

APPENDIX A

Notice of Preparation



NOTICE OF PREPARATION

DRAFT ENVIRONMENTAL IMPACT REPORT

TO: REVIEWING AGENCIES

**FROM: CITY OF MANTECA
Community Development Dept.
1001 W. Center Street
Manteca, CA 95337**

Subject: Notice of Preparation of a Draft Environmental Impact Report

The City of Manteca will be the Lead Agency and will prepare an environmental impact report (EIR) for the project identified below. We need to know your views as to the scope and content of the environmental information that is germane to your agency's statutory responsibilities or your interests in connection with the proposed project. Your agency will need to use the EIR when considering your permit or other approval for the project.

The project description, location, and a summary of the environmental issues to be evaluated in the EIR are contained in the attached materials.

Due to the time limits mandated by State law, your responses must be sent at the earliest possible date but not later than 30 days after receipt of this notice.

Please send your response to **Erika Hollander, Senior Planner**, at the address shown above. We will need the name for a contact person in your agency.

Project Title: Union Crossing EIR

Project Applicant: William Filios. 1132 Norman Dr., Manteca, CA 95336

SCOPING MEETING: Date & Time: Thursday, October 2, 2008, 3:00 p.m.

LOCATION: COUNCIL CHAMBERS
CITY OF MANTECA
1001 W. CENTER STREET
MANTECA, CA 95337

Date 9/19/08 Signature L. Rey for EH

Title: Senior Planner
Telephone: (209) 239-3156
Facsimile: (209) 825-2349
Email: ehollander@ci.manteca.ca.us

1 INTRODUCTION

In accordance with the California Environmental Quality Act (CEQA) and the State CEQA Guidelines, the City of Manteca (City) (as lead agency) will be preparing an environmental impact report (EIR) to evaluate the environmental effects associated with the proposed Union Crossing project. The proposed project involves development of a commercial retail center that would include restaurant uses within the southern portion of the city of Manteca, San Joaquin County, California (Exhibit 1). The EIR will identify any significant environmental impacts of the project and recommend mitigation measures to reduce the project's environmental impacts where feasible.

In accordance with Section 15082 of the State CEQA Guidelines, the City of Manteca has prepared this notice of preparation (NOP) to provide responsible and trustee agencies and other interested parties with information describing the project and the issue areas that will be evaluated in the EIR.

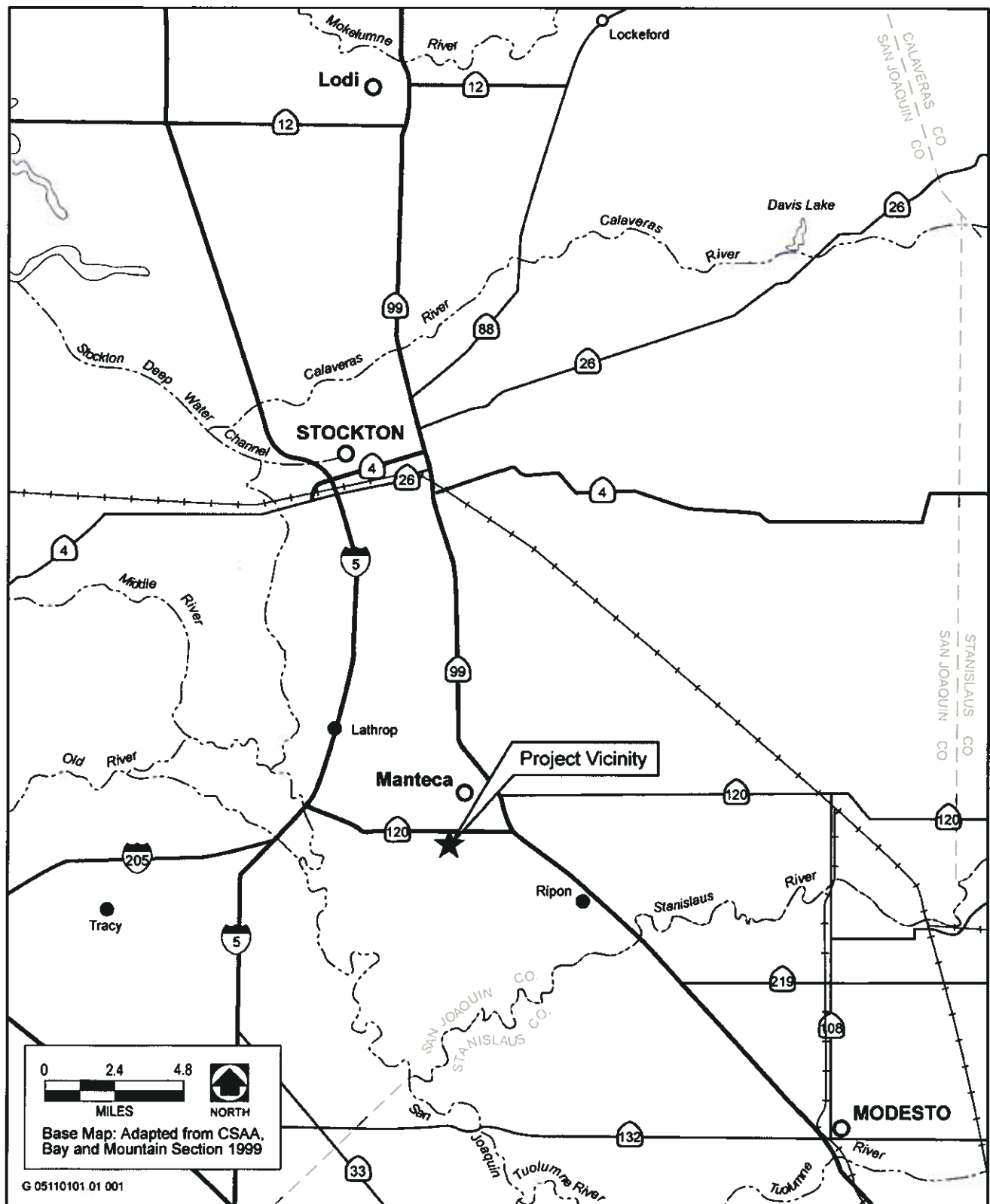
2 PROJECT LOCATION AND CURRENT USE

The project site is approximately 65 acres (including a portion of Woodward Avenue and the three residential parcels in the southwestern portion of the site that are not proposed for development) and is located in the southern portion of the city of Manteca (Exhibit 1). The project site is located immediately south of State Route 120 (SR 120), approximately 2 miles west of State Route 99 (SR 99), and 4 miles east of Interstate 5 (I-5). The site is generally bounded by SR 120 to the north; agricultural land and residential homesites to the west and south; and South Union Road and a new residential subdivision and commercial development to the east (Exhibit 2).

Existing uses on the project site include row crops, an orchard, a rural residence in the southeastern portion of the site, and three additional rural residences in the southwestern portion of the site. In general, agricultural uses are the predominant land use in the project vicinity. However, with adoption of the City of Manteca General Plan (City General Plan) in 2003 and designation of the area for urban land uses, the area is experiencing an increasing number of development applications to convert agricultural lands to urban development. Low-density single-family residential subdivisions are developed to the north, directly across SR 120. In addition, several new residential subdivisions and a commercial center are under development or are proceeding through the development entitlement process to the south, east, and west of the project site.

The project site is located outside of the city limits, but within the City of Manteca's sphere of influence (SOI) and the City's Primary Urban Service Boundary. As a result, implementation of the project would require the annexation of the project site to the city. An annexation is the incorporation of land and water area into an existing community (e.g., City of Manteca) with a resulting change in the boundaries of that community. The State of California has delegated the authority for approving annexations to the San Joaquin County Local Agency Formation Commission (LAFCO). The San Joaquin County LAFCO would be the agency responsible for approving the annexation of the project to the city.

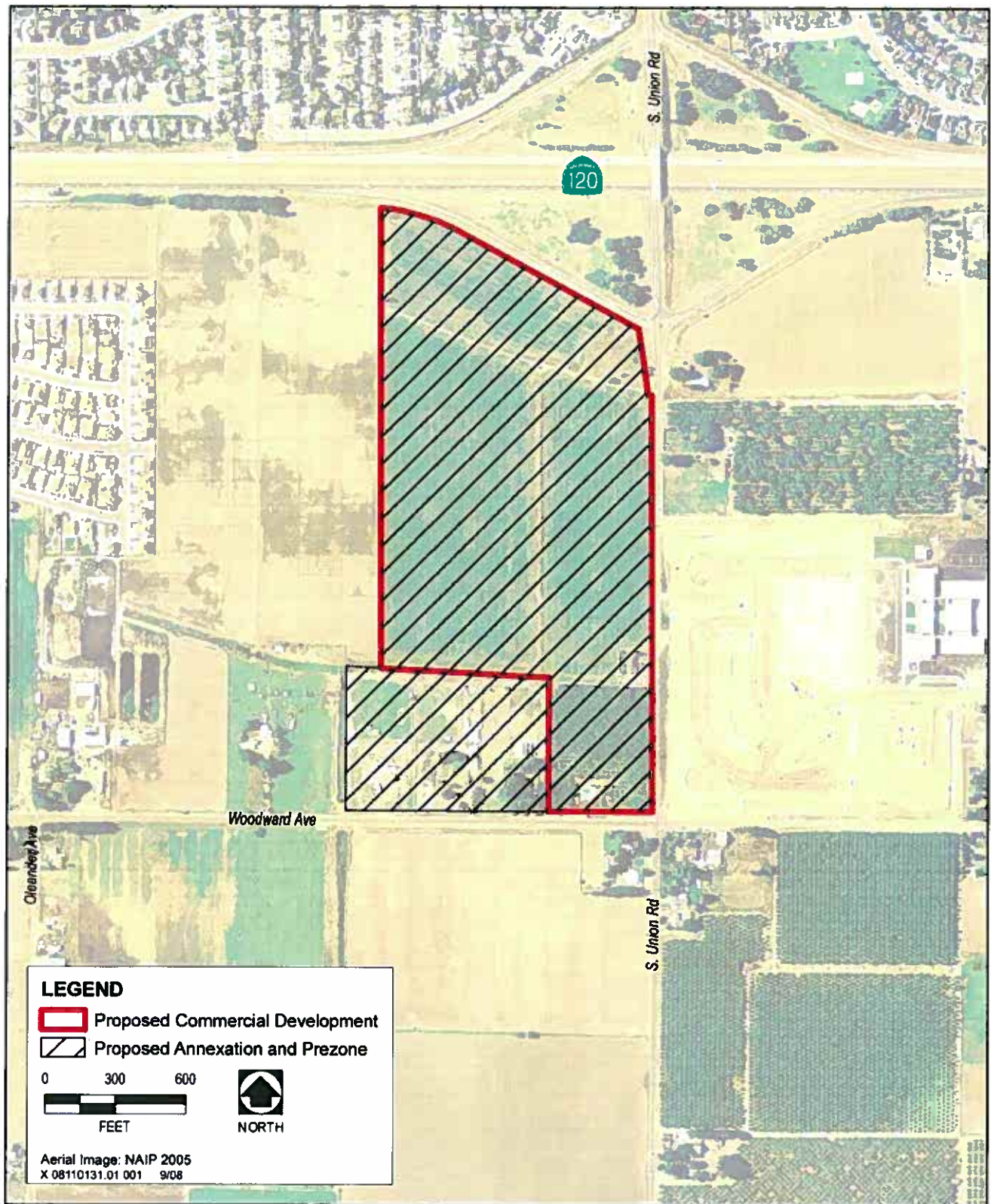
The City General Plan, which was updated in October 2003, designates the site for General Commercial (GC), Medium Density Residential (MDR), and Low Density Residential (LDR) land uses. Surrounding general plan designations include LDR and GC. The proposed project includes the rezoning and annexation of the site to the city of Manteca. Once annexed, the project site would be subject to the planning jurisdiction of the City of Manteca.



Source: Adapted by EDAW in 2005

Regional Map

Exhibit 1



Source: San Joaquin County 1999; NAIP 2005

Project Location Map

Exhibit 2

3 PROJECT CHARACTERISTICS

The three primary components of the proposed project consist of (1) a northern retail site consisting of approximately 229,200 square feet of retail and restaurant space on approximately 22.7 acres, (2) a central retail site consisting of approximately 178,300 square feet of retail and restaurant space on approximately 20 acres, and (3) a southern retail site consisting of 47,500 square feet of retail and restaurant space on approximately 5.8 acres (Exhibit 3). These project components would be constructed in three separate phases as described below (Exhibit 3). Although not currently proposed, some retail uses may be replaced by office uses if the market demands. This change in use is consistent with the current and proposed General Commercial (GC) zoning of the site.

As part of the project, the proposed southern retail site would require a general plan amendment to redesignate the southern retail site from Low Density Residential (LDR) to General Commercial (CG). In addition, the annexation and prezone of three residential parcels (10.9 acres) and a portion of Woodward Avenue (1.7 acres) in the southwestern portion of the site are proposed. No development is proposed at Woodward Avenue and for these three parcels.

PHASE 1—NORTHERN RETAIL SITE

As shown in Exhibit 3, the project site would extend in a north-south direction across the site, with primary vehicular access provided by the proposed extension of Atherton Drive.

The extension of Atherton Drive through the site (3.9 acres) and approximately 229,200 square feet of retail space north of the proposed Atherton Drive extension would be developed. Buildings in this portion of the site would range in size from 3,500 square feet to 31,400 square feet and would be surrounded by a central parking area that would include 1,023 stalls.

PHASE 2—CENTRAL RETAIL SITE

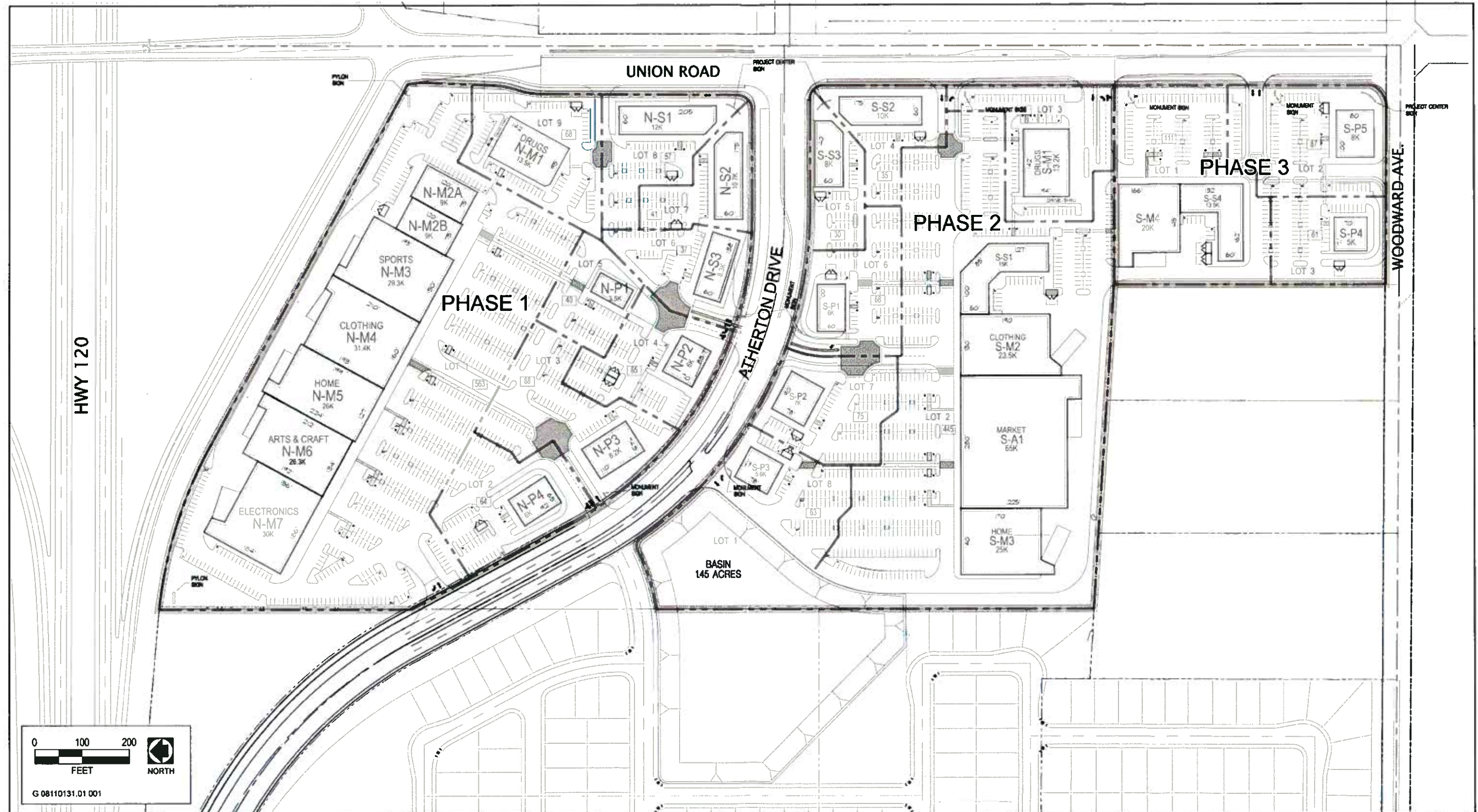
The central retail site would consist of approximately 178,300 square feet of retail and restaurant space just south of the proposed Atherton Drive extension. Buildings in this portion of the site would also surround a central parking area that would include 774 stalls. On-site buildings would range in size from 5,600 square feet to 65,000 square feet. In addition, an approximately 1.5-acre stormwater detention basin would be constructed adjacent to the western project boundary and would serve the entire project site.

