	120	82	340	217	480	229	4%	1%

Intersection 4

US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	680	500	42	820	55	700	4	29%	3%
	Right Turn	200	60	14	180	30	220	0	0%	0%
NB	Left Turn	1,500	1,520	7	1,560	20	1,560	0	54%	80%
	Right Turn	320	320	16	380	59	340	0	1%	0%
WB	Through	360	120	16	200	28	240	44	0%	0%
	Right Turn	360	20	2	20	11	20	22	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	60	3	100	8	140	16	0%	0%
	Through	400	160	14	340	33	360	107	1%	0%
	Right Turn	120	100	11	180	2	140	0	12%	0%
NB	Left Turn	260	60	5	80	6	100	9	0%	0%
	Left/Through	1,940	40	4	60	7	80	16	0%	0%
	Right Turn	260	20	1	20	5	20	12	0%	0%
SB	Left/Through	1,020	40	5	80	12	120	29	2%	0%
	Right Turn	80	20	4	40	21	80	9	0%	0%
WB	Left Turn	120	60	6	120	14	140	14	1%	0%
	Through	780	80	7	140	18	180	27	2%	0%
	Through/Right	780	60	8	100	21	140	44	0%	0%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	20	5	60	26	100	66	0%	0%
	Through	980	220	153	440	347	500	343	18%	1%
	Right Turn	160	40	29	140	64	180	0	0%	0%
NB	Left Turn	320	100	8	140	12	160	21	0%	0%
	Through	1,240	100	19	160	31	200	46	6%	0%
	Right Turn	100	40	11	100	32	120	3	1%	0%
SB	Left Turn	60	60	6	100	4	80	0	27%	0%
	Through	980	120	71	220	198	280	250	15%	0%
	Right Turn	120	20	9	80	26	140	0	0%	0%
WB	Left Turn	160	80	5	140	14	180	17	1%	0%
	Through	960	120	7	200	28	260	70	1%	0%
	Right Turn	260	20	3	40	30	80	83	0%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Side-street Stop

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,080	920	148	1,300	134	1,100	6	74%	15%
	Right Turn	140	120	15	220	9	160	0	0%	0%
NB	Left Turn	1,100	1,120	2	1,140	4	1,160	0	6%	99%
	Right Turn	160	180	3	200	20	180	0	95%	0%
WB	Left Turn	160	100	10	160	14	180	9	1%	0%
	Through	520	20	9	60	68	140	180	0%	0%

Intersection 3

US-101 SB Ramps/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	520	520	3	520	21	520	6	0%	46%
	Right Turn	520	580	5	600	9	620	0	0%	93%
NB	Left Turn	980	200	54	400	136	460	165	26%	0%
	Right Turn	120	120	6	160	5	140	0	6%	0%
WB	Left Turn	440	320	13	400	24	440	39	1%	0%
	Through	680	100	16	260	77	520	202	0%	0%

Intersection 4

US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	680	100	9	160	23	200	64	0%	0%
	Right Turn	200	20	4	60	35	120	102	0%	0%
NB	Left Turn	1,500	260	21	460	73	640	135	3%	0%
	Right Turn	320	80	16	280	34	340	0	0%	0%
WB	Through	360	340	24	440	22	380	8	0%	16%
	Right Turn	360	20	5	60	30	120	91	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	100	8	160	16	180	20	0%	0%
	Through	400	140	10	220	20	260	33	16%	0%
	Right Turn	120	60	12	160	14	140	0	0%	0%
NB	Left Turn	260	200	28	280	32	280	6	4%	0%
	Left/Through	520	220	79	380	169	420	126	6%	5%
	Right Turn	260	40	32	160	75	280	2	0%	0%
SB	Left/Through	440	80	19	160	47	240	60	5%	0%
	Right Turn	80	60	5	120	3	100	0	13%	0%
WB	Left Turn	120	80	12	180	16	160	0	1%	0%
	Through	780	320	174	540	307	540	224	49%	9%
	Through/Right	780	300	175	520	313	520	233	0%	7%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	60	12	160	29	180	1	0%	0%
	Through	9,040	5,160	618	9,120	849	8,820	504	44%	7%
	Right Turn	160	160	15	260	6	180	0	1%	0%
NB	Left Turn	320	160	31	260	41	340	3	1%	0%
	Through	1,240	200	21	360	53	480	92	26%	0%
	Right Turn	100	80	9	160	5	120	0	2%	0%
SB	Left Turn	60	80	2	100	3	80	0	64%	0%
	Through	6,060	4,320	341	7,080	340	6,100	13	44%	29%
	Right Turn	120	40	11	120	27	140	0	0%	0%
WB	Left Turn	160	80	12	160	19	180	1	1%	0%
	Through	960	160	18	260	38	300	73	7%	0%
	Right Turn	260	20	8	40	40	80	73	0%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,040	80	4	160	12	230	31	0%	0%
	Through/Right	240	140	6	200	15	220	27	0%	0%
NB	Left Turn	220	20	4	60	8	80	15	0%	0%
	Right Turn	160	60	4	100	7	120	18	0%	0%
WB	Left Turn	160	160	9	200	7	180	1	12%	0%
	Through	500	100	43	320	101	400	164	0%	0%

Intersection 3

US-101 NB Ramps/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	500	120	6	200	24	260	80	0%	0%
	Right Turn	220	80	7	160	23	200	34	0%	0%
NB	Left Turn	960	240	44	480	90	640	170	15%	0%
	Right Turn	120	120	6	160	7	140	0	7%	0%
WB	Left Turn	440	160	11	260	25	340	90	0%	0%
	Through	660	60	11	220	49	400	111	0%	0%

Intersection 4

US-101 SB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	660	140	25	300	52	420	91	0%	0%
	Through/Right	660	260	33	440	60	480	82	0%	0%
NB	Left Turn	1,520	180	13	240	48	380	127	0%	0%
	Right Turn	320	180	15	280	23	320	6	1%	0%
WB	Through	360	80	8	120	12	140	28	0%	0%
	Right Turn	360	20	3	20	17	60	42	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	80	6	120	10	140	17	0%	0%
	Through	400	220	33	400	37	400	72	2%	1%
	Right Turn	120	100	8	180	2	140	0	12%	0%
NB	Left Turn	260	40	4	60	6	80	10	0%	0%
	Left/Through	1,320	60	4	100	8	120	22	0%	0%
	Right Turn	260	20	2	20	10	40	25	0%	0%
SB	Left/Through	2,280	40	5	80	10	120	28	3%	0%
	Right Turn	80	20	5	60	11	100	6	0%	0%
WB	Left Turn	120	60	5	100	9	120	17	1%	0%
	Through	4,220	60	7	120	23	160	44	0%	0%
	Through/Right	4,220	80	8	120	15	140	31	0%	0%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	40	9	100	32	180	36	0%	0%
	Through	9,040	220	131	420	332	540	373	15%	0%
	Right Turn	160	60	24	180	39	180	3	0%	0%
NB	Left Turn	320	120	18	200	40	260	78	0%	0%
	Through	1,240	160	24	280	58	360	115	18%	0%
	Right Turn	100	60	13	140	13	120	0	1%	0%
SB	Left Turn	60	60	5	100	2	80	0	28%	0%
	Through	6,060	120	20	220	45	300	59	20%	0%
	Right Turn	120	20	7	60	35	100	52	0%	0%
WB	Left Turn	160	120	14	200	16	180	1	15%	0%
	Through	960	220	104	440	253	560	271	7%	1%
	Right Turn	260	40	35	180	82	260	58	0%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,040	479	27	864	20	811	14	0%	10%
	Through/Right	240	220	22	280	16	280	12	0%	23%
NB	Left Turn	940	570	19	1,035	17	919	13	1%	40%
	Right Turn	160	180	4	200	9	180	0	54%	0%
WB	Left Turn	160	120	11	180	19	180	7	2%	0%
	Through	500	160	26	240	61	300	88	3%	0%

Intersection 3

US-101 SB Ramps/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	500	460	78	640	67	560	20	27%	17%
	Right Turn	220	240	2	240	4	240	0	47%	0%
NB	Left Turn	940	260	63	520	145	640	193	20%	0%
	Right Turn	120	120	8	160	36	140	47	13%	0%
WB	Left Turn	440	440	18	480	11	460	0	29%	0%
	Through	660	560	96	840	129	720	44	19%	8%