PHASE 3—SOUTHERN RETAIL SITE

Improvements proposed as part of Phase 3 include the development of approximately 47,500 square feet of retail and restaurant space within the southern portion of the project site. Southern retail site buildings would range in size from approximately 6,000 square feet to 20,000 square feet. The parking area for Phase 3 would include 259 stalls. A general plan amendment redesignating the parcel from Low Density Residential (LDR) to General Commercial (CG) is also proposed.

ACCESS AND CIRCULATION

As shown in Exhibit 3, the project would include a series of public access and circulation improvements to facilitate movement within the site and to and from surrounding areas. Primary access to the site would be provided via a new planned roadway, Atherton Drive. This east-west roadway would provide two lanes in each direction and would serve as a divider between the northern and central retail sites. Five entrances on Atherton Drive would provide ingress and egress to the site. Right-in-, right-out-only entrances/exits to the site on South Union Road would also be provided. For the southern retail site, entrances/exits would be provided on South Union Road and Woodward Avenue.



Source: Nadel Retail Architects, LLP, July 23, 2008; EDAW August 2008

Site Plan

Exhibit 3

4 REQUESTED ENTITLEMENTS

Implementation of the Union Crossing project would require several entitlements from the City of Manteca. Approvals required for the project include, but are not limited to, the following:

- ▶ a general plan amendment redesignating the 6.3-acre parcel (Phase 3 of the project) on the northwest corner of Union Road and Woodward Avenue from Low Density Residential (LDR) to General Commercial (CG);
- ▶ rezoning of the retail commercial site to C-G (General Commercial);
- ▶ development agreement between the City and the developer;
- ▶ site development plan;
- ▶ tentative subdivision map;
- ▶ ministerial grading, foundation and building permits;
- ▶ planned unit development;
- ▶ master sign program;
- ▶ prezone and annexation of the 3 residential parcels and the adjacent portion of Woodward Avenue where no development is proposed; and
- ▶ other agency permits to implement the proposed project, as may be required.

The project will also require approval of annexation of the project site to the City of Manteca from the San Joaquin County Local Agency Formation Commission (LAFCO). Other agencies that may require permission or approvals may include, but are not limited to, the San Joaquin Valley Air Pollution Control District, South San Joaquin Irrigation District, United States Army Corps of Engineers, Central Valley Regional Water Control Board, and California Department of Fish and Game.

5 POTENTIAL ENVIRONMENTAL EFFECTS

The EIR will identify and describe the potential environmental impacts associated with implementation of the Union Crossing project as described below. Mitigation measures will be recommended where appropriate to reduce potentially significant and significant impacts. The following issues are proposed for analysis.

5.1 AESTHETICS

The project would change land uses on the site from primarily agricultural to a commercial development. The EIR will describe the visual changes that would occur with the project including the potential visibility of the project from surrounding uses. Because the project includes wall- and pole-mounted lighting that could exceed the City's maximum height requirements, the EIR will include a discussion of the project's potential nighttime lighting and glare impacts to off-site receptors.

5.2 LAND USE AND AGRICULTURAL RESOURCES

The site contains single-family residences, an orchard, and row crops. The site is generally bounded by SR 120 to the north, South Union Road to the east, and agricultural uses to the west. The EIR will evaluate the project's effect on existing agricultural resources on and adjacent to the site, including impacts to important farmlands.

Because the applicant would be required to apply for annexation of the site to the City, this process will be described and mitigation measures will be recommended, if necessary.

5.3 AIR QUALITY

The EIR will describe regional and local air quality in the vicinity of the project site and evaluate construction and operational impacts to air quality. The project's estimated air emissions will be quantified and compared to emissions thresholds of the San Joaquin Valley Unified Air Pollution Control District. The EIR will evaluate the construction, stationary source, mobile source, and carbon monoxide emissions that would be generated by project activities. With respect to global climate change, the analysis will include a calculation of the project's generation of greenhouse gas emissions and an assessment of whether this generation constitutes a substantial contribution to global climate change.

5.4 BIOLOGICAL RESOURCES

Botanical and wildlife surveys of the project site and surrounding area will be conducted and summarized in the EIR as appropriate. The project site lies within the area covered by the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (SJMSCP). To the degree the project affects habitat and species covered under the SJMSCP, it will be identified and mitigated consistent with the SJMSCP.

5.5 CULTURAL RESOURCES

The EIR will include a cultural resource impact assessment for the project site and will consider historic resources in connection with existing buildings and other resources on the project site. Field surveys of the project site and a literature review will be completed and summarized in the EIR. Mitigation measures will be recommended, if necessary.

5.6 GEOLOGY AND SOILS

The EIR will summarize the results of a preliminary geotechnical investigation, will describe the project's potential exposure to geologic hazards (i.e., earthquakes, liquefaction, etc.), and will describe the project's potential effects on soil erosion. The project site is not located in an area of known mineral resources, nor are any expected to be encountered during project development. As such, no impacts related to mineral resources are anticipated. Thus, this issue will not be evaluated further in the EIR.

5.7 PALEONTOLOGICAL RESOURCES

The EIR will include a paleontological resources assessment for the project site. A field survey and a literature review related to geologic formations and recorded paleontological resources in the vicinity of the project site will be completed and summarized in the EIR. Mitigation measures will be recommended, if necessary.

5.8 HAZARDS AND HAZARDOUS MATERIALS

The EIR will summarize the results of a Phase I Environmental Site Assessment prepared for the project site and will evaluate the operational characteristics of the project to determine potential impacts related to use of hazardous materials and potential affect to existing emergency response plans. Mitigation measures will be recommended, if necessary.

5.9 HYDROLOGY AND WATER QUALITY

Implementation of the proposed project would create additional impervious surfaces on the project site. The additional runoff caused by the increase in impervious surfaces would lead to an increase in stormwater runoff,

which would be conveyed to an on-site detention basin. The EIR will evaluate the project's stormwater, flooding, and water quality impacts. In addition, the EIR will summarize hydrology and water quality data associated with the project area and describe the project's effect on alteration of drainage patterns, erosion, stormwater discharges, and flooding. Mitigation measures will be recommended, if necessary.

5.10 NOISE

The EIR will describe the project's construction and operational noise impacts including noise generated from existing and proposed traffic and will compare these impacts to applicable noise thresholds. Mitigation measures will be recommended, if necessary.

5.11 EMPLOYMENT, POPULATION AND HOUSING

The EIR will evaluate the project's effect on employment, population and housing in the local area based on projections of project employment and distribution of their residences. Mitigation measures will be recommended, if necessary.

5.12 PUBLIC SERVICES

The EIR will evaluate the adequacy of existing public services and the potential need for additional fire, police, and waste disposal services. Mitigation measures will be recommended, if necessary.

The project does not include proposals for new housing. Therefore, the project would not generate students or increase demands for school services or facilities. As such, no impacts related to school services or facilities are anticipated, and this issue area will not be evaluated further in the EIR.

5.13 RECREATION

The project is a commercial development that would provide new employment opportunities. The project does not include proposals for new housing. Therefore, the project would not increase demands for park or other recreational facilities and would not result in accelerated physical deterioration of existing recreational facilities. As such, no impacts related to recreational resources are anticipated. This issue will not be evaluated further in the EIR.

5.14 TRANSPORTATION/TRAFFIC

The EIR will evaluate the project's impact to regional and local transportation facilities based on a transportation analysis that will assess daily trips, access, and parking. Mitigation measures will be recommended, if necessary.

5.15 UTILITIES AND SERVICE SYSTEMS

The EIR will analyze the current capacity of the City's water and wastewater systems and the project's impact on these systems. An analysis of regional water supply conditions will be provided. The EIR will describe the existing gas and electrical facilities within the project vicinity, and provide an impact analysis of the utility line construction. The EIR will also describe the existing solid waste facilities that serve the site. Mitigation measures will be recommended, if necessary.

APPENDIX B

Union Crossing Parking Lot Lighting Study



**Union Crossing Parking Lot Lighting Study
City of Manteca, CA
Prepared by Auerbach Glasow French**

Executive Summary

- The original calculation does not meet illuminance or uniformity standards
- Glare and light trespass issues exist in the original calculation
- Although within Title 24 the original calculation has a higher watts per square foot value than is needed
- Trees have not been coordinated with luminaire locations, blocking the lighting

Summary of Recommendations

- Relocate and reconfigure luminaires per the alternate calculation
- Illuminance and uniformity standards are met
- Total fixture count and watts per square foot are reduced
- Glare and light trespass are within accepted norms
- Trees have been removed in some locations to coordinate with luminaire locations

Process

Lighting levels, light trespass, and high-angle glare were assessed for the parking lot and adjacent areas of Union Crossing shopping center in Manteca, CA. Calculations were prepared by Auerbach Glasow French (AGF), using AGI32 v2.0, by Lighting Analysts, using a calculation file provided by EDAW as a template. It should be noted that the calculation file provided by EDAW did not include buildings or trees. The template file also had lamp wattages and light loss factors that were modified in both subsequent calculations done by AGF. Site layout, landscaping, fixture layouts, and photometric files were based on the materials provided by EDAW. Calculations were run to assess horizontal and vertical light levels, glare, and light trespass.

Results were analyzed based on lighting recommendations published by the International Engineering Society of North America (IESNA), California Energy Commission (CEC), the International Dark-Sky Association (IDA), discussions with EDAW and the city of Manteca.

Calculations

AGF calculated both an original calculation and a recommended alternate calculation. Both calculation models include mature trees and planting, arranged according to the most recent landscape plans provided to EDAW. Buildings were also included in the calculations. Following standard industry practice, all calculations are for maintained footcandle levels. This allows for the normal depreciation of light output over life due to the accumulation of dirt on the fixture and reduction in output from the lamp, known as light loss factors. Photometric reports are included in the document (Appendix C1, C2, C3 and C4). The following input data was used:

Original calculation:

Six different fixture types utilizing three different fixture heads were used mounted on three different pole heights (15', 20' and 25'). AGF modified the wattage of fixtures from the template. Two different wattage metal halide lamps were used, a 100 watt lamp with 9500 initial lumens and a 175 watt lamp with 16000 initial lumens. All fixtures in the original calculation were left in place and the orientation and type of the fixture optics were not changed.



A lamp lumen depreciation value of 0.75 was used for the 100W lamp and 0.7 for the 175W lamp. A ballast factor of 1.1 was used for both lamps. A luminaire dirt depreciation value of 0.87 was assumed for all luminaires, yielding a light loss factor of 0.718 and 0.67 respectively.

Buildings and trees were added to the calculation file template. All trees in the original landscape plan were input into the calculation.

Alternate calculation:

Five different fixture types utilizing two different fixture heads were used mounted on three different pole heights (15', 20' and 30'). Two different wattage ceramic metal halide lamps were used, a 100 watt lamp with 9500 initial lumens and 150 watt lamp with 14000 initial lumens. Fixtures were relocated and the orientation and type of the fixture optics were modified. Total fixture quantities were reduced and the 175 watt lamp from the original calculation was reduced to 150 watts.

A lamp lumen depreciation value of 0.75 was used for the 100W lamps and 0.71 for 150W lamps. A ballast factor of 1.1 was used for the 100 watt lamp and 1.0 for the 150 watt lamp. A luminaire dirt depreciation value of 0.87 was assumed for all luminaires, yielding a light loss factor of 0.718 and 0.618 respectively.

Buildings and trees were added to the calculation file template. Some trees in the original landscape plan were removed that were close to pole locations.

Lighting Code Recommendations for Parking Lots

Table 1 summarizes the lighting level recommendations from Section 22 of the IESNA Handbook, 9th Edition.

Table 1 - Recommended maintained illuminance for parking lots

Recommended Average Horizontal Illuminance at pavement	1.0 fc
Minimum Horizontal Illuminance at pavement	0.2 fc
Horizontal Uniformity Ratio, Maximum-to-Minimum	20:1
Minimum Vertical Illuminance at 5' above pavement	0.1 fc

The maximum allowed lighting power densities prescribed by the CEC in Title 24 are based upon the Lighting Zone the site is located within. According to the CEC, those areas not designated as a park, recreation area, or wildlife preserve, or otherwise redefined by a local jurisdiction, shall be considered in Lighting Zone 2 if the property is located in a rural census tract, and Lighting Zone 3 if the area is located in an urban census tract, per the U.S. 2007 Census map. The Union Crossing site will be considered an urban tract [Appendix A], and is therefore in Lighting Zone 3. Title 24 allows a maximum of 0.15 watts per square foot for site lighting in this Lighting Zone. Both the original and the alternate calculation comply with Title 24 although the alternate has a lower overall lighting power density.

Results

The results of these calculations are summarized and compared to the recommended criteria in Table 2. Values that fail to meet the criteria are shown in red.



Table 2 – Comparison of recommended versus calculated lighting values.

IESNA Handbook			
Criteria	Recommended Value	Original Value	Alternate Value
Average Horizontal Illuminance at pavement	1.0 fc	1.73 fc	1.56 fc
Minimum Horizontal Illuminance at pavement	0.2 fc	0.1 fc	0.2 fc
Horizontal Uniformity Ratio, Maximum-to-Minimum	20:1	63:1	19.5:1
Minimum Vertical Illuminance at 5' above pavement	0.1 fc	0.0	0.1
Title 24			
Criteria	Allowed Value	Original Value	Alternate Value
Lighting Power Density	0.15 W/sq. ft.	0.0425 W/sq. ft.	0.0309 W/sq. ft.

Light Trespass

To assess light trespass, vertical light levels at 4' to 6' above the ground were calculated at the site boundaries and entries (Appendix B). In the original calculation, the highest light level is 4.3 footcandles with several areas with averages above 1 footcandle. This would be considered light trespass at the project boundaries.

Based on AGF's alternate calculation, fixtures were fitted with house-side shields and optics were oriented away from the site boundary. In general, light trespass in the alternate layout is significantly reduced from the original layout. The highest calculated value is 1.2 footcandles and averages are all below 0.25. This would not be considered significant light trespass.

Table 3 – Summary of light levels at site entries and boundaries.

Site entries and boundaries*	Original		Alternate	
	Avg.	Max.	Avg.	Max.
Entry 1	0.68	2.1	0.01	0.1
Entry 2	0.00	0.0	0.00	0.0
Entry 3	2.32	2.9	0.00	0.0
Entry 4	1.81	2.8	0.10	0.1
Entry 5	0.04	0.2	0.01	0.1
Boundary 1	0.00	0.0	0.00	0.0
Boundary 2	0.00	0.0	0.03	0.1



Boundary 3	0.13	0.6	0.10	0.3
Boundary 4	0.13	0.4	0.17	1.2
Boundary 5	1.01	4.3	0.08	0.4
Boundary 6	0.02	0.1	0.02	0.1
Boundary 7	0.15	2.3	0.13	0.5
Boundary 8	0.26	1.6	0.14	0.3
Boundary 9	0.28	1.4	0.06	0.2
Boundary 10	0.10	0.7	0.05	0.0
Boundary 11	0.16	1.5	0.26	0.9
Boundary 12	0.14	0.8	0.06	0.3
Boundary 13	0.17	1.0	0.21	0.9

Refer to Appendix B for calculation plan locations.

Glare

Glare on wall surfaces was calculated in both versions (Appendix B). Calculations were taken at the wall plane, and analyzed based on IDA recommendations for glare. In that recommendation, the maximum intensity in one's field of view should not exceed 10 times that of the average lighting level. Maximum lighting levels in the original calculation are high in most places. Maximum to average ratios at some wall surfaces in the original calculation were found to be as high as 14.5:1, exceeding IDA recommendations [Table 4]. The alternate calculation moves luminaires away from buildings, reorients optics and alters some pole heights to bring glare issues within IDA recommendations.

Table 4 – Evaluation of glare at wall surfaces.