Intersection 4

US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	660	180	19	300	41	380	44	0%	0%
	Right Turn	660	60	32	220	101	380	92	0%	0%
NB	Left Turn	1,440	140	9	200	16	240	56	0%	0%
	Right Turn	320	160	11	260	23	300	31	0%	0%
WB	Through	360	380	5	400	15	400	10	0%	48%
	Right Turn	360	60	23	240	67	340	42	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	100	6	180	18	240	33	0%	0%
	Through	400	180	11	260	19	300	40	22%	0%
	Right Turn	120	100	11	180	5	140	0	0%	0%
NB	Left Turn	260	260	12	320	16	280	0	15%	0%
	Left/Through	1,220	1,020	161	1,600	68	1,280	6	50%	54%
	Right Turn	260	160	30	380	23	280	0	0%	0%
SB	Left/Through	2,280	140	36	280	83	360	117	7%	0%
	Right Turn	80	80	6	120	8	100	0	32%	0%
WB	Left Turn	120	100	15	180	9	140	0	2%	0%
	Through	4,220	1,620	354	3,100	786	3,000	859	78%	0%
	Through/Right	4,220	1,620	348	3,080	765	2,960	845	0%	0%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	60	10	140	24	180	0	0%	0%
	Through	9,040	5,020	566	9,000	913	8,500	708	44%	3%
	Right Turn	160	160	16	240	19	180	0	1%	0%
NB	Left Turn	320	140	21	240	39	320	48	1%	0%
	Through	1,240	180	27	320	46	400	53	28%	0%
	Right Turn	100	80	10	180	6	120	0	2%	0%
SB	Left Turn	60	80	1	100	2	80	0	65%	0%
	Through	6,060	4,320	321	7,200	271	6,100	0	40%	31%
	Right Turn	120	40	11	140	20	140	0	0%	0%
WB	Left Turn	160	80	16	140	33	160	38	1%	0%
	Through	960	140	17	240	36	300	66	5%	0%
	Right Turn	260	20	8	60	53	160	131	0%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	260	80	9	140	21	200	46	0%	0%
	Through/Right	260	140	8	200	15	220	20	0%	0%
NB	Left Turn	200	20	2	40	5	60	16	0%	0%
	Right Turn	160	60	4	80	7	100	19	0%	0%
WB	Left Turn	160	120	10	180	12	180	3	3%	0%
	Through	480	40	13	120	63	280	123	0%	0%

Intersection 3

US-101 NB Ramps/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	480	120	11	200	43	240	98	0%	0%
	Right Turn	220	80	10	140	23	200	49	0%	0%
NB	Left Turn	1,080	160	31	300	61	400	93	7%	0%
	Right Turn	120	100	7	160	4	140	0	5%	0%
WB	Left Turn	440	160	24	260	54	300	63	0%	0%
	Through	660	80	36	240	101	380	127	0%	0%

Intersection 4

US-101 SB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	660	140	25	320	51	420	94	0%	0%
	Through/Right	660	280	29	460	47	520	68	0%	0%
NB	Left Turn	1,460	160	23	260	114	380	241	0%	0%
	Right Turn	320	200	14	300	29	320	23	1%	0%
WB	Through	360	80	7	120	18	160	28	0%	0%
	Right Turn	360	20	1	20	8	40	23	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	80	9	120	18	140	39	0%	0%
	Through	400	240	24	420	36	400	77	2%	1%
	Right Turn	120	120	6	180	6	140	0	14%	0%
NB	Left Turn	260	40	3	60	7	80	13	0%	0%
	Left/Through	3,460	60	3	80	6	120	19	0%	0%
	Right Turn	260	20	1	20	6	40	16	0%	0%
SB	Left/Through	2,280	40	5	80	15	120	46	2%	0%
	Right Turn	80	20	6	60	16	100	6	0%	0%
WB	Left Turn	120	60	7	100	15	120	20	1%	0%
	Through	4,220	60	4	120	11	140	36	1%	0%
	Through/Right	4,220	80	6	120	9	160	27	0%	0%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	20	5	80	20	120	59	0%	0%
	Through	9,040	200	39	340	115	420	176	10%	0%
	Right Turn	160	60	17	180	28	180	2	0%	0%
NB	Left Turn	320	100	12	180	37	260	85	0%	0%
	Through	1,240	160	16	260	45	360	93	16%	0%
	Right Turn	100	60	10	140	16	120	0	0%	0%
SB	Left Turn	60	60	4	100	3	80	0	24%	0%
	Through	6,060	100	11	180	31	240	71	20%	0%
	Right Turn	120	20	5	40	32	80	63	0%	0%
WB	Left Turn	160	120	11	200	13	180	0	11%	0%
	Through	960	200	42	400	124	560	239	7%	0%
	Right Turn	260	40	21	140	73	240	86	0%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,060	580	21	1,200	22	1,090	6	0%	16%
	Through/Right	260	240	16	320	15	300	11	0%	28%
NB	Left Turn	880	610	19	1,210	10	990	13	2%	49%
	Right Turn	160	180	3	220	6	180	0	63%	0%
WB	Left Turn	160	100	10	160	17	180	6	1%	0%
	Through	480	160	14	240	18	300	50	2%	0%

Intersection 3

US-101 NB Ramps/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	480	460	46	660	16	540	13	36%	25%
	Right Turn	220	240	2	240	6	240	0	58%	0%
NB	Left Turn	1,060	200	32	380	70	460	92	18%	0%
	Right Turn	120	120	6	160	20	140	0	10%	0%
WB	Left Turn	440	420	10	500	6	460	0	26%	0%
	Through	660	520	54	900	47	720	14	15%	7%

Intersection 4

US-101 SB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	660	140	21	260	36	300	55	0%	0%
	Right Turn	660	20	17	140	86	280	166	0%	0%
NB	Left Turn	1,500	140	12	240	75	320	205	0%	0%
	Right Turn	320	160	13	260	22	300	28	0%	0%
WB	Through	360	380	4	400	7	400	9	0%	45%
	Right Turn	360	60	19	260	56	360	30	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	100	9	160	12	200	39	0%	0%
	Through	400	180	13	280	22	320	43	22%	0%
	Right Turn	120	100	12	180	4	140	0	1%	0%
NB	Left Turn	260	280	9	320	23	280	0	15%	0%
	Left/Through	3,460	2,540	377	4,420	173	3,520	1	49%	40%
	Right Turn	260	180	21	400	10	280	0	0%	0%
SB	Left/Through	2,280	120	21	260	47	320	65	7%	0%
	Right Turn	80	80	3	120	3	100	0	30%	0%
WB	Left Turn	120	100	11	200	8	140	0	2%	0%
	Through	4,220	1,820	447	3,460	738	3,200	731	78%	1%
	Through/Right	4,220	1,820	439	3,460	715	3,200	728	0%	0%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	60	9	140	24	180	1	0%	0%
	Through	9,040	5,380	913	9,460	1,087	8,980	233	44%	14%
	Right Turn	160	160	9	260	5	180	0	1%	0%
NB	Left Turn	320	140	17	240	36	300	52	0%	0%
	Through	1,240	180	26	320	58	420	152	26%	0%
	Right Turn	100	80	9	160	9	120	0	2%	0%
SB	Left Turn	60	80	1	100	4	80	1	65%	0%
	Through	6,060	4,360	377	7,020	253	6,100	12	41%	30%
	Right Turn	120	40	8	120	18	140	0	0%	0%
WB	Left Turn	160	80	11	160	25	180	17	2%	0%
	Through	960	160	19	280	62	340	92	7%	0%
	Right Turn	260	20	10	80	59	180	117	0%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,040	100	6	170	11	220	31	0%	0%
	Through/Right	240	140	9	220	13	220	26	0%	0%
NB	Left Turn	200	40	3	60	5	80	9	0%	0%
	Right Turn	160	80	5	120	9	140	12	0%	0%
WB	Left Turn	160	160	8	200	9	180	0	30%	0%
	Through	500	240	80	520	84	500	60	0%	2%