Building Surface*	Original Maximum (fc)	Original Average (fc)	Original Max. to Ave. Ratio	Alternate Maximum (fc)	Alternate Average (fc)	Alternate Max. to Ave. Ratio
Wall 1	8.8	1.45	6.06	0.8	0.14	5.71
Wall 2	5.8	1.62	3.58	0.2	0.04	5.00
Wall 3	8.4	1.09	7.70	0.5	0.08	6.25
Wall 4	13.4	2.00	6.70	4.4	0.55	8.00
Wall 5	10.0	1.49	6.71	0.9	0.13	6.92
Wall 6	14.9	2.46	6.05	0.0	0.00	0.0
Wall 7	11.8	2.11	5.59	0.1	0.02	5.00
Wall 8	0.4	0.28	1.42	1.5	0.75	2.00
Wall 9	16.1	2.49	6.46	0.0	0.00	0.0
Wall 10	2.2	0.66	3.33	0.1	0.01	10.00
Wall 11	6.5	1.36	4.77	0.8	0.44	1.82
Wall 12	10.2	1.73	5.89	0.4	0.04	10.00
Wall 13	9.9	1.65	6.00	0.3	0.06	5.00
Wall 14	7.4	1.05	7.04	1.0	0.33	3.03
Wall 15	8.7	0.71	12.25	1.6	0.44	3.64
Wall 16	14.8	1.19	12.43	.5	0.07	7.14
Wall 17	10.1	3.53	0.28	0.5	0.06	8.33
Wall 18	0.4	0.20	2.00	0.0	0.00	0.0



Wall 19	1.0	0.24	4.16	0.3	0.15	2.00
Wall 20	2.3	0.26	8.84	0.1	0.03	3.33
Wall 21	3.6	0.30	12.00	0.6	0.23	2.61
Wall 22	7.4	0.77	9.61	0.4	0.16	2.50
Wall 23	6.4	0.44	14.54	0.5	0.14	3.57
Wall 24	3.0	0.60	5.00	0.4	0.08	5.00
Wall 25	3.6	0.38	9.47	0.5	0.06	8.33
Wall 26	1.2	0.24	5.0	0.3	0.08	3.75
Wall 27	7.1	0.75	9.46	1.5	0.35	4.29
Wall 28	16.3	2.01	8.10	0.3	0.07	4.29
Wall 29	3.2	1.34	2.38	0.1	0.03	3.33
Wall 30	16.6	1.59	10.44	0.4	0.05	8.00

*Refer to Appendix B for calculation plan locations.

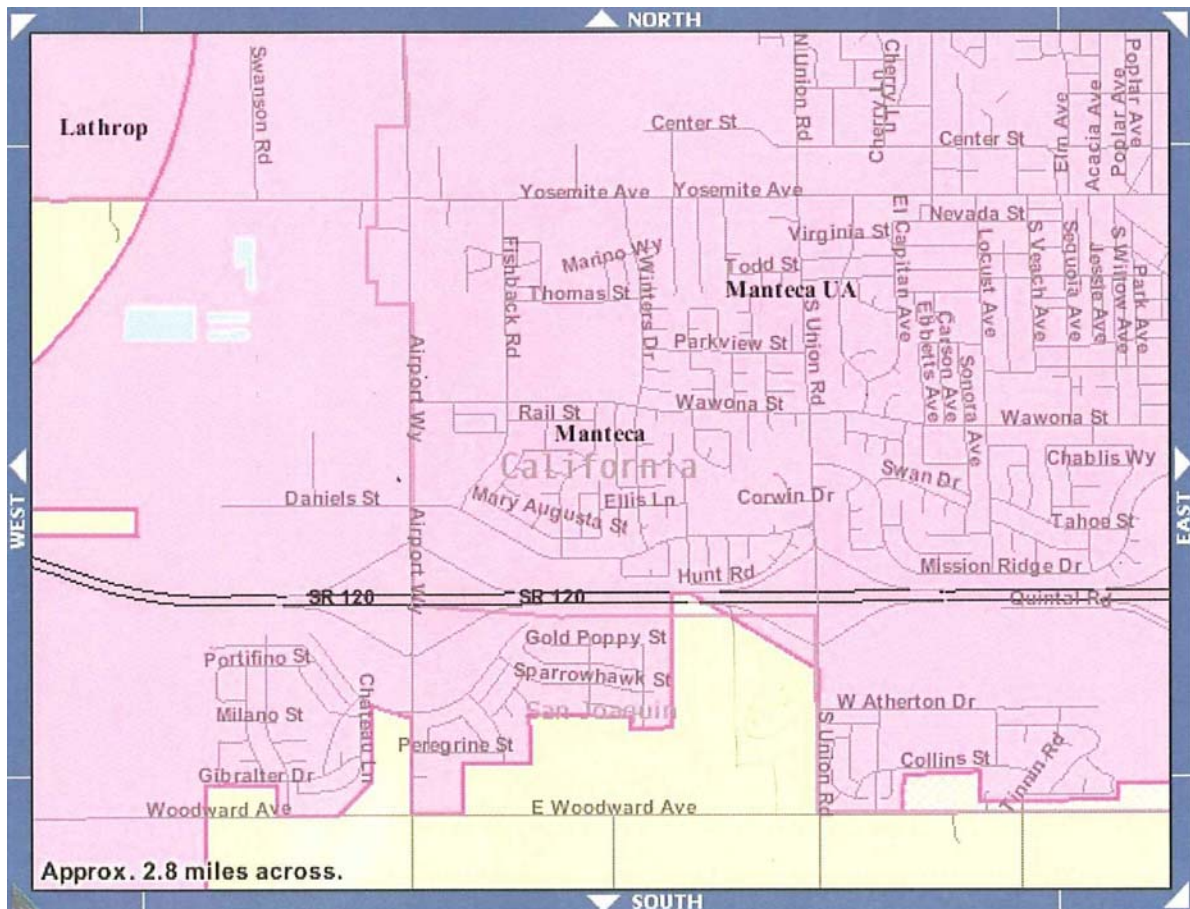
Summary and Discussion

The original calculation did not meet IES illuminance recommendations, had issues with light trespass and glare on walls and used more luminaires than were needed. Some luminaires had higher wattages than required, contributing to uniformity ratio problems. The location of luminaires in relationship to landscape trees was not coordinated, resulting in dark zones due to trees blocking the light.

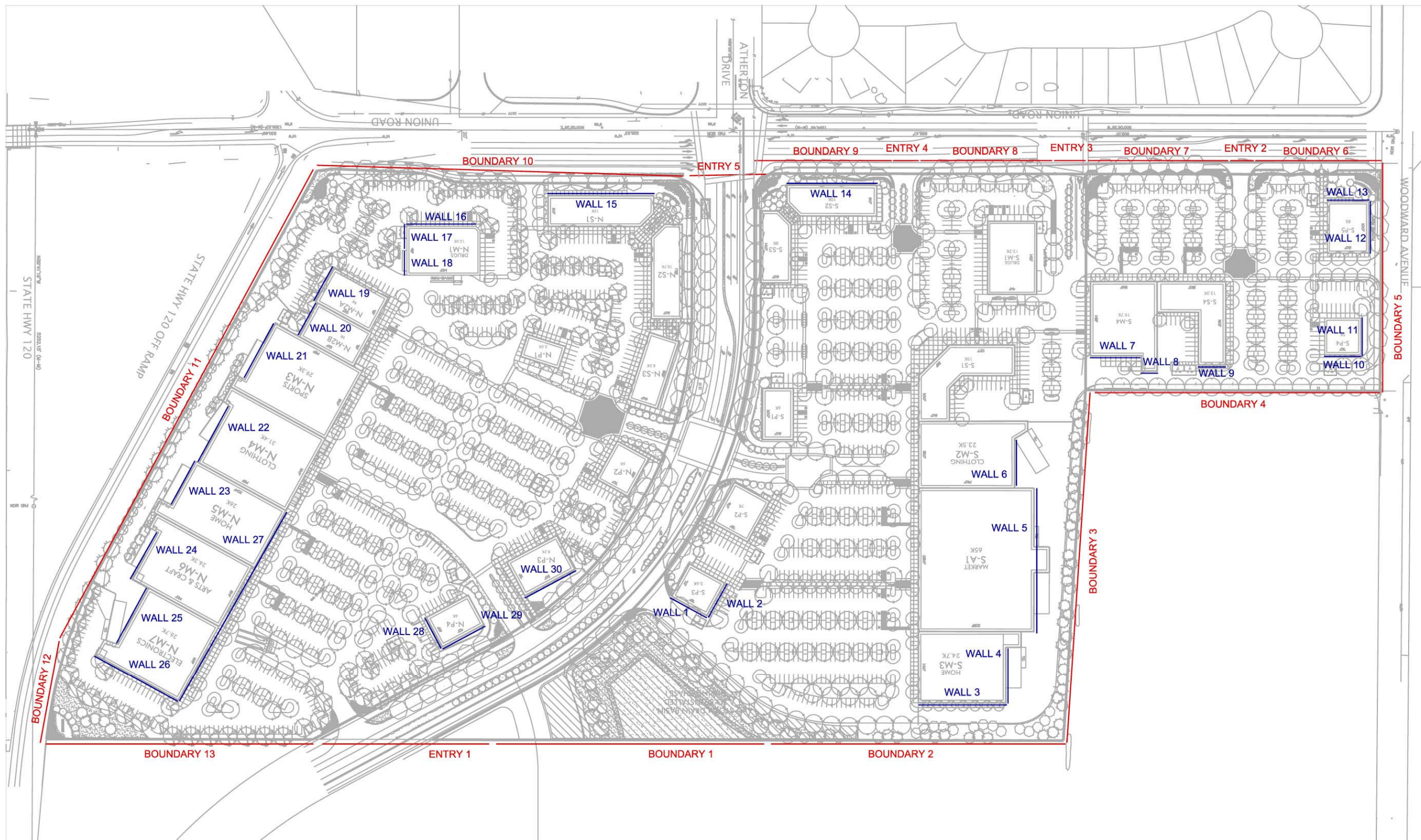
The revisions made to the landscaping and lighting layout in the alternate calculation greatly improve the lit uniformity of the parking lot. Total fixture quantities were reduced and some fixture wattage was reduced. Illuminance levels and uniformity criteria meet IES recommended standards. This was achieved through relocation of the luminaires, reorientation of the type and direction of luminaire optics, changing lamp wattage and the elimination of some trees that were adjacent to luminaires. Light trespass and glare are within recommended standards, achieved through reorientation of the perimeter fixtures and fixtures originally located very close to buildings. House side shields were also added to many fixtures along the site boundary.

Appendix A – U.S. 2007 Census map for Site

From: <http://factfinder.census.gov>



Appendix B – Site location of calculation planes





Appendix C-1 – Photometric reports for specified fixtures

Fixture type A32 Rev
Double head 30' pole
150 Watt Type III Distribution

Photometric Report (Type C)

Filename: EMM10M3SF.IES
[TEST] ITL53939
[ISSUEDATE] 09 02 03
[MANUFAC] COOPER LIGHTING
[LUMCAT] EMM-100-MH-XX-3S-FG-SO
[LUMINAIRE] MEDIUM DECORATIVE LUMINAIRE WITH SOLID MID
- TYPE III DISTRIBUTION
[LAMP] 100 WATT MH CLEAR ED-17

Maximum Candela = 4679 at 62 H 65 V

Classification:

Road Classification: Type III, Short, Full Cutoff (deprecated)
Luminaire Efficacy Rating (LER): 61
Indoor Classification: Direct

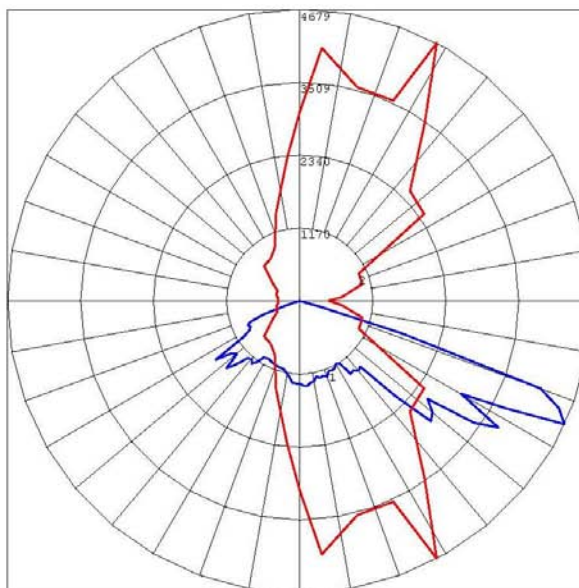
LCS Summary:

LCS Zone	Lumens	%Lamp	%Lum
FL (0-30)	519.6	6.1	8.5
FM (30-60)	1878.2	22.1	30.9
FH (60-80)	1437.8	16.9	23.6
FVH (80-90)	4.0	0.0	0.1
BL (0-30)	447.4	5.3	7.4
BM (30-60)	1236.0	14.5	20.3
BH (60-80)	554.4	6.5	9.1
BVH (80-90)	6.0	0.1	0.1
UL (90-100)	0.0	0.0	0.0
UH (100-180)	0.0	0.0	0.0
Total	6083.4	71.5	100.0

Polar Candela Curves:

Vertical Plane Through:
1) 62 - 242 Horizontal

Horizontal Cone Through:
2) 65 Vertical





Appendix C-2 – Photometric reports for specified fixtures

Fixture types W3 Rev and W3 100
W3 Rev-Single head 30' pole 150 Watt Type III Distribution
W3 100-Single head 15' pole 100 Watt Type III Distribution

Photometric Report (Type C)

Filename: EMM10M3SF.IES
[TEST] ITL53939
[ISSUEDATE] 09 02 03
[MANUFAC] COOPER LIGHTING
[LUMCAT] EMM-100-MH-XX-3S-FG-SO
[LUMINAIRE] MEDIUM DECORATIVE LUMINAIRE WITH SOLID MID
- TYPE III DISTRIBUTION
[LAMP] 100 WATT MH CLEAR ED-17

Maximum Candela = 4679 at 62 H 65 V

Classification:

Road Classification: Type III, Short, Full Cutoff (deprecated)
Luminaire Efficacy Rating (LER): 100
Indoor Classification: Direct

LCS Summary:

LCS Zone	Lumens	%Lamp	%Lum
FL (0-30)	855.9	6.1	8.5
FM (30-60)	3093.6	22.1	30.9
FH (60-80)	2368.1	16.9	23.6
FVH (80-90)	6.5	0.0	0.1
BL (0-30)	736.9	5.3	7.4
BM (30-60)	2035.8	14.5	20.3
BH (60-80)	913.2	6.5	9.1
BVH (80-90)	9.8	0.1	0.1
UL (90-100)	0.0	0.0	0.0
UH (100-180)	0.0	0.0	0.0
Total	10019.8	71.5	100.0

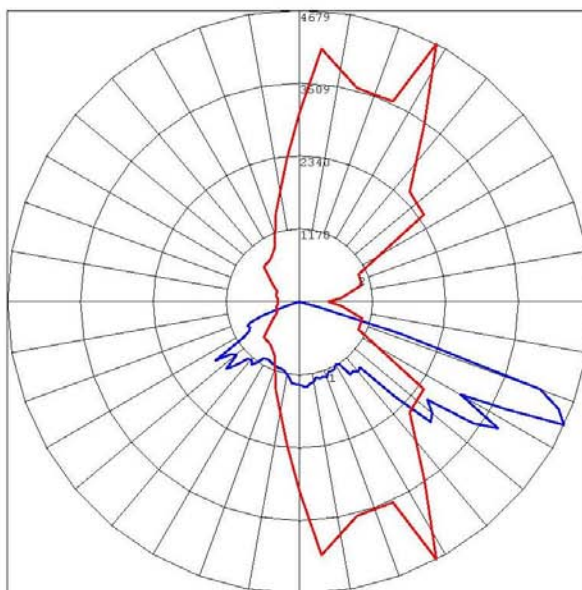
Polar Candela Curves:

Vertical Plane Through:

1) 62 - 242 Horizontal

Horizontal Cone Through:

2) 65 Vertical





Appendix C-3 – Photometric reports for specified fixtures

Fixture type SL
Single head 20' pole
150 Watt Type IV Distribution

Photometric Report (Type C)

Filename: EMM-175-MH-XX-SL.IES
[TEST] ITL54975
[ISSUEDATE] 07_16_04
[MANUFAC] COOPER LIGHTING
[LUMCAT] EMM-175-MH-XX-SL
[LUMINAIRE] MEDIUM DECORATIVE LUMINAIRE WITH SOLID MID
- SPILL LIGHT ELIMINATOR
[LAMP] 175-WATT MH CLEAR ED-17

Maximum Candela = 6207 at 0 H 67 V



Classification:

Road Classification: Type IV, Very Short, Full Cutoff (deprecated)
Luminaire Efficacy Rating (LER): 41
Indoor Classification: Direct

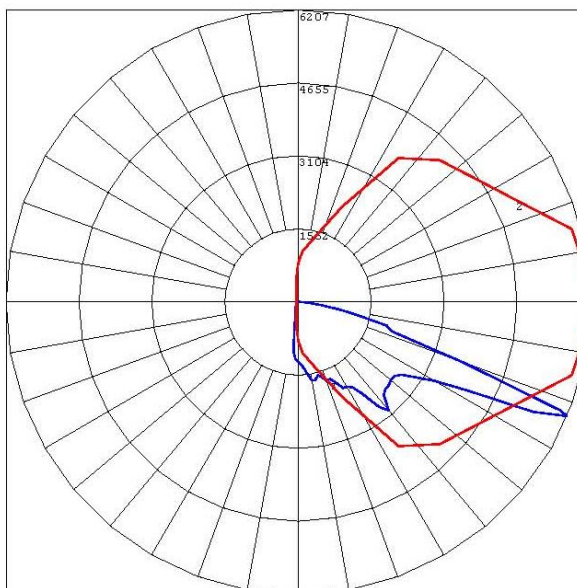
LCS Summary:

LCS Zone	Lumens	%Lamp	%Lum
FL (0-30)	733.0	5.2	10.2
FM (30-60)	3041.5	21.7	42.3
FH (60-80)	2697.2	19.3	37.6
FVH (80-90)	102.1	0.7	1.4
BL (0-30)	219.1	1.6	3.1
BM (30-60)	285.0	2.0	4.0
BH (60-80)	97.4	0.7	1.4
BVH (80-90)	7.5	0.1	0.1
UL (90-100)	0.0	0.0	0.0
UH (100-180)	0.0	0.0	0.0
Total	7182.8	51.3	100.0

Polar Candela Curves:

Vertical Plane Through:
1) 0 - 180 Horizontal

Horizontal Cone Through:
2) 67 Vertical





Appendix C-4 – Photometric reports for specified fixtures

Fixture type W3 HS
Single head 30' pole with house side shield
150 Watt Type III Distribution

Photometric Report (Type C)

Filename: EMM10M3SF.IES
[TEST] ITL53939
[ISSUEDATE] 09_02_03
[MANUFAC] COOPER LIGHTING
[LUMCAT] EMM-100-MH-XX-3S-FG-SO
[LUMINAIRE] MEDIUM DECORATIVE LUMINAIRE WITH SOLID MID
- TYPE III DISTRIBUTION
[LAMP] 100 WATT MH CLEAR ED-17

Maximum Candela = 4679 at 62 H 65 V

Classification:

Road Classification: Type III, Short, Full Cutoff (deprecated)
Luminaire Efficacy Rating (LER): 67
Indoor Classification: Direct

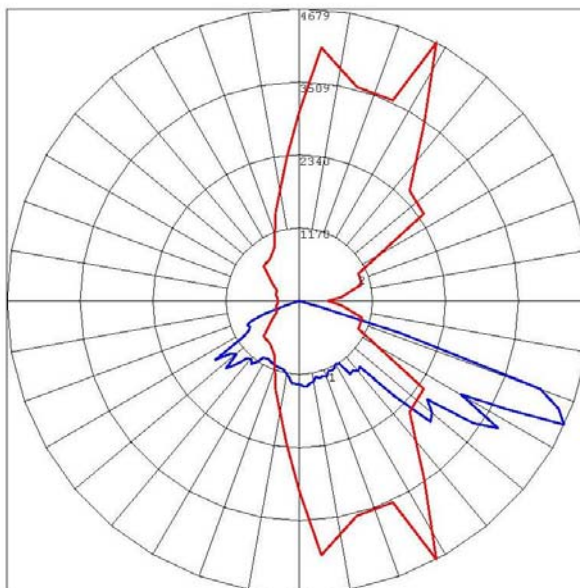
LCS Summary:

LCS Zone	Lumens	%Lamp	%Lum
FL (0-30)	855.9	6.1	8.5
FM (30-60)	3093.6	22.1	30.9
FH (60-80)	2368.1	16.9	23.6
FVH (80-90)	6.5	0.0	0.1
BL (0-30)	736.9	5.3	7.4
BM (30-60)	2035.8	14.5	20.3
BH (60-80)	913.2	6.5	9.1
BVH (80-90)	9.8	0.1	0.1
UL (90-100)	0.0	0.0	0.0
UH (100-180)	0.0	0.0	0.0
Total	10019.8	71.5	100.0

Polar Candela Curves:

Vertical Plane Through:
1) 62 - 242 Horizontal

Horizontal Cone Through:
2) 65 Vertical



APPENDIX C

Health Risk Assessment to Support Environmental Impact Analysis for the
Proposed Union Crossing Commercial Development, Manteca, CA
and Air Modeling Results

Health Risk Assessment to Support Environmental Impact Analysis for the
Proposed Union Crossing Commercial Development, Manteca, CA

Prepared for:
EDAW,
Sacramento, California

**Health Risk Assessment to Support Environmental
Impact Analysis for the Proposed Union Crossing
Commercial Development, Manteca, CA**

AECOM Environment
January 2009
Document No.: 02450-052

Prepared for:
EDAW
Sacramento, California

**Health Risk Assessment to Support Environmental Impact
Analysis for the Proposed Union Crossing Commercial
Development, Manteca, CA**



Prepared By: Charanva Varadaraian



Reviewed By: Greg Wolfe

AECOM Environment
January 2009
Document No.: 02450-052

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1.0 Introduction

This health risk assessment (HRA) is a comprehensive analysis of the potential health risks posed by operation of the proposed Union Crossing Center Commercial Development, located in Manteca, CA, in support of the environmental impact analysis required under the California Environmental Quality Act (CEQA) for the proposed action. The HRA evaluates toxic air contaminants (TACs) emitted into the environment due to the proposed project, the potential for human exposure, and a quantitative assessment of individual health risks associated with those levels of exposure. The principal concerns for public health are associated with emissions of TACs into the air during routine operation of the proposed facility.

1.1 Project Background

The project site is approximately 65 acres (including a portion of Woodward Avenue and the three residential parcels in the southwestern portion of the site that are not proposed for development) and is located in the southern portion of the city of Manteca. The project site is located immediately south of State Route 120 (SR 120), approximately 2 miles west of State Route 99 (SR 99), and 4 miles east of Interstate 5 (I-5). The site is generally bounded by SR 120 to the north; agricultural land and residences to the west and Woodward Avenue to the south and South Union Road and residences to the east.

Existing uses on the project site include row crops, an orchard, a rural residence in the southeastern portion of the site, and three additional rural residences in the southwestern portion of the site. In general, agricultural uses are the predominant land use in the project vicinity. However, with adoption of the City of Manteca General Plan (City General Plan) in 2003 and designation of the area for urban land uses, the area is experiencing an increasing number of development applications to convert agricultural lands to urban development. Low-density single-family residential subdivisions are developed to the north, directly across SR 120. In addition, several new residential subdivisions and a commercial center are under development or are proceeding through the development entitlement process to the west, south, and east of the project site.

The project site is located outside of the city limits, but within the City of Manteca's sphere of influence (SOI) and the City's Primary Urban Service Boundary. As a result, implementation of the project would require the annexation of the project site to the city. An annexation is the incorporation of land and water area into an existing community (e.g., City of Manteca) with a resulting change in the boundaries of that community. The State of California has delegated the authority for approving annexations to the San Joaquin County Local Agency Formation Commission (LAFCO). The San Joaquin County LAFCO would be the agency responsible for approving the annexation of the project to the city.

The City General Plan, which was updated in October 2003, designates the site for General Commercial (GC), Medium Density Residential (MDR), and Low Density Residential (LDR) land uses. Surrounding general plan designations include LDR and GC. The proposed project includes the rezoning and annexation of the site to the city of Manteca. Once annexed, the project site would be subject to the planning jurisdiction of the City of Manteca.

1.2 Project Description

The three primary components of the proposed project include (1) a northern retail site consisting of approximately 225,800 square feet of retail and restaurant space on approximately 22.7 acres, (2) a central retail site consisting of approximately 178,000 square feet of retail and restaurant space on

approximately 20 acres, and (3) a southern retail site consisting of 46,200 square feet of retail and restaurant space on approximately 5.8 acres. These project components would be constructed in three separate phases as described below. Although not currently proposed, some retail uses may be replaced by office uses if the market demands. This change in use is consistent with the current and proposed GC zoning of the site.

As part of the project, the proposed southern retail site would require a general plan amendment to redesignate the southern retail site from LDR to CG. In addition, the annexation and prezone of three residential parcels (10.9 acres) and a portion of Woodward Avenue (1.7 acres) in the southwestern portion of the site are proposed. No development is proposed at Woodward Avenue and for these three parcels. Figure 1 shows the proposed development site layout. The three phases of this development are described in greater detail below.

Phase 1: Northern Retail Site

The northern project site would include retail and restaurant spaces ranging in size from 3,500 square feet to 31,400 square feet and would be surrounded by a central parking area that would include 987 stalls.

Phase 2: Central Retail Site

The central retail site would consist of approximately 178,000 square feet of retail and restaurant space just south of the proposed Atherton Drive extension. Buildings in this portion of the site would also surround a central parking area that would include 777 stalls. On-site buildings would range in size from 5,600 square feet to 65,000 square feet. In addition, an approximately 1.5-acre stormwater detention basin would be constructed adjacent to the western project boundary and would serve the entire project site.

Phase 3: Southern Retail Site

Improvements proposed as part of Phase 3 include the development of approximately 46,200 square feet of retail and restaurant space within the southern portion of the project site. Southern retail site buildings would range in size from approximately 6,000 square feet to 20,000 square feet. The parking area for Phase 3 would include 263 stalls. A general plan amendment redesignating the parcel from LDR to CG is also proposed.

2.0 Identification of Air Toxic Contaminants

This section identifies and presents information on the TAC emissions from the proposed action, potential health hazards associated with the TACs emitted and their associated cancer risk and/or non-cancer health impact evaluation requirement. It addresses potential environmental impacts associated with human exposure to TACs of concern resulting from operation of Union Crossing Commercial Development.

Potential TAC emissions from the proposed project include emissions of diesel particulate matter (DPM) from delivery trucks, and poly aromatic hydrocarbons (PAH) and naphthalene from restaurant operations. The TACs are evaluated for long-term cancer and non-cancer chronic health hazard impacts. DPM and PAH are evaluated for cancer risk and naphthalene is evaluated for both cancer risk and non-cancer chronic health impacts. An assessment of acute exposure (short-term) was not conducted for the proposed project because the pollutants emitted do not have short-term (acute) impacts.

2.1 Health Risk Assessment Methodology

This health risk assessment contains TAC emission estimation, air dispersion analysis, and health risk characterization. The Guidance for Air Dispersion Modeling, (San Joaquin Valley Air Pollution Control District (SJVAPCD), 2006) describes recommended methodology for conducting CEQA health risk assessments for sources with dominant DPM emissions. Sources of TAC emissions from the project were estimated using emission factors provided in the SJVAPCD modeling guidance. The truck release parameters and emission factors presented in the guidance document were used to estimate DPM emissions from truck travel and idling. PAH and naphthalene emissions were estimated based on emission factors for different restaurant/fast food operations in the guidance document.

Exposure calculations were performed using air dispersion modeling analysis to predict ground-level air concentrations, by source. Results of the air modeling exposure predictions were then applied to the emission estimates along with respective cancer potency factors and chronic non-cancer reference exposure levels (RELs) to characterize health risk associated with predicted levels of exposure.

The methods used to assess potential human health risks from the proposed project are consistent with those prepared by The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments (OEHHA, 2003) which describes algorithms, exposure methods, and cancer and non-cancer health values needed to perform a HRA under the Air Toxics Hot Spots Information and Assessment Act of 1987 (Hot Spots or AB 2588, Health and Safety Code Section 44360 et seq.). This manual is generally considered the best available reference for conducting human health risk assessment in California.

2.2 Air Toxic Substances Emitted

The primary TAC evaluated for potential health risks from operation of the proposed project is particulate emissions from diesel-fueled engine exhaust. Organic gases are also expected to be emitted from the proposed project from operations at nine restaurants onsite.

2.2.1 Sources of Air Toxic Emissions

Sources of TAC emissions include diesel-fueled engines and restaurant operations. Delivery truck travel, and truck idling are emission sources of DPM. Trucks entering and leaving the project site will include haul truck deliveries to the many stores in the northern and central areas of the development. The southern site of the development will be primarily serviced by smaller delivery vans.

The delivery haul trucks will generally follow travel routes established in the proposed project site design that facilitate traffic circulation and minimize vehicle congestion. Truck idling may occur in the receiving delivery docks at specific stores. However, the trucks will be limited to an idle time not to exceed five minutes for entering or exiting the delivery docks in compliance with state Air Toxic Control Measure (ATCM) that prohibits heavy-duty truck idling for five minutes or more. A transportation refrigeration unit (TRU's) is assumed to service the central site market once a week. Idling emissions from the TRU are calculated based on SJVAPCD modeling guidance at thirty minutes idling time per trip.

The onsite restaurants will emit organic gases from the cooking of animal fats and oils. Emissions will be controlled through to an exhaust manifold (hood) to a roof-top vent. In accordance with the SJVAPCD modeling guidance emissions from vehicles traveling on off-site roads or highways are not considered in HRA.

2.2.2 Health Risk Factors

Risk impacts from TAC emissions were evaluated in this analysis using health values approved and published by the OEHHA and the California Air Resources Board (ARB) for use in facility HRA's conducted for the AB 2588 Air Toxics Hot Spots Program (ARB, 2008). The TACs of concern that are addressed in this HRA are listed in Table 1, along with their respective OEHHA health values. The table lists the OEHHA adopted inhalation and oral cancer slope factors, non-cancer acute RELs, and inhalation and oral non-cancer chronic RELs. The cancer potency factors and RELs used are the most recent values updated in July 2008. In accordance with SJVAPCD modeling guidance, PAH emissions were analyzed using cancer potency factors for benzo(a)pyrene [B(a)P], which provides a conservative health impact estimation.

Table 1: Risk Assessment Health Values for Substances of Potential Concern				
Compound (CAS Number)	Cancer Risk		Non-cancer Effects	
	Inhalation Cancer Potency (mg/kg-day) ⁻¹	Inhalation Unit Risk (μg/m ³) ⁻¹	Chronic Inhalation Reference Exposure Level (μg/m ³)	Acute Inhalation Reference Exposure Level (μg/m ³)
PAH (50328) ¹	3.9E+00	1.1E-03	--	--
Naphthalene (91203)	1.2E-01	3.4E-05	9.0E+00	--
Diesel Particulate Matter (9901)	1.1E+00	3.0E-04	5.0 E+00	--
Source: OEHHA, 2008				
1. Benzo(a)pyrene (CAS number shown) was modeled as a surrogate carcinogen for all PAH emissions.				

2.3 Risk Definitions and Significance

Cancer Risk. Cancer risk is the probability or chance of contracting cancer over a human life span, which is assumed to be 70 years. Carcinogens are not assumed to have a threshold below which there would be no human health impact. In other words, any exposure to a carcinogen is assumed to have some probability of causing cancer; the lower the exposure, the lower the cancer risk (i.e., a linear, no-threshold model). Under various state and local regulations, an incremental cancer risk of 10-in-one-million due to a project is considered to be a significant impact on public health. For example, the 10-in-one-million risk level is used by the Air Toxics "Hot Spots" (AB2588) program and California's Proposition 65 as the public notification level for air toxic emissions from existing sources. The SJVAPCD modeling guidance states that for permitting purposes, health risk impacts above 10-in-one-million are considered significant.

Non-Cancer Risk. Non-cancer health impacts can result from short-term (acute) or long-term (chronic) exposure to chemical substances. In determining potential non-cancer health risks from air toxics, it is assumed that there is a dose of the chemical of concern below which there would be no impact on human health. The air concentration corresponding to this dose is called the REL. Non-cancer health risks are measured in terms of a hazard index (HI), which is the calculated exposure of each contaminant divided by its REL. Hazard indices for those pollutants affecting the same target organ are typically summed, with the resulting totals expressed as hazard indices for each organ system. Similar to cancer risk, non-cancer impacts also have determined significance thresholds based on the estimated HI for the project.

The SJVAPCD modeling guidance allows for an incremental HI of less than 1.0 is considered to be an insignificant health risk.

Chronic toxicity is defined as adverse health effects from prolonged chemical exposure, caused by chemicals accumulating in the body. Because chemical accumulation to toxic levels typically occurs slowly, symptoms of chronic effects usually do not appear until long after exposure commences. The lowest no-effect chronic exposure level for a non-cancer air toxic is the chronic REL. Below this threshold, the body is capable of eliminating or detoxifying the chemical rapidly enough to prevent its accumulation. The chronic hazard index was calculated using the hazard indices calculated with model-predicted annual concentrations.

Acute toxicity is defined as adverse health effects caused by a short-term chemical exposure of no more than 24-hours. Short-term impacts were not evaluated in this HRA because TACs emitted from the proposed project do not have acute toxicity factors published to evaluate exposure.

CEQA Significance Criteria for Health Impacts. California has not established state-wide significance thresholds for cancer and non-cancer health risk impacts under CEQA. However, most air districts in California have adopted local significance thresholds for health risks in their policy guidance to project proponents. The SJVAPCD modeling guidance defines CEQA HRA significance thresholds for cancer health impacts as equal to or greater than 10 (cases) in a million and a significance thresholds for non-cancer health impacts as equal to or greater than a HI of 1.0.

3.0 Exposure Assessment and Risk Characterization

This section describes the information related to the air dispersion modeling process used to estimate ground-level concentrations of TACs emitted from the proposed project. Evaluation of potential health risks from the proposed development was conducted in accordance with the procedures described in the SJVAPCD modeling guidance for facilities with predominant DPM emissions.

3.1 Toxic Air Contaminant Emissions

3.1.1 Particulate Matter from Diesel-Fueled Engines

As discussed earlier, the potential health risk impact from the operation of the proposed development will be from diesel-fueled internal combustion engines. Operations contributing to DPM include haul truck travel and truck idling as shown in Table 2. Emission estimates were determined based on emission factors specified in the SJVAPCD modeling guidance. Detailed emission calculations are provided in Appendix A.