Intersection 3

US-101 SB Ramps/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	500	140	10	220	33	320	94	1%	0%
	Right Turn	220	100	14	180	25	240	9	0%	0%
NB	Left Turn	1,020	380	97	780	221	880	181	23%	3%
	Right Turn	120	120	5	160	6	140	0	10%	0%
WB	Left Turn	440	160	29	280	69	360	99	0%	0%
	Through	660	100	43	320	129	440	179	1%	0%

Intersection 4

US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	660	220	61	460	125	540	123	0%	0%
	Through/Right	660	340	73	600	124	620	80	0%	1%
NB	Left Turn	1,500	180	10	260	50	360	162	0%	0%
	Right Turn	320	180	17	280	33	320	32	0%	0%
WB	Through	360	80	8	120	12	160	19	0%	0%
	Right Turn	360	20	1	20	7	40	16	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	60	4	120	11	160	33	0%	0%
	Through	400	240	35	420	30	400	68	2%	1%
	Right Turn	120	120	13	180	16	140	0	13%	0%
NB	Left Turn	260	40	3	60	5	80	17	0%	0%
	Left/Through	1,540	60	7	100	11	100	17	0%	0%
	Right Turn	260	20	1	20	8	20	19	0%	0%
SB	Left/Through	2,280	40	6	80	18	120	24	3%	0%
	Right Turn	80	20	5	60	14	100	5	0%	0%
WB	Left Turn	120	60	6	100	12	120	15	0%	0%
	Through	4,220	60	8	100	16	140	23	0%	0%
	Through/Right	4,220	80	6	120	12	140	26	0%	0%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	40	5	80	25	140	57	0%	0%
	Through	9,040	180	17	300	39	360	53	10%	0%
	Right Turn	160	60	15	180	25	180	0	0%	0%
NB	Left Turn	320	120	16	200	39	260	64	0%	0%
	Through	1,240	160	26	280	53	340	82	20%	0%
	Right Turn	100	60	8	160	8	120	0	1%	0%
SB	Left Turn	60	60	4	100	4	80	0	24%	0%
	Through	6,060	120	19	220	45	260	71	20%	0%
	Right Turn	120	20	8	60	31	120	39	0%	0%
WB	Left Turn	160	140	9	220	11	180	0	19%	0%
	Through	960	260	97	520	241	640	246	8%	0%
	Right Turn	260	60	39	220	85	280	0	0%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,040	410	21	780	11	830	7	0%	11%
	Through/Right	240	240	17	280	12	280	10	0%	20%
NB	Left Turn	1,040	990	4	1,270	17	1,130	14	1%	42%
	Right Turn	160	180	0	180	2	180	0	62%	0%
WB	Left Turn	160	160	15	200	9	180	0	23%	0%
	Through	500	240	34	420	55	480	67	2%	0%

Intersection 3

US-101 SB Ramps/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	500	400	67	600	58	560	19	9%	6%
	Right Turn	220	220	4	240	10	240	0	30%	0%
NB	Left Turn	1,000	640	208	1,040	250	980	121	39%	26%
	Right Turn	120	140	7	160	15	140	0	23%	0%
WB	Left Turn	440	440	9	500	7	460	0	28%	0%
	Through	660	580	61	880	66	720	15	21%	10%