A maximum of 20 truck trips per day were assumed for the proposed development for the purpose of quantifying emissions. The emission factors specified in Appendix A of the SJVAPCD Guidance for use in conducting CEQA health risk assessments were used to determine particulate emissions generated by delivery trucks. Distances (in feet) used to estimate emissions from truck travel were determined based on site layout including the length of building side delivery lanes and other truck lanes. For emission estimation purposes, approximately 15 trucks per day are assumed to move through the north site and 5 trucks per day through the central site. A transportation refrigeration unit (TRU) is assumed to service the market at the south site once a week and the idling emissions from the TRU are calculated per SJVAPCD guidance. In accordance with the SJVAPCD modeling guidance, emissions from vehicles occurring on the roads or highways were not considered in this analysis.

Table 2: Emissions of Particulate Matter from Diesel-Fueled Engines

Emission Source	Emission Source Description	Average Emission Rates		
		Hourly Emissions (lbs/hr)	Daily Emissions (lbs/day)	Annual Emissions (lbs/year)
	Truck Travel			
North1	North site truck travel - no bldg line	0.0004	0.0045	1.6428
North2	North site truck travel - bldg line	0.0008	0.0093	3.4061
North3	North site truck travel - no bldg line	0.0004	0.0051	1.8688
South1	South site truck travel - no bldg line	0.0002	0.0020	0.7150
South2	South site truck travel - bldg line	0.0001	0.0011	0.4052
South3	South site truck travel - no bldg line	0.0001	0.0007	0.2495
	Subtotal	0.0019	0.0227	8.2875
	Truck Idle			
IDL_NM3	Haul truck idling at delivery dock	0.0001	0.0012	0.4308
IDL_NM4	Haul truck idling at delivery dock	0.0001	0.0012	0.4308
IDL_NM5	Haul truck idling at delivery dock	0.0001	0.0012	0.4308
IDL_NM6	Haul truck idling at delivery dock	0.0001	0.0012	0.4308
IDL_NM7	Haul truck idling at delivery dock	0.0001	0.0012	0.4308
IDL_SM1	Haul truck idling at delivery dock	0.0001	0.0012	0.4308
IDL_SM2	Haul truck idling at delivery dock	0.0001	0.0012	0.4308
IDL_SM3	Haul truck idling at delivery dock	0.0001	0.0012	0.4308
IDL_SA1	TRU idling at delivery dock	0.0419	0.0419	2.1781
	Subtotal	0.0427	0.0513	5.6248
Grand Total		0.0446	0.0740	13.9123

3.1.2 Organic Gases (PAH and Naphthalene)

The PAH and naphthalene emissions from the nine onsite restaurants were based on emission provided for four types facilities [Type 1: CD-Charbroiler (86% control); Type 2: Flat Griddle (0% control); Type 3: UF-Charbroiler (0% control); Type 4: Flat Griddle (0% control)] in the SJVAPCD modeling guidance. The guidance recommends that facilities with more than four restaurants base the emissions of four restaurants on the emission factors identified for the four types, and the emissions for all the remaining restaurants on Type 4: Flat Griddle emission factors. PAH emissions were evaluated using [B(a)P] as the surrogate carcinogen. Since B(a)P is one of the most potent carcinogens in the PAH class, use of this cancer potency factor with total emissions will overestimate the risk. Table 3 shows the emissions from the restaurant operations.

Table 3: Emissions of PAH and Naphthalene from Fast Food/Restaurant Operations

Restaurants	Location	Emissions ¹			
		Annual (lbs/yr)		Hourly (lbs/hr)	
TAC		PAH	Naphthalene	PAH	Naphthalene
CAS		50328	91203	50328	91203
N-P1	North	2.55E-03	1.51E-01	2.91E-07	1.73E-05
N-P2	North	7.57E-04	1.70E-01	8.64E-08	1.94E-05

Table 3: Emissions of PAH and Naphthalene from Fast Food/Restaurant Operations

Restaurants	Location	Emissions ¹			
		Annual (lbs/yr)		Hourly (lbs/hr)	
TAC		PAH	Naphthalene	PAH	Naphthalene
CAS		50328	91203	50328	91203
N-P3	North	6.66E-03	3.35E-01	7.61E-07	3.82E-05
N-P4	North	2.52E-04	5.72E-02	2.87E-08	6.53E-06
S-P1	Central	2.52E-04	5.72E-02	2.87E-08	6.53E-06
S-P2	Central	2.52E-04	5.72E-02	2.87E-08	6.53E-06
S-P3	Central	2.52E-04	5.72E-02	2.87E-08	6.53E-06
S-P4	South	2.52E-04	5.72E-02	2.87E-08	6.53E-06
S-P5	South	2.52E-04	5.72E-02	2.87E-08	6.53E-06
	Total	1.15E-02	9.99E-01	1.31E-06	1.14E-04

¹SJVAPCD Modeling Guidance, Fast Food Emissions

3.2 Dispersion Modeling Methodology

Concentrations of TACs in ambient air are estimated from mass emissions through use of air dispersion modeling analysis. Air concentrations resulting from the potential emissions were estimated using the methodology provided in the SJVAPCD modeling guidance, and good modeling practice. This section presents the methods used to conduct the air dispersion modeling analysis for estimating concentrations of TACs.

3.2.1 Air Dispersion Model

This health risk assessment used U.S EPA approved AERMOD dispersion model (version 5.8.0) to determine ground-level air concentrations. AERMOD was used in the rural mode with all model option switches set to regulatory-default settings. Modeling was performed using a Universal Transverse Mercator (UTM), zone 10 NAD83 datum coordinate system.

AERMOD was used exclusively for the evaluation of cancer risk impacts from DPM emissions. Because DPM emissions were evaluated as a single pollutant in AERMOD, actual emission rates from each emission source were modeled in the dispersion analysis. Dispersion modeling of emissions from the fast-food restaurants were also modeled in AERMOD with a normalized ("unit") emission rate to later use with the actual emission rates for risk characterization in Hotspots Analysis Reporting Program (HARP).

The HARP software package (Version 1.4a, updated September 2008) developed by the ARB for conducting health risk assessments in California under the Air Toxics Hot Spots Program was used to evaluate potential health risk due to PAH and naphthalene emissions from the operation of the restaurants. HARP On-Ramp (version 1) which allows use of AERMOD modeling files with HARP was used to prepare HARP required files from AERMOD dispersion modeling files. The PAH and naphthalene emissions from the restaurant are multi-pathway pollutants that impact public health through multiple pathways including inhalation, dermal, and oral exposure routes. Therefore, a multi-pathway HRA was conducted in HARP for the restaurant emissions. The total health impact from the project was calculated as a sum of risk from DPM and restaurant operations at the identified receptors.

3.2.2 Meteorological Data

The modeling analysis used five years (2000-2004) of sequential hourly meteorological data to determine the highest annual concentrations for use in the HRA. The meteorological data sets were developed by the SJVAPCD for use in air dispersion modeling studies using AERMOD. The meteorological data was obtained from the SJVAPCD website for the Stockton monitoring station. The analysis showed that meteorological data for the year 2002 produced the highest annual impacts from emission sources at the proposed development. A wind rose for the Stockton meteorological station for the year 2002 is presented in Figure 2.

3.2.3 Modeled Source Release Parameters

In accordance with the SJVAPCD modeling guidance, emissions from truck idling were modeled as vertical point source releases and emissions from truck travel were modeled as volume sources. Figure 3 shows modeled emission sources for the facility. Table 4 summarizes the modeled release parameters for the emission sources evaluated in the HRA.

Figure 1: Union Crossing Commercial Development Site Plan

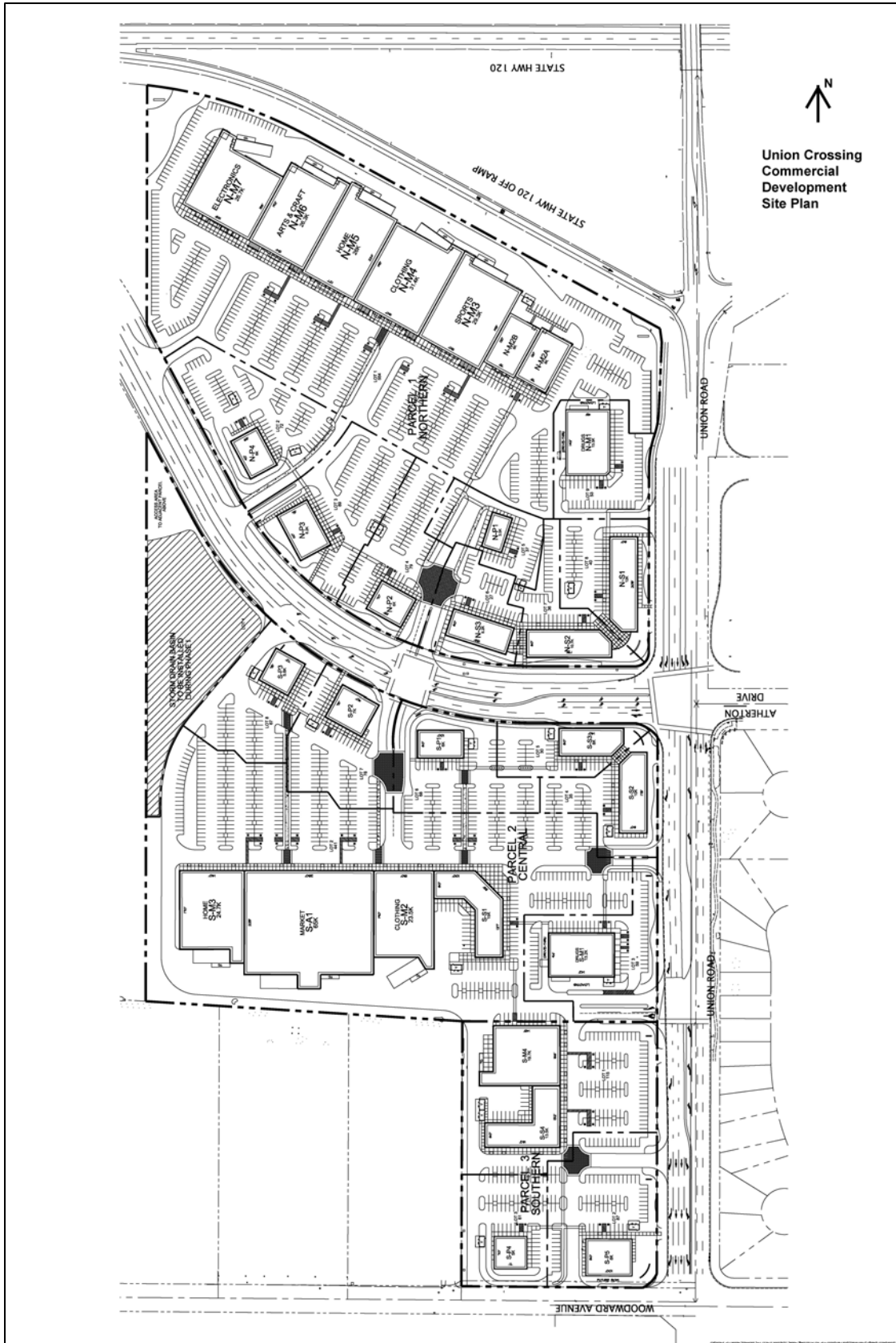


Figure 2: Wind-rose for Stockton Meteorological Station (Year 2002)

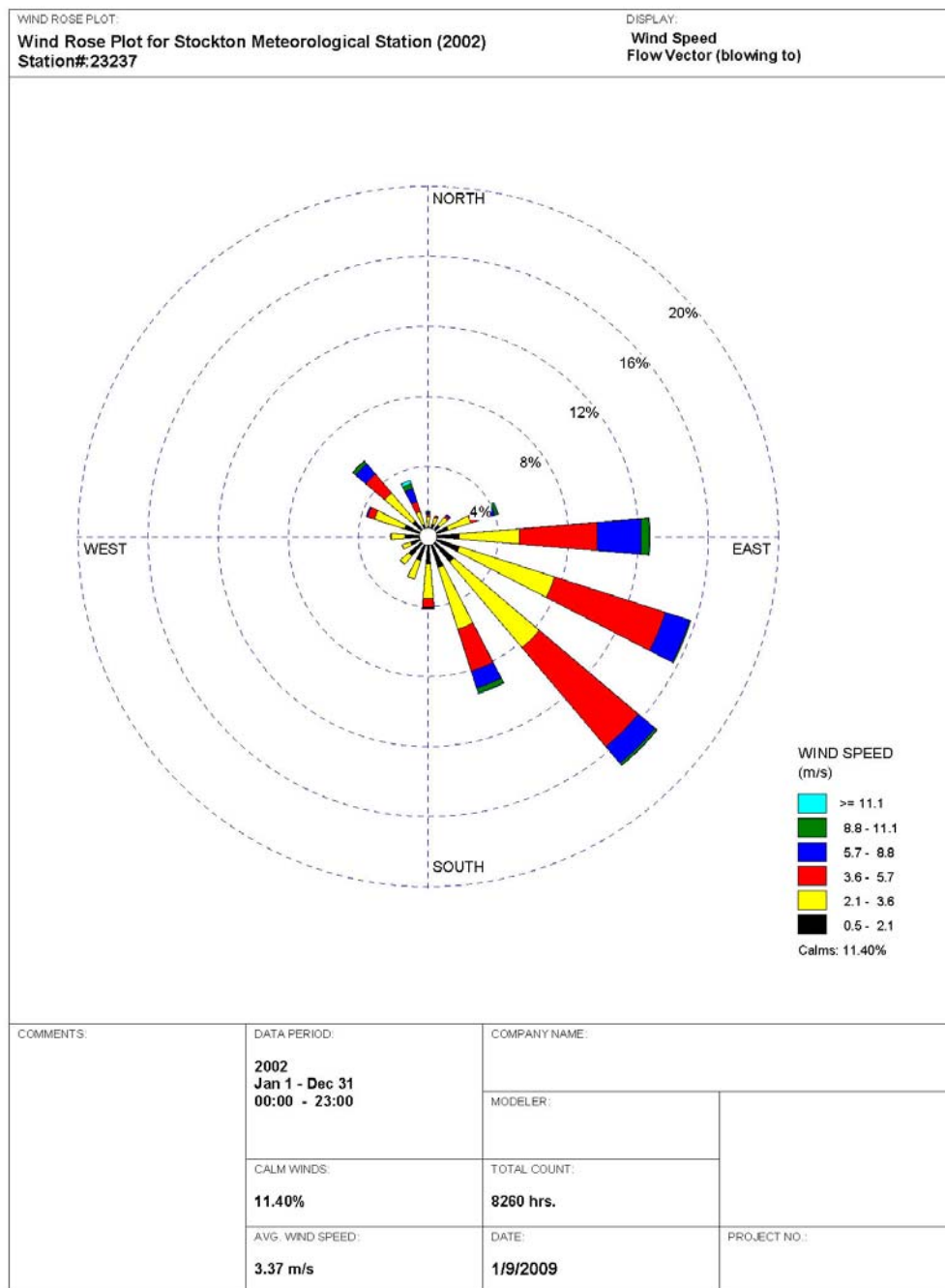
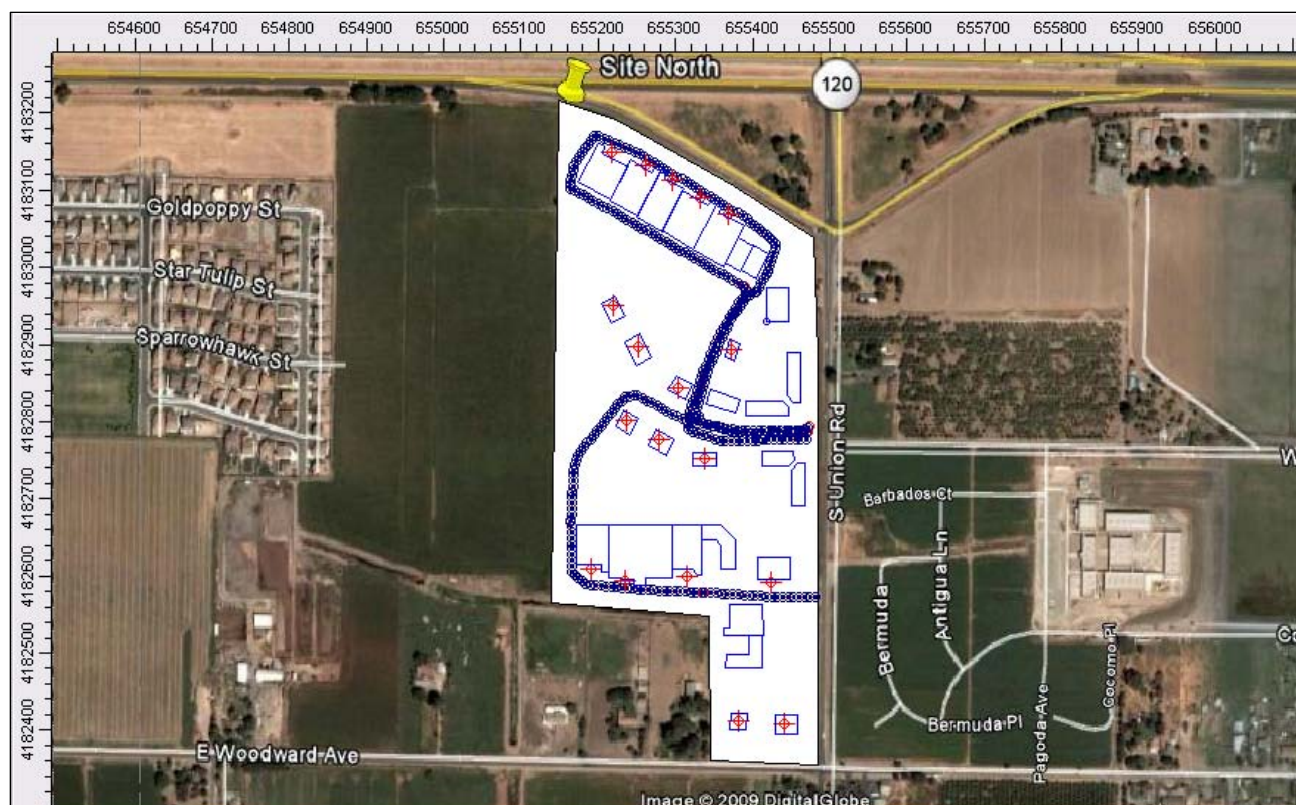


Figure 3: Modeled Emission Sources



Legend: Blue line represents line sources which are modeled as volume sources in AERMOD. The line source represents the truck travel path around the sites. Red symbols represent point sources. Point sources include idling at delivery areas and nine restaurant emissions.

Table 4: Modeled Release Parameters for Emission Sources

Source	Description	Source Type	Release Height (ft)	Length of Side (ft)	Temperature (K)	Release Velocity (m/sec)	Vertical Dimension (ft)	Stack Diameter (ft)
North1	North site truck travel	Line ^a	6	12	-	-	6	-
North2	North site truck travel - bldg line	Line ^a	6	12	-	-	15 ^b	-
North3	North site truck travel	Line ^a	6	12	-	-	6	-
South1	South site truck travel	Line ^a	6	12	-	-	6	-
South2	South site truck travel - bldg line	Line ^a	6	12	-	-	15 ^b	-
South3	South site truck travel	Line ^a	6	12	-	-	6	-
IDL_NM3	Haul truck idling at delivery dock	Point	12.6	-	366	51.71	-	0.33
IDL_NM4	Haul truck idling at delivery dock	Point	12.6	-	366	51.71	-	0.33
IDL_NM5	Haul truck idling at delivery dock	Point	12.6	-	366	51.71	-	0.33
IDL_NM6	Haul truck idling at delivery dock	Point	12.6	-	366	51.71	-	0.33
IDL_NM7	Haul truck idling at delivery dock	Point	12.6	-	366	51.71	-	0.33
IDL_SM1	Haul truck idling at delivery dock	Point	12.6	-	366	51.71	-	0.33
IDL_SM2	Haul truck idling at delivery dock	Point	12.6	-	366	51.71	-	0.33
IDL_SM3	Haul truck idling at delivery dock	Point	12.6	-	366	51.71	-	0.33
IDL_SA1	TRU idling at delivery dock	Point	13	-	501	49	-	0.13
NP1	Restaurant/Fast food	Point	35	-	294	6.14	-	1
NP2	Restaurant/Fast food	Point	35	-	294	6.14	-	1
NP3	Restaurant/Fast food	Point	35	-	294	6.14	-	1
NP4	Restaurant/Fast food	Point	35	-	294	6.14	-	1
SP1	Restaurant/Fast food	Point	35	-	294	6.14	-	1
SP2	Restaurant/Fast food	Point	35	-	294	6.14	-	1
SP3	Restaurant/Fast food	Point	35	-	294	6.14	-	1
SP4	Restaurant/Fast food	Point	35	-	294	6.14	-	1
SP5	Restaurant/Fast food	Point	35	-	294	6.14	-	1
a. Line source represented by adjacent volume sources.								
b. Elevated release next to buildings. Building heights assumed to be 30 ft.								

3.2.5 Building Downwash

The latest version of the USEPA Building Profile Input Program (BPIP-PRIME) was run to determine dominant structures for building downwash calculations run in AERMOD for point sources. Direction specific building heights and widths of the dominant downwash structure(s) were included in the AERMOD model data input file directly from BPIP-PRIME results. Building downwash was also modeled for evaluating emissions from the restaurant.

3.2.5 Terrain

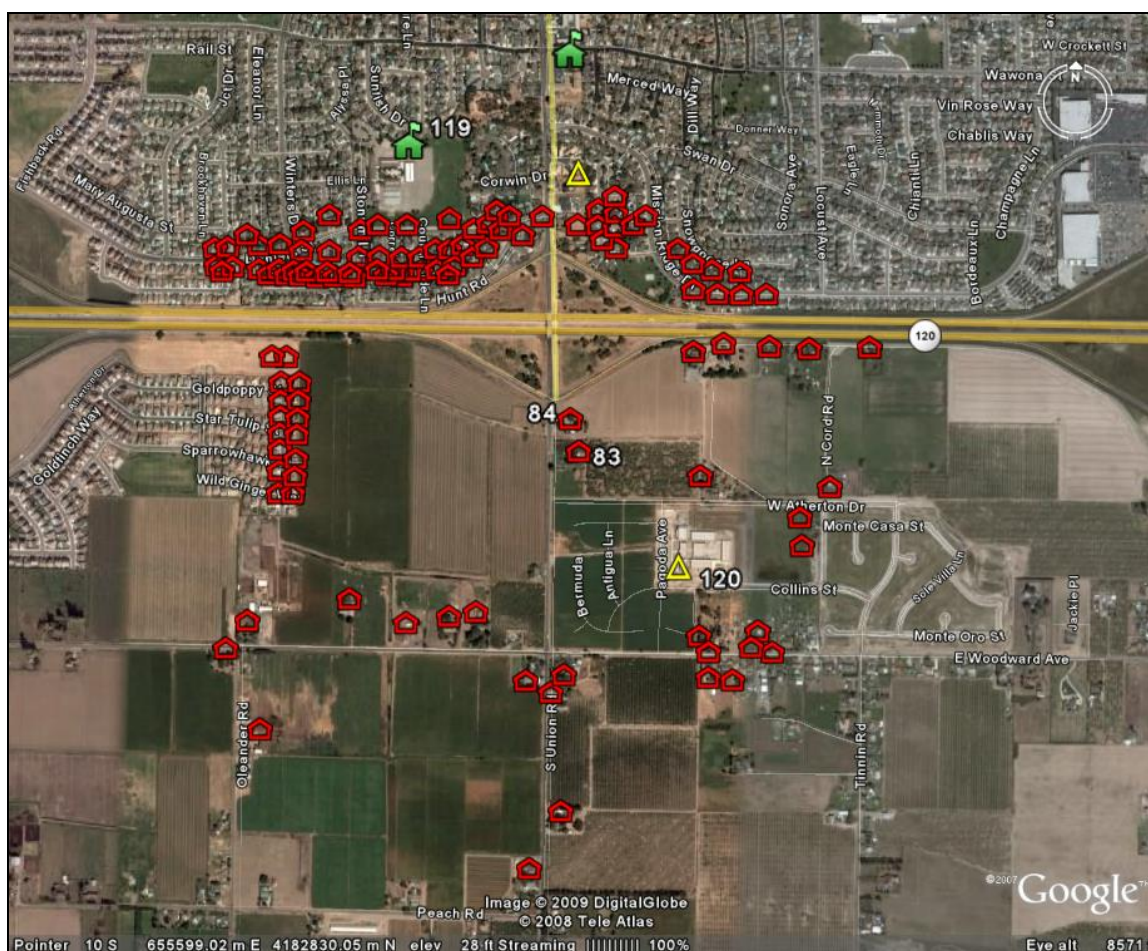
The terrain surrounding the proposed site is primarily flat agricultural land. Due to the relative flatness of terrain, and that no point source has high plume rise, terrain was not applicable to the air dispersion modeling analysis.

3.2.6 Receptors

Modeled receptors were placed at locations of potential human exposure to identify the maximum exposed individual at an existing residential receptor (MEIR), and the maximum exposed individual at an existing occupational worker receptor (MEIW). In addition, sensitive receptors, locations where a sensitive population segment such as children, elderly, or the infirmed may be exposed were also identified and modeled.

A network of 117 residential receptors were identified and modeled to determine the MEIR near the proposed facility. Residential receptors included existing residences located primarily to the west and north of the proposed project. A few residences were also identified to the south and east of the project site. Four occupational receptors were modeled to determine the MEIW. Two schools were identified within 1-km of the facility and were evaluated health risks using both child exposure factors to assess child impacts, and as an occupational receptor to assess adults working at the schools. Figure 4 shows a map of receptors evaluated in this HRA. Since the maximum impacts occur close to the facility, impacts at receptors located farther than the ones evaluated should be lower than the estimated impacts.

Figure 4: Modeled Receptors on Aerial Photograph of Area



Legend: Orange symbols represent residential receptors; Green symbols represent school receptors; Yellow symbols represent worker receptors. The receptor locations with maximum impacts are labeled. The cancer MEIR is at receptor 84; the chronic MEIR is at receptor 83; the cancer and chronic MEIW occurs at receptor 120; and the MEIC occurs at receptor 119.

3.3 Risk Characterization

Risk characterization was performed in accordance with the SJVAPCD modeling guidance for facilities with dominant DPM emissions. The guidance suggests the calculation of DPM cancer using equation below after AERMOD is employed to calculate the ground-level concentrations.

$$\text{Cancer Risk} = (\text{SF} \times \text{C}_{\text{air}} \times \text{DBR} \times \text{A} \times \text{EF} \times \text{ED} \times 10^{-6})/\text{AT}$$

Where,

SF, DPM Slope Factor	1.1 (mg/kg-day) ⁻¹
C _{air} , modeled concentration of DPM	ug/m ³
EF, Exposure Frequency (Residential Receptors)	350 (days/year)
ED, Exposure Duration (Residential Receptors)	70 (years)
DBR, Daily Breathing Rate (Adult)	393 (liter/kg-day)
AT, Averaging time	25550 (days)
Conversion factor	10 ⁻⁶
A	1

The assumptions shown above are for residential receptor locations. The cancer risk for offsite workers were calculated for an exposure duration of 40 years and a daily breathing rate of 149 liter/kg-day. Child cancer risk was modeled at a 9-year exposure duration and higher daily breathing rate of 581 liter/kg-day. SJVAPCD modeling guidance does not require the chronic HI calculation for DPM.

The SJVAPCD modeling guidance requires other TAC sources in the facility be modeled separately in HARP. Carcinogenic risk and chronic non-carcinogenic health effects from PAHs and naphthalene from restaurant operations were assessed by first running HARP On-Ramp to prepare files for HARP from the AERMOD modeling files. The AERMOD predicted annual average concentrations were then used with the latest OEHHA cancer potency factors, and chronic RELs (OEHHA, 2008) to characterize risk. The approved health values are incorporated into HARP Version 1.4a.

The modeled exposure pathways consisted of homegrown produce, dermal absorption, and soil ingestion in addition to the inhalation pathway. The following HARP modeling options were used for the risk analysis to estimate cancer and non-cancer impacts at the maximum exposed points.

- 70-year Resident Cancer Risk – Derived (Adjusted) Method
- Worker Cancer Risk – Point Estimate
- Chronic Hazard Index – Derived (OEHHA) Method
- 9-year (child resident) Cancer Risk – Derived (OEHHA) Method

4.0 Health Risk Assessment Results

The HRA evaluated cancer risk and chronic non-cancer health effects at specific nearby locations where people may experience an actual exposure. Carcinogenic risks and potential chronic non-cancer health effects were assessed using the dispersion modeling and numerical values of toxicity provided by OEHHA/ARB as described in the preceding sections. The multi-pathway health risk assessment evaluated cancer and non-cancer health effects at individual residential, occupational, and sensitive receptors. As stated earlier, because the pollutants of concern do not have published toxicity factors for short-term (acute) exposure, this HRA evaluated only potential long-term health impacts.

Health risk impacts were identified at actual locations of residential, occupational and sensitive receptors. A summary of maximum cancer risk and non-cancer health impacts values is shown in Table 5. Results of the health risk assessment are discussed below.

Table 5: Summary of Maximum Health Risk Impacts by Individual Receptor		
Receptor Type	Health Risk Impact	
	Cancer Risk (per million)	Non-Cancer Chronic HI
Residential Receptors		
Maximum Exposed Individual Resident (MEIR)	2.3	0.00001
Occupational Receptors		
Maximum Exposed Individual Worker (MEIW)	0.1	4.48E-06
School Receptors		
Maximum Exposed Individual Child (MEIC)	0.1	--
Significance Threshold	10	1

The cancer risk (expressed in cases per million) shown in the table above is the total cancer risk from DPM, PAHs and naphthalene. The cancer risk for residential receptor is based on a 70-year exposure, while the cancer risk for worker receptors is based on a 40-year adjusted worker exposure in accordance with OEHHA. The cancer risk for school receptors is based on a 9-year student exposure using inhalation and body weight factors developed by OEHHA for children.

Of the 118 residential locations identified for evaluating maximum individual health risk impacts, cancer risk at the MEIR was determined to be 2-in-one-million. The non-cancer chronic HI at the MEIR was determined to be 0.00001. The maximum predicted residential risks are below the significance criteria for the proposed project. Four off-site worker locations were identified for evaluating maximum individual health risk impacts at the MEIW. Cancer risk and the non-cancer chronic HI at the MEIW were determined to be very insignificant. The impacts at the MEIW are below the significance criteria for the proposed project. The child exposure cancer risk at the sensitive receptor (school) was estimated as 0.1-in-one-million which is also below the significance threshold. The maximum impact locations are presented in Figure 4.

Estimated cancer risks and non-cancer chronic HI at all receptors evaluated in this HRA were determined to be less than the SJVAPCD significance levels of 10-in-one-million and 1.0, respectively. Detailed health risk calculations are provided in Appendix B.

5.0 Risk Assessment Uncertainty

Sources of uncertainty in the assessment of risks to public health include emissions estimates, dispersion modeling, exposure characteristics, and extrapolation of toxicity data in animals to humans. To address this uncertainty, highly conservative assumptions were used in this risk assessment, as discussed below.

Emissions. There are inherent uncertainties in the quantification of emissions from truck travel and idling activities. Emission factors based on the SJVAPCD modeling guideline for truck emissions are based on mobile "on-road" diesel engines (vehicle engines in haul trucks) developed from the ARB on-road emissions factor model (EMFAC). These composite factors include older and newer engines with newer engines designed with cleaner, more fuel-efficient combustion technology.

Air Dispersion Modeling. In general, U.S.EPA dispersion models such as AERMOD are designed to generally to over-predict concentrations rather than under-predict. For example, the model algorithms assume chemical emissions are not transformed in the atmosphere into other chemical compounds. For certain pollutants, conversion may occur quickly enough to reduce concentrations from the conservative model predictions.

Exposure Assessment. The most important uncertainties related to exposure include the definitions of exposed populations and their exposure characteristics. The chief exposure assumption is one of continuous exposure to the TAC concentrations produced by continuous emissions at the maximum emission rates over a 70-year period at each receptor location. The choice of a "residential" maximally exposed individual is very conservative in the sense that no real person is likely to spend 24 hours a day, 365 days a year over a 70-year period at exactly the point of highest toxicity-weighted annual average air concentration. The actual risks are not expected to be any higher than the predicted risks and are likely to be substantially lower. The averaging time for the cancer risk estimate is usually 70 years, which is used to represent a lifetime exposure. An additional conservative assumption was the use of the OEHHA-defined 95th percentile breathing rate of 393 liters of air/kg-day.

Toxicity Assessment. Another area of uncertainty is in the use of toxicity data in risk estimation. Estimates of toxicity for the health risk assessment obtained from OEHHA are conservative compilations of toxicity information. Toxicity estimates are derived either from observations in humans or from projections derived from experiments with laboratory animals. When toxicity estimates are derived from animal data, they usually involve extra safety factors to account for possibly greater sensitivity in humans, and the less-than-human-lifetime observations in animals. Overall, the toxicity assumptions and criteria used in the proposed project risk assessment are biased toward over-estimating risk. The amount of the bias is unknown, but could be substantial.

Diesel Particulate Cancer Potency Factor. The diesel exhaust cancer potency factor is a best-estimate value established by the ARB Scientific Review Panel (SRP) based on review of more than 30 diesel exposure studies. The established potency risk factor is a 95th percentile upper confidence limit value, implying that there is only a 5% chance that the value is underestimated (too low). In addition, the most significant of the studies reviewed by the SRP are occupational studies of exposure of diesel exhaust by railroad workers. The occupational results were then extrapolated to the general population, which includes more sensitive individuals than healthy railroad workers.

6.0 REFERENCES

California Air Pollution Control Officers Association (CAPCOA), 1993. Air Toxics "Hot Spots" Program: Revised 1992 Risk Assessment Guidelines.