Intersection 4

US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	660	180	30	360	62	460	81	0%	0%
	Right Turn	660	120	45	380	99	500	57	0%	0%
NB	Left Turn	1,540	140	7	240	32	320	111	0%	0%
	Right Turn	320	160	14	260	33	300	34	0%	0%
WB	Through	360	380	6	400	17	400	9	0%	53%
	Right Turn	360	40	16	200	68	320	98	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	100	11	180	21	200	29	0%	0%
	Through	400	180	14	260	18	280	30	22%	0%
	Right Turn	120	80	13	180	7	140	0	0%	0%
NB	Left Turn	260	280	8	320	19	280	0	16%	0%
	Left/Through	1,100	960	82	1,460	40	1,160	6	53%	55%
	Right Turn	260	180	10	380	7	280	0	0%	0%
SB	Left/Through	2,280	160	45	320	101	380	114	8%	0%
	Right Turn	80	80	4	120	5	100	0	37%	0%
WB	Left Turn	120	100	11	200	7	140	0	1%	0%
	Through	4,220	2,360	302	4,460	448	4,040	357	83%	10%
	Through/Right	4,220	2,360	300	4,440	449	4,020	372	0%	9%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	60	9	160	33	200	42	0%	0%
	Through	980	4,220	1,037	7,340	1,517	7,400	1,040	44%	2%
	Right Turn	160	180	9	300	7	220	0	2%	0%
NB	Left Turn	320	260	39	420	31	360	0	29%	0%
	Through	1,240	400	185	820	395	900	379	31%	4%
	Right Turn	100	80	14	200	19	160	0	3%	0%
SB	Left Turn	60	120	2	120	7	120	0	70%	0%
	Through	980	3,080	578	5,200	923	5,100	713	59%	3%
	Right Turn	120	60	18	160	35	180	0	0%	0%
WB	Left Turn	160	80	11	160	21	220	21	1%	0%
	Through	960	140	13	260	27	300	40	6%	0%
	Right Turn	260	20	6	40	45	100	124	0%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,080	1,020	303	1,640	399	1,660	356	57%	1%
	Right Turn	140	160	19	260	10	200	0	0%	0%
NB	Left Turn	2,340	20	3	40	9	60	13	0%	0%
	Right Turn	160	60	6	100	14	120	19	0%	0%
SB	Left Turn	2,060	480	209	720	280	800	274	0%	0%
	Through	280	80	13	140	21	180	31	0%	0%
	Right Turn	280	60	11	120	21	160	35	0%	0%
WB	Left Turn	160	200	10	260	10	220	0	32%	0%
	Through	1,180	380	110	860	204	1,020	165	0%	0%

Intersection 3

US-101 SB Ramps/Lucas Valley Rd

Uncontrolled

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	520	20	19	140	107	380	240	0%	0%
	Right Turn	220	40	5	80	11	100	25	0%	0%
WB	Through/Right	680	100	67	380	164	540	103	0%	0%
	Right Turn	680	60	61	240	190	520	108	0%	0%

Intersection 4

US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	680	160	21	420	47	760	71	0%	0%
	Through/Right	680	240	33	380	64	460	65	0%	0%
NB	Left Turn	580	200	14	300	42	380	90	0%	0%
	Right Turn	320	200	19	320	31	340	34	2%	0%
WB	Through	360	60	5	120	16	140	30	0%	0%
	Right Turn	360	20	1	20	13	40	38	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	60	8	120	18	160	54	0%	0%
	Through	400	200	35	380	47	400	86	2%	0%
	Right Turn	120	140	11	240	5	180	0	15%	0%
NB	Left Turn	260	40	4	60	9	100	16	0%	0%
	Left/Through	520	60	3	100	9	120	20	0%	0%
	Right Turn	260	20	1	20	6	40	24	0%	0%
SB	Left/Through	440	40	4	80	7	100	9	2%	0%
	Right Turn	80	20	3	40	12	80	20	0%	0%
WB	Left Turn	120	60	6	120	20	140	26	1%	0%
	Through	780	60	4	100	18	140	51	0%	0%
	Through/Right	780	80	5	120	8	140	14	0%	0%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	40	7	80	36	140	77	0%	0%
	Through	980	160	12	280	33	340	65	8%	0%
	Right Turn	160	40	6	160	15	220	0	0%	0%
NB	Left Turn	320	140	29	240	68	280	63	3%	0%
	Through	1,240	160	36	300	142	400	226	15%	0%
	Right Turn	100	40	14	140	48	140	47	0%	0%
SB	Left Turn	60	80	5	120	7	120	2	21%	0%
	Through	980	80	9	140	21	180	37	20%	0%
	Right Turn	120	20	2	20	23	60	76	0%	0%
WB	Left Turn	160	120	14	220	22	220	1	12%	0%
	Through	960	180	39	320	120	400	179	6%	0%
	Right Turn	260	40	15	120	64	220	118	0%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,080	320	57	560	94	680	96	41%	0%
	Right Turn	140	80	15	200	25	200	0	0%	0%
NB	Left Turn	2,340	140	21	260	18	240	9	3%	5%
	Right Turn	160	240	20	400	32	520	38	12%	0%
SB	Left Turn	2,060	160	14	220	34	260	39	0%	1%
	Through	280	40	5	80	10	100	21	0%	0%
	Right Turn	280	60	5	100	10	120	17	0%	0%
WB	Left Turn	160	120	6	180	16	220	13	4%	0%
	Through	1,180	180	20	460	43	680	68	2%	0%