California ARB, 2008. HARP Version 1.4a, July.

Office of Environmental Health Hazard Assessment (OEHHA), 2008. Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values, June.

OEHHA, 2003. Air Toxics Hotspots Program Guidance Manual for Preparation of Health Risk Assessments. August.

San Joaquin Valley Air Pollution Control District (SJVAPCD), 2006. Guidance for Air Dispersion Modeling, Appendix A, 2.0 CEQA Health Risk Assessments. July.

Appendix A

Detailed Emission Calculations

Table A-1: Truck Running Emissions Summary

Source ID	Description	Emissions		
		(lbs/hr)	(lbs/day)	(lbs/year)
North1	North site truck travel - no bldg line	3.75E-04	4.50E-03	1.64E+00
North2	North site truck travel - bldg line	7.78E-04	9.33E-03	3.41E+00
North3	North site truck travel - no bldg line	4.27E-04	5.12E-03	1.87E+00
South1	South site truck travel - no bldg line	1.63E-04	1.96E-03	7.15E-01
South2	South site truck travel - bldg line	9.25E-05	1.11E-03	4.05E-01
South3	South site truck travel - no bldg line	5.70E-05	6.84E-04	2.50E-01
Truck Running Emissions <u>General Assumptions:</u> Project Generated Trips¹: 20 trucks/day Daily Operation²: 12 hrs/day <u>Emission Factor:</u> Haul Truck Emission Factor³ 0.670 g/mile <u>Emission Calculation:</u> Truck Running Emissions - North Site <i>North site truck travel - no bldg line</i> Average Travel Distance⁴: 1073 feet/truck trip Average Daily Truck Trips: 15 truck trips/day Daily Travel Distance: 3 miles/day Travel Rate: 0.2539 miles/hour Emission Rate⁵: 0.000375 lbs/hr <i>North site truck travel - bldg line</i> Average Travel Distance⁴: 2224 feet/truck trip³ Average Daily Truck Trips: 15 truck trips/day Daily Travel Distance: 6 miles/day Travel Rate: 0.5265 miles/hour Emission Rate⁵: 0.000778 lbs/hr <i>North site truck travel - no bldg line</i> Average Travel Distance⁴: 1220 feet/truck trip³ Average Daily Truck Trips: 15 truck trips/day Daily Travel Distance: 3 miles/day Travel Rate: 0.2889 miles/hour Emission Rate⁵: 0.000427 lbs/hr				

Table A-1: Truck Running Emissions Summary

Truck Running Emissions - Central Site

***South site truck travel - no
bldg line***

Average Travel Distance ⁴ :	1401 feet/truck trip ⁴
Average Daily Truck Trips:	5 truck trips/day
Daily Travel Distance:	1 miles/day
Travel Rate:	0.1105 miles/hour
Emission Rate ⁵ :	0.000163 lbs/hr ⁵

***South site truck travel - bldg
line***

Average Travel Distance ⁴ :	794 feet/truck trip ⁴
Average Daily Truck Trips:	5 truck trips/day
Daily Travel Distance:	1 miles/day
Travel Rate:	0.0626 miles/hour
Emission Rate ⁵ :	0.000093 lbs/hr ⁵

***South site truck travel - no
bldg line***

Average Travel Distance ⁴ :	489 feet/truck trip ⁴
Average Daily Truck Trips:	5 truck trips/day
Daily Travel Distance:	0 miles/day
Travel Rate:	0.0386 miles/hour
Emission Rate ⁵ :	0.000057 lbs/hr ⁵

¹ A maximum of 20 trucks trips is assumed, of which 15 trucks trips are assumed for the north site and 5 for the central site.

² Truck travel are expected to occur daily.

³ SJVAPCD Modeling Guidance, Emission Factor for Truck Travel.

⁴ Travel distance determined by calculating the shortest delivery truck route distance.

⁵ Average hourly emission estimates are the product of the average truck miles/hour and the emission factor for DPM, in units of grams/mile, converted to pounds.

Average hourly emission rate = 0.2539 miles/hour * 0.67 grams/mile / 453.6 grams/pound
= 0.000375 pounds/hour

Average annual emission rate = 0.000375 pounds/hour * 12 hours/day * 365 days/year
= 1.64 pounds/year

Table A-2: Truck Idling Emissions Summary

Source	Emissions		
	(lbs/hour)	(lbs/day)	(lbs/year)
Total Haul Truck Idling	7.87E-04	9.44E-03	3.45E+00
Haul Truck Idling Emissions at Each Delivery Bay (8 stations)	9.84E-05	1.18E-03	4.31E-01
TRU Idling	4.19E-02	4.19E-02	2.18E+00
Total Haul Truck Idling Emissions			
<u>General Assumptions:</u>			
	Project Generated Trips ¹ :	20 truck trips/day	
	Daily Operation ² :	12 hrs/day ¹	
<u>Emission Factor:</u>			
	Haul Truck Emission Factor ³	2.57 g/idle-hr	
<u>Emission Calculation:</u>			
	Engine Idle ⁴ :	5 minutes/idle	
	Idle rate:	100 idle-minutes/day	
	Hourly Idle Rate ⁵ :	0.139 idle-hrs/hr ⁴	
	Total Emission Rate ⁶ :	0.0008 lbs/hr ⁵	
		0.0094 lbs/day	
		3.45 lbs/year	
	Truck Idling Emissions at each delivery bay (8 bays) ⁷	0.0001 lbs/hr	
		0.0012 lbs/day	
		0.43 lbs/year	
Transportation Refrigeration Unit (TRU) Idling Emissions			
	Engine HP ⁸	50 bhp	
	Operating Time ⁸	0.5 hr/trip	
		0.5 hr/day	
	Operation Frequency ⁸	1 trip/week	
		52 trips/year	
<u>Emission Factor:</u>			
	TRU Emission Factor ⁸	0.76 g/bhp-hr	
		38 g/hr	
<u>Emission Calculation:</u>			
	Emission Rate ⁹ :	0.0419 lb/day	
		0.04 lb/hr	
		2.18 lb/year	
¹ A maximum of 20 trucks trips is assumed, of which 15 trucks trips are assumed for the north site and 5 for the central site. ² Truck travel are expected to occur daily. ³ SJVAPCD Modeling Guidance, Emission Factor for Truck Travel. ⁴ Engine idle time based on state ATCM of 5 minutes for heavy duty trucks. ⁵ Average hours of truck idling per hour is a ratio of idling hours per hour of operation (100 idle minutes/day / 60 minutes/hour / 12 hours/day). ⁶ Average emissions equals the average hourly idle rate (idle-hrs/hr) multiplied by the SJVAPCD emission factor for DPM emissions from truck idling (grams/idle-hr), converted to pounds. Average hourly emission rate = 0.139 idle-hrs/hour * 2.57 grams/mile / 453.6 grams/pound = 0.0008 pounds/hour Average annual emission rate = 0.0008 pounds/hour * 12 hours/day * 365 days/year = 3.45 pounds/year ⁷ For modeling purposes, the idling emissions are equally divided between 8 delivery bays. ⁸ SJVAPCD Modeling Guidance, Transportation Refrigeration Unit Emissions. ⁹ Average emissions equals the SJVAPCD emission factor (gram/hr) multiplied by the hours of idling (0.5 hrs/day), converted to pounds. The TRU operates 0.5 hours per trip with 1 trip per week, i.e. the TRU operates 0.5 hours/day for a total of 52 weeks in a year. Average daily emission rate = 38 grams/hour * 0.5 hr/day/ 453.6 grams/pound = 0.04 pounds/day Average annual emission rate = 0.04 pounds/day * 52 days/yr = 2.18 pounds/year			

Table A-3: Summary of Diesel Particulate Matter Emissions from Trucks

Emission Source	Emission Source Description	Average Emission Rates			
		Hourly Emissions (lbs/hr)	Daily Emissions (lbs/day)	Annual Emissions (lbs/year)	Modeled Annual Emission Rate (g/s)
	Truck Travel				
North1	North site truck travel - no bldg line	3.75E-04	4.50E-03	1.64E+00	2.36E-05
North2	North site truck travel - bldg line	7.78E-04	9.33E-03	3.41E+00	4.90E-05
North3	North site truck travel - no bldg line	4.27E-04	5.12E-03	1.87E+00	2.69E-05
South1	South site truck travel - no bldg line	1.63E-04	1.96E-03	7.15E-01	1.03E-05
South2	South site truck travel - bldg line	9.25E-05	1.11E-03	4.05E-01	5.83E-06
South3	South site truck travel - no bldg line	5.70E-05	6.84E-04	2.50E-01	3.59E-06
	SubTotal	0.0019	0.0227	8.2875	
	Truck Idle				
IDL_NM3	Haul truck idling at delivery dock	9.84E-05	1.18E-03	4.31E-01	6.20E-06
IDL_NM4	Haul truck idling at delivery dock	9.84E-05	1.18E-03	4.31E-01	6.20E-06
IDL_NM5	Haul truck idling at delivery dock	9.84E-05	1.18E-03	4.31E-01	6.20E-06
IDL_NM6	Haul truck idling at delivery dock	9.84E-05	1.18E-03	4.31E-01	6.20E-06
IDL_NM7	Haul truck idling at delivery dock	9.84E-05	1.18E-03	4.31E-01	6.20E-06
IDL_SM1	Haul truck idling at delivery dock	9.84E-05	1.18E-03	4.31E-01	6.20E-06
IDL_SM2	Haul truck idling at delivery dock	9.84E-05	1.18E-03	4.31E-01	6.20E-06
IDL_SM3	Haul truck idling at delivery dock	9.84E-05	1.18E-03	4.31E-01	6.20E-06
IDL_SA1	TRU idling at delivery dock	4.19E-02	4.19E-02	2.18E+00	3.13E-05
	SubTotal	0.0427	0.0513	5.6248	
Grand Total		0.0446	0.0740	13.9123	

Table A-4: PAH and Naphthalene Emissions from Fast Food/Restaurant Operations

Source	Location	Emission Rates ¹					
		Annual (lbs/yr)		Hourly (lbs/hr)		Modeled Annual Emission Rate (g/s)	
		PAH	Naphthalene	PAH	Naphthalene	PAH	Naphthalene
		50328	91203	50328	91203	50328	91203
N-P1	North	2.55E-03	1.51E-01	2.91E-07	1.73E-05	3.67E-08	2.17E-06
N-P2	North	7.57E-04	1.70E-01	8.64E-08	1.94E-05	1.09E-08	2.45E-06
N-P3	North	6.66E-03	3.35E-01	7.61E-07	3.82E-05	9.58E-08	4.82E-06
N-P4	North	2.52E-04	5.72E-02	2.87E-08	6.53E-06	3.62E-09	8.23E-07
S-P1	Central	2.52E-04	5.72E-02	2.87E-08	6.53E-06	3.62E-09	8.23E-07
S-P2	Central	2.52E-04	5.72E-02	2.87E-08	6.53E-06	3.62E-09	8.23E-07
S-P3	Central	2.52E-04	5.72E-02	2.87E-08	6.53E-06	3.62E-09	8.23E-07
S-P4	South	2.52E-04	5.72E-02	2.87E-08	6.53E-06	3.62E-09	8.23E-07
S-P5	South	2.52E-04	5.72E-02	2.87E-08	6.53E-06	3.62E-09	8.23E-07
Total		1.15E-02	9.99E-01	1.31E-06	1.14E-04		

¹SJVAPCD Modeling Guidance, Fast Food Emissions

Appendix B

Detailed Health Risk Calculations

Table B-1: Summary of Maximum Health Risk Impacts by Individual Receptor

Receptor Type	Health Risk Impact	
	Cancer Risk	Non-Cancer Chronic HI
Residential Receptors		
Maximum Exposed Individual Resident (MEIR)	2.3	1.35E-05
Occupational Receptors		
Maximum Exposed Individual Worker (MEIW)	0.1	4.48E-06
School Receptors		
Maximum Exposed Individual Child (MEIC)	0.1	--
Significance Threshold	10-in-one-million	1

Table B-2: Facility Cancer Risk Results

Residential Cancer Risk						
Receptor ID	Receptor Type	Easting (m)	Northing (m)	Cancer Risk		Total Cancer Risk (per million) ¹
				DPM	PAH/ Naphthalene	
1	Res	654835.0625	4182743.25	5.64E-07	4.41E-08	6.08E-07
2	Res	654838	4182787.5	5.76E-07	4.68E-08	6.23E-07
3	Res	654839.625	4182833.5	5.97E-07	5.06E-08	6.48E-07
4	Res	654839.625	4182896.5	6.22E-07	5.19E-08	6.74E-07
5	Res	654839.625	4182939	6.30E-07	6.38E-08	6.94E-07
6	Res	654840.4375	4182985	6.26E-07	7.32E-08	6.99E-07
7	Res	654841.25	4183031.75	6.18E-07	7.59E-08	6.94E-07
8	Res	654797.8125	4182742.5	5.14E-07	3.94E-08	5.53E-07
9	Res	654797.8125	4182801.5	5.18E-07	4.31E-08	5.61E-07
10	Res	654797	4182856.25	5.31E-07	4.50E-08	5.76E-07
11	Res	654795.375	4182898.25	5.39E-07	4.52E-08	5.84E-07
12	Res	654795.375	4182942.5	5.47E-07	5.54E-08	6.03E-07
13	Res	654794.5625	4182983.25	5.47E-07	6.25E-08	6.10E-07
14	Res	654793.75	4183030	5.43E-07	6.54E-08	6.08E-07
15	Res	654805.1875	4183096.5	5.51E-07	6.16E-08	6.13E-07
16	Res	654767.5	4183096.5	4.97E-07	5.72E-08	5.55E-07
17	Res	654725.375	4183321.75	3.98E-07	3.83E-08	4.36E-07
18	Res	654776.5625	4183323.5	4.39E-07	4.27E-08	4.82E-07
19	Res	654815.1875	4183320.75	4.77E-07	4.78E-08	5.25E-07
20	Res	654849	4183319.75	5.14E-07	5.15E-08	5.66E-07
21	Res	654903.125	4183320.75	5.80E-07	5.35E-08	6.34E-07
22	Res	654962	4183320.75	6.76E-07	5.60E-08	7.32E-07
23	Res	655033.5	4183331.25	7.88E-07	4.90E-08	8.37E-07
24	Res	655076	4183332.25	8.37E-07	4.52E-08	8.83E-07
25	Res	655118.5	4183332.25	8.50E-07	4.22E-08	8.92E-07
26	Res	655147.5	4183332.25	8.33E-07	4.11E-08	8.74E-07
27	Res	655189.0625	4183338	7.46E-07	3.66E-08	7.83E-07
28	Res	655235.4375	4183349.75	6.38E-07	2.98E-08	6.68E-07
29	Res	655279.8125	4183373.75	5.22E-07	2.38E-08	5.46E-07
30	Res	655316.5625	4183400	4.31E-07	1.99E-08	4.51E-07
31	Res	655351.3125	4183447.25	3.27E-07	1.67E-08	3.44E-07
32	Res	655372.5625	4183484	2.74E-07	1.51E-08	2.89E-07
33	Res	655339.1875	4183496.75	2.86E-07	1.45E-08	3.01E-07
34	Res	655318.6875	4183462.25	3.36E-07	1.63E-08	3.52E-07
35	Res	655282.0625	4183447.25	3.81E-07	1.87E-08	4.00E-07
36	Res	655253	4183404	4.77E-07	2.35E-08	5.00E-07
37	Res	655219.5625	4183391	5.31E-07	2.73E-08	5.58E-07
38	Res	655182.9375	4183391	5.72E-07	3.03E-08	6.02E-07
39	Res	655143.0625	4183367.5	6.88E-07	3.61E-08	7.24E-07
40	Res	655095.6875	4183365.25	7.25E-07	3.78E-08	7.63E-07
41	Res	655037.5	4183366.25	7.05E-07	4.19E-08	7.47E-07
42	Res	654983.625	4183363	6.47E-07	4.67E-08	6.93E-07
43	Res	654906.5625	4183375.25	5.35E-07	4.64E-08	5.81E-07
44	Res	654833.8125	4183373.5	4.56E-07	4.48E-08	5.01E-07
45	Res	654777.25	4183388.25	3.98E-07	4.14E-08	4.39E-07
46	Res	654722.3125	4183383.25	3.61E-07	3.67E-08	3.97E-07
47	Res	654656.0625	4183325	3.52E-07	3.49E-08	3.87E-07
48	Res	654614	4183326.75	3.27E-07	3.31E-08	3.61E-07
49	Res	654607.5625	4183372	3.03E-07	3.15E-08	3.34E-07
50	Res	654641.5	4183375.25	3.19E-07	3.23E-08	3.51E-07
51	Res	654690	4183409.25	3.32E-07	3.41E-08	3.66E-07
52	Res	654837.0625	4183425.25	4.27E-07	3.97E-08	4.67E-07
53	Res	654903.3125	4183469	4.48E-07	3.47E-08	4.82E-07
54	Res	654985.75	4183433.5	5.39E-07	3.49E-08	5.74E-07
55	Res	655031	4183448	5.22E-07	3.11E-08	5.53E-07
56	Res	655107	4183451.25	4.89E-07	2.79E-08	5.17E-07
57	Res	655216.875	4183470.5	3.86E-07	2.16E-08	4.07E-07
58	Res	655408.9375	4183435.75	3.03E-07	1.81E-08	3.21E-07
59	Res	655458.8125	4183485.75	2.45E-07	1.51E-08	2.60E-07
60	Res	655552	4183467	2.57E-07	1.49E-08	2.72E-07