Intersection 3

US-101 SB Ramps/Lucas Valley Rd

Uncontrolled

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	520	40	36	180	157	480	250	0%	0%
	Right Turn	220	100	8	200	14	240	26	1%	0%
WB	Through/Right	680	60	16	240	64	420	94	0%	0%
	Right Turn	680	20	23	120	118	260	227	0%	0%

Intersection 4

US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	680	160	36	400	74	660	82	0%	0%
	Through/Right	680	180	14	280	29	320	43	0%	0%
NB	Left Turn	580	160	6	240	17	280	55	0%	0%
	Right Turn	320	160	16	260	34	300	43	0%	0%
WB	Through	360	180	12	280	25	320	40	0%	0%
	Right Turn	360	20	7	100	32	200	82	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	100	8	160	17	180	27	0%	0%
	Through	400	140	12	200	22	240	41	17%	0%
	Right Turn	120	40	9	140	20	180	0	0%	0%
NB	Left Turn	260	200	6	280	22	320	13	1%	0%
	Left/Through	520	200	15	320	59	380	115	3%	0%
	Right Turn	260	20	13	80	61	140	123	0%	0%
SB	Left/Through	440	80	16	180	44	260	67	5%	0%
	Right Turn	80	80	7	140	9	140	0	19%	0%
WB	Left Turn	120	80	8	200	15	180	0	1%	0%
	Through	780	220	16	340	37	360	58	34%	0%
	Through/Right	780	220	14	340	33	360	40	0%	0%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	60	12	140	28	180	1	0%	0%
	Through	980	5,120	997	8,700	1,598	8,280	1,093	42%	8%
	Right Turn	160	160	7	260	5	180	0	1%	0%
NB	Left Turn	320	160	30	280	53	320	43	2%	0%
	Through	1,240	180	25	340	61	420	110	27%	0%
	Right Turn	100	80	11	160	6	120	0	2%	0%
SB	Left Turn	60	80	2	100	2	80	0	58%	0%
	Through	980	4,620	301	7,360	114	6,100	13	51%	43%
	Right Turn	120	40	11	120	27	140	4	0%	0%
WB	Left Turn	160	80	11	160	25	180	2	1%	0%
	Through	960	160	9	280	30	380	72	7%	0%
	Right Turn	260	20	13	100	65	200	113	0%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,080	620	220	1,060	343	1,140	344	52%	0%
	Right Turn	140	120	9	200	4	160	0	0%	0%
NB	Left Turn	2,340	40	7	80	24	120	49	0%	0%
	Right Turn	160	60	10	120	19	140	31	0%	0%
SB	Left Turn	2,060	580	253	880	314	940	291	0%	0%
	Through	280	240	30	340	17	320	18	0%	11%
	Right Turn	280	100	23	200	50	260	39	0%	0%
WB	Left Turn	160	160	9	200	7	180	0	41%	0%
	Through	1,180	620	259	1,000	265	1,020	180	50%	4%

Intersection 3 US-101 SB Ramps/Lucas Valley Rd Uncontrolled

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	520	20	16	100	92	220	209	0%	0%
	Right Turn	220	20	6	80	11	80	14	0%	0%
WB	Through/Right	680	260	211	540	242	560	128	0%	4%
	Right Turn	680	220	213	520	267	540	144	0%	4%

Intersection 4 US-101 NB Ramps/Smith Ranch Rd Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	680	160	30	360	78	560	93	0%	0%
	Through/Right	680	240	35	380	77	440	88	0%	0%
NB	Left Turn	580	240	76	420	164	520	201	5%	0%
	Right Turn	320	200	29	320	44	340	6	2%	0%
WB	Through	360	80	35	180	84	220	102	0%	1%
	Right Turn	360	20	3	40	28	60	83	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	80	5	120	8	140	14	0%	0%
	Through	400	240	30	420	38	400	82	2%	1%
	Right Turn	120	120	10	180	7	140	0	12%	0%
NB	Left Turn	260	40	5	60	9	80	17	0%	0%
	Left/Through	520	60	4	100	8	100	13	0%	0%
	Right Turn	260	20	2	20	10	40	22	0%	0%
SB	Left/Through	440	40	4	80	10	120	25	3%	0%
	Right Turn	80	20	5	60	15	100	11	0%	0%
WB	Left Turn	120	60	5	120	10	140	11	1%	0%
	Through	780	60	6	120	13	160	30	1%	0%
	Through/Right	780	80	6	140	11	180	29	0%	0%

Intersection 1

Las Gallinas Ave/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	160	40	6	100	33	160	76	0%	0%
	Through	980	180	10	300	26	360	56	9%	0%
	Right Turn	160	40	18	140	56	200	48	0%	0%
NB	Left Turn	320	140	20	240	41	340	67	1%	0%
	Through	1,240	160	16	280	47	420	109	18%	0%
	Right Turn	100	60	11	160	18	160	0	0%	0%
SB	Left Turn	60	80	5	120	7	120	1	21%	0%
	Through	980	80	10	160	24	200	27	21%	0%
	Right Turn	120	20	2	20	16	40	66	0%	0%
WB	Left Turn	160	140	24	240	23	220	0	25%	0%
	Through	960	260	149	540	331	640	316	7%	1%
	Right Turn	260	60	47	200	127	240	113	0%	0%

Intersection 2

Los Gamos Dr/Lucas Valley Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	1,080	380	166	660	243	720	207	50%	1%
	Right Turn	140	100	21	220	28	200	0	0%	0%
NB	Left Turn	2,340	180	32	320	17	280	14	2%	11%
	Right Turn	160	360	147	680	233	860	236	23%	0%
SB	Left Turn	2,060	120	8	180	13	200	17	0%	0%
	Through	280	80	9	140	21	160	28	0%	0%
	Right Turn	280	60	3	100	6	140	18	0%	0%
WB	Left Turn	160	100	10	160	16	200	15	2%	0%
	Through	1,180	120	21	340	44	580	60	0%	0%

Intersection 3

US-101 SB Ramps/Lucas Valley Rd

Uncontrolled

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	520	60	40	220	157	480	252	0%	0%
	Right Turn	220	100	9	200	16	220	19	0%	0%
WB	Through/Right	680	60	20	240	68	440	55	0%	0%
	Right Turn	680	40	24	180	105	360	182	0%	0%

Intersection 4

US-101 NB Ramps/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Through	680	140	37	380	70	700	75	0%	0%
	Through/Right	680	120	10	220	28	300	60	0%	0%
NB	Left Turn	580	140	18	240	95	340	292	0%	0%
	Right Turn	320	160	17	260	36	300	60	1%	0%
WB	Through	360	200	27	380	61	540	86	0%	0%
	Right Turn	360	20	7	80	26	140	52	0%	0%

Intersection 5

Redwood Dr/Smith Ranch Rd

Signal

Direction	Lane Group	Storage (ft)	Average Queue (ft)		95th Queue (ft)		Maximum Queue (ft)		Block Time	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Pocket	Upstream
EB	Left Turn	260	100	11	180	25	220	32	0%	0%
	Through	400	140	6	200	12	260	28	17%	0%
	Right Turn	120	40	11	140	26	180	0	0%	0%
NB	Left Turn	260	200	11	280	13	320	12	1%	0%
	Left/Through	520	200	16	320	52	420	161	3%	0%
	Right Turn	260	20	9	80	56	180	128	0%	0%
SB	Left/Through	440	100	35	260	99	340	122	7%	0%
	Right Turn	80	100	8	140	8	140	0	25%	0%
WB	Left Turn	120	100	12	200	14	180	1	2%	0%
	Through	780	220	25	340	51	380	69	32%	0%
	Through/Right	780	220	22	340	44	380	56	0%	0%