Table B-2: Facility Cancer Risk Results

Residential Cancer Risk						
Receptor ID	Receptor Type	Easting (m)	Northing (m)	Cancer Risk		Total Cancer Risk (per million) ¹
				DPM	PAH/ Naphthalene	
61	Res	655604.375	4183468.5	2.45E-07	1.44E-08	2.59E-07
62	Res	655604.375	4183510.25	2.20E-07	1.35E-08	2.33E-07
63	Res	655649.25	4183465.5	2.40E-07	1.40E-08	2.54E-07
64	Res	655695.5625	4183473	2.32E-07	1.45E-08	2.47E-07
65	Res	655646.25	4183544.75	1.95E-07	1.24E-08	2.07E-07
66	Res	655728.5	4183497	2.11E-07	1.39E-08	2.25E-07
67	Res	655617.8125	4183431	2.74E-07	1.52E-08	2.89E-07
68	Res	655655.1875	4183411.75	2.82E-07	1.70E-08	2.99E-07
69	Res	655650.75	4183501.5	2.20E-07	1.30E-08	2.33E-07
70	Res	655860.0625	4183311.5	3.23E-07	2.19E-08	3.45E-07
71	Res	655922.875	4183302.5	3.07E-07	2.15E-08	3.28E-07
72	Res	655985.6875	4183302.5	2.82E-07	2.08E-08	3.03E-07
73	Res	656050.75	4183305.5	2.53E-07	1.98E-08	2.73E-07
74	Res	655855.75	4183379	2.69E-07	1.78E-08	2.87E-07
75	Res	655906.375	4183363.75	2.65E-07	1.86E-08	2.84E-07
76	Res	655979.8125	4183361.25	2.49E-07	1.81E-08	2.67E-07
77	Res	655816.0625	4183414.75	2.53E-07	1.74E-08	2.70E-07
78	Res	655866.0625	4183149.75	4.77E-07	3.47E-08	5.11E-07
79	Res	655943.9375	4183173.75	3.90E-07	2.95E-08	4.19E-07
80	Res	656063.625	4183170.25	3.19E-07	2.73E-08	3.46E-07
81	Res	656167.5	4183168.75	2.69E-07	2.63E-08	2.96E-07
82	Res	655896.375	4182828.5	6.09E-07	7.61E-08	6.85E-07
83	Res	655577.125	4182880	1.96E-06	2.86E-07	2.25E-06
84	Res	655551.8125	4182963.5	2.16E-06	1.86E-07	2.34E-06
85	Res	656101.4375	4182378.5	2.69E-07	4.26E-08	3.12E-07
86	Res	655935.5625	4182373	3.52E-07	5.21E-08	4.04E-07
87	Res	655937.0625	4182306.5	3.15E-07	4.78E-08	3.63E-07
88	Res	656000.5625	4182302.25	2.86E-07	4.42E-08	3.30E-07
89	Res	655560.4375	4182299.25	5.47E-07	8.44E-08	6.32E-07
90	Res	655527.9375	4182252	4.68E-07	6.99E-08	5.38E-07
91	Res	655461.5	4182280	5.43E-07	7.62E-08	6.19E-07
92	Res	654993.3125	4182475	5.47E-07	4.83E-08	5.95E-07
93	Res	654675.75	4182334.75	2.49E-07	2.71E-08	2.76E-07
94	Res	655324.75	4182453.25	1.43E-06	1.05E-07	1.54E-06
95	Res	655254.6875	4182439.25	1.03E-06	8.12E-08	1.11E-06
96	Res	655143.375	4182418.25	6.84E-07	6.09E-08	7.45E-07
97	Res	654729.0625	4182408	2.90E-07	3.15E-08	3.22E-07
98	Res	656046.25	4182389.5	2.98E-07	4.61E-08	3.45E-07
99	Res	655909.5	4182413.25	3.94E-07	5.71E-08	4.51E-07
100	Res	656062	4182431.5	3.07E-07	4.73E-08	3.54E-07
101	Res	656160.625	4182731.25	3.19E-07	4.60E-08	3.65E-07
102	Res	656168.5	4182657.75	3.11E-07	4.59E-08	3.57E-07
103	Res	656235.5625	4182812.75	2.90E-07	3.98E-08	3.30E-07
104	Res	656324.9375	4183178.25	2.16E-07	2.38E-08	2.39E-07
105	Res	654750.6875	4183308.5	4.27E-07	4.05E-08	4.67E-07
106	Res	654796.625	4183309.25	4.68E-07	4.53E-08	5.14E-07
107	Res	654832.5625	4183309.25	5.06E-07	5.05E-08	5.56E-07
108	Res	654877.8125	4183305.75	5.64E-07	5.50E-08	6.19E-07
109	Res	654923.75	4183309.75	6.26E-07	5.63E-08	6.82E-07
110	Res	654975	4183310.5	7.17E-07	5.82E-08	7.75E-07
111	Res	654628.6875	4183312.5	3.44E-07	3.41E-08	3.78E-07
112	Res	655056.9375	4183318.5	8.62E-07	4.97E-08	9.12E-07
113	Res	655097.375	4183317	9.16E-07	4.66E-08	9.63E-07
114	Res	655218.625	4183326	7.54E-07	3.48E-08	7.89E-07
115	Res	655565.875	4181945	1.95E-07	2.92E-08	2.24E-07
116	Res	655489.125	4181793.25	1.45E-07	2.19E-08	1.67E-07
117	Res	654772.75	4182128	1.91E-07	2.23E-08	2.13E-07

¹Risk for naphthalene and PAH (as benzo(a)pyrene) were obtained from HARP modeling output files for cancer risk based on a 70-year residential exposure using "Derived (Adjusted)" analysis method.

Table B-3: Facility Cancer Risk Results

Worker Cancer Risk

Receptor ID	Receptor Type	Easting (m)	Northing (m)	Cancer Risk		Total Cancer Risk (per million) ²
				DPM	PAH/ Naphthalene	
118	Sch/Wrk	655514.13	4183905	1.98E-08	7.53E-10	2.05E-08
119	Sch/Wrk	655103.56	4183652.5	5.48E-08	1.50E-09	5.63E-08
120	Wrk	655848.13	4182625	1.34E-07	7.54E-09	1.41E-07
121	Wrk	655548.25	4183635.8	3.50E-08	9.93E-10	3.60E-08

² Risk for naphthalene and PAH (as benzo(a)pyrene) were obtained from HARP modeling output files for cancer risk based on a 40-year worker exposure using "Point Estimate" analysis method.

Child Cancer Risk

Receptor ID	Receptor Type	Easting (m)	Northing (m)	Cancer Risk		Total Cancer Risk (per million) ³
				DPM	PAH/ Naphthalene	
118	Sch	655514.13	4183905	1.73E-08	1.51E-09	1.88E-08
119	Sch	655103.56	4183652.5	4.81E-08	3.00E-09	5.11E-08

³ Risk for naphthalene and PAH (as benzo(a)pyrene) were obtained from HARP modeling output files for cancer risk based on a 9-year child exposure scenario using "Derived OEHHA" analysis method.

Table B-4: Total Chronic Hazard Index - Residential Receptors

Residential Receptor Chronic HI						
Receptor ID	Receptor Type	Easting (m)	Northing (m)	Chronic HI1		Total Chronic HI
				DPM	Naphthalene	
1	Res	654835.06	4182743.3		2.44E-06	2.44E-06
2	Res	654838	4182787.5		2.55E-06	2.55E-06
3	Res	654839.63	4182833.5		2.73E-06	2.73E-06
4	Res	654839.63	4182896.5		2.90E-06	2.90E-06
5	Res	654839.63	4182939		3.35E-06	3.35E-06
6	Res	654840.44	4182985		3.61E-06	3.61E-06
7	Res	654841.25	4183031.8		3.65E-06	3.65E-06
8	Res	654797.81	4182742.5		2.19E-06	2.19E-06
9	Res	654797.81	4182801.5		2.32E-06	2.32E-06
10	Res	654797	4182856.3		2.45E-06	2.45E-06
11	Res	654795.38	4182898.3		2.53E-06	2.53E-06
12	Res	654795.38	4182942.5		2.93E-06	2.93E-06
13	Res	654794.56	4182983.3		3.13E-06	3.13E-06
14	Res	654793.75	4183030		3.18E-06	3.18E-06
15	Res	654805.19	4183096.5		3.04E-06	3.04E-06
16	Res	654767.5	4183096.5		2.81E-06	2.81E-06
17	Res	654725.38	4183321.8		1.97E-06	1.97E-06
18	Res	654776.56	4183323.5		2.18E-06	2.18E-06
19	Res	654815.19	4183320.8		2.40E-06	2.40E-06
20	Res	654849	4183319.8		2.55E-06	2.55E-06
21	Res	654903.13	4183320.8		2.64E-06	2.64E-06
22	Res	654962	4183320.8		2.71E-06	2.71E-06
23	Res	655033.5	4183331.3		2.39E-06	2.39E-06
24	Res	655076	4183332.3		2.20E-06	2.20E-06
25	Res	655118.5	4183332.3		2.06E-06	2.06E-06
26	Res	655147.5	4183332.3		1.98E-06	1.98E-06
27	Res	655189.06	4183338		1.81E-06	1.81E-06
28	Res	655235.44	4183349.8		1.50E-06	1.50E-06
29	Res	655279.81	4183373.8		1.21E-06	1.21E-06
30	Res	655316.56	4183400		9.94E-07	9.94E-07
31	Res	655351.31	4183447.3		8.24E-07	8.24E-07
32	Res	655372.56	4183484		7.43E-07	7.43E-07
33	Res	655339.19	4183496.8		7.30E-07	7.30E-07
34	Res	655318.69	4183462.3		8.27E-07	8.27E-07
35	Res	655282.06	4183447.3		9.57E-07	9.57E-07
36	Res	655253	4183404		1.20E-06	1.20E-06
37	Res	655219.56	4183391		1.38E-06	1.38E-06
38	Res	655182.94	4183391		1.52E-06	1.52E-06
39	Res	655143.06	4183367.5		1.75E-06	1.75E-06
40	Res	655095.69	4183365.3		1.86E-06	1.86E-06
41	Res	655037.5	4183366.3		2.05E-06	2.05E-06
42	Res	654983.63	4183363		2.28E-06	2.28E-06
43	Res	654906.56	4183375.3		2.28E-06	2.28E-06
44	Res	654833.81	4183373.5		2.23E-06	2.23E-06
45	Res	654777.25	4183388.3		2.08E-06	2.08E-06
46	Res	654722.31	4183383.3		1.89E-06	1.89E-06
47	Res	654656.06	4183325		1.79E-06	1.79E-06

Table B-4: Total Chronic Hazard Index - Residential Receptors

Residential Receptor Chronic HI						
Receptor ID	Receptor Type	Easting (m)	Northing (m)	Chronic HI1		Total Chronic HI
				DPM	Naphthalene	
48	Res	654614	4183326.8		1.70E-06	1.70E-06
49	Res	654607.56	4183372		1.62E-06	1.62E-06
50	Res	654641.5	4183375.3		1.68E-06	1.68E-06
51	Res	654690	4183409.3		1.76E-06	1.76E-06
52	Res	654837.06	4183425.3		1.98E-06	1.98E-06
53	Res	654903.31	4183469		1.73E-06	1.73E-06
54	Res	654985.75	4183433.5		1.73E-06	1.73E-06
55	Res	655031	4183448		1.54E-06	1.54E-06
56	Res	655107	4183451.3		1.38E-06	1.38E-06
57	Res	655216.88	4183470.5		1.10E-06	1.10E-06
58	Res	655408.94	4183435.8		8.73E-07	8.73E-07
59	Res	655458.81	4183485.8		7.60E-07	7.60E-07
60	Res	655552	4183467		7.38E-07	7.38E-07
61	Res	655604.38	4183468.5		7.14E-07	7.14E-07
62	Res	655604.38	4183510.3		6.68E-07	6.68E-07
63	Res	655649.25	4183465.5		7.10E-07	7.10E-07
64	Res	655695.56	4183473		7.22E-07	7.22E-07
65	Res	655646.25	4183544.8		6.23E-07	6.23E-07
66	Res	655728.5	4183497		6.93E-07	6.93E-07
67	Res	655617.81	4183431		7.63E-07	7.63E-07
68	Res	655655.19	4183411.8		8.31E-07	8.31E-07
69	Res	655650.75	4183501.5		6.59E-07	6.59E-07
70	Res	655860.06	4183311.5		1.07E-06	1.07E-06
71	Res	655922.88	4183302.5		1.06E-06	1.06E-06
72	Res	655985.69	4183302.5		1.04E-06	1.04E-06
73	Res	656050.75	4183305.5		1.00E-06	1.00E-06
74	Res	655855.75	4183379		9.05E-07	9.05E-07
75	Res	655906.38	4183363.8		9.23E-07	9.23E-07
76	Res	655979.81	4183361.3		8.98E-07	8.98E-07
77	Res	655816.06	4183414.8		8.58E-07	8.58E-07
78	Res	655866.06	4183149.8		1.70E-06	1.70E-06
79	Res	655943.94	4183173.8		1.46E-06	1.46E-06
80	Res	656063.63	4183170.3		1.35E-06	1.35E-06
81	Res	656167.5	4183168.8		1.29E-06	1.29E-06
82	Res	655896.38	4182828.5		3.96E-06	3.96E-06
83	Res	655577.13	4182880		1.35E-05	1.35E-05
84	Res	655551.81	4182963.5		8.15E-06	8.15E-06
85	Res	656101.44	4182378.5		2.50E-06	2.50E-06
86	Res	655935.56	4182373		3.17E-06	3.17E-06
87	Res	655937.06	4182306.5		2.96E-06	2.96E-06
88	Res	656000.56	4182302.3		2.69E-06	2.69E-06
89	Res	655560.44	4182299.3		7.61E-06	7.61E-06
90	Res	655527.94	4182252		6.04E-06	6.04E-06
91	Res	655461.5	4182280		6.84E-06	6.84E-06
92	Res	654993.31	4182475		2.86E-06	2.86E-06
93	Res	654675.75	4182334.8		1.50E-06	1.50E-06

1. Chronic non-cancer impacts are for naphthalene only. SJVAPCD modeling guidance does not require the calculation of DPM chronic impacts. OEHHHA has not published factors for the evaluation of non-cancer risk impacts due to emissions of B(a)P.

Table B-5: Total Chronic Hazard Index - Worker Receptors

Worker Receptor Chronic HI						
Receptor ID	Receptor Type	Easting (m)	Northing (m)	Chronic HI1		Total Chronic HI
				DPM	Naphthalene	
118	Sch/Wrk	655514.13	4183905		4.17E-07	4.17E-07
119	Sch/Wrk	655103.56	4183652.5		8.40E-07	8.40E-07
120	Wrk	655848.13	4182625		4.48E-06	4.48E-06
121	Wrk	655548.25	4183635.8		5.65E-07	5.65E-07

1. Chronic non-cancer impacts are for naphthalene only. SJVAPCD modeling guidance does not require the calculation of DPM chronic impacts. OEHHA has not published factors for the evaluation of non-cancer risk impacts due to emissions of B(a)P.

Table B-6: DPM Cancer Risk Calculation

$$\text{Cancer Risk} = (\text{Slope factor} \times \text{Cair} \times \text{DBR} \times \text{A} \times \text{EF} \times \text{ED} \times 10^{-6}) / \text{AT}$$

Receptor Number	Easting (m)	Northing (m)	Receptor Type	Concentration (ug/m3)	Cancer Risk
Residential Receptors- Cancer Risk Calculation					
1	654835.0625	4182743.25	Res	0.00136	5.64E-07
2	654838	4182787.5	Res	0.00139	5.76E-07
3	654839.625	4182833.5	Res	0.00144	5.97E-07
4	654839.625	4182896.5	Res	0.0015	6.22E-07
5	654839.625	4182939	Res	0.00152	6.30E-07
6	654840.4375	4182985	Res	0.00151	6.26E-07
7	654841.25	4183031.75	Res	0.00149	6.18E-07
8	654797.8125	4182742.5	Res	0.00124	5.14E-07
9	654797.8125	4182801.5	Res	0.00125	5.18E-07
10	654797	4182856.25	Res	0.00128	5.31E-07
11	654795.375	4182898.25	Res	0.0013	5.39E-07
12	654795.375	4182942.5	Res	0.00132	5.47E-07
13	654794.5625	4182983.25	Res	0.00132	5.47E-07
14	654793.75	4183030	Res	0.00131	5.43E-07
15	654805.1875	4183096.5	Res	0.00133	5.51E-07
16	654767.5	4183096.5	Res	0.0012	4.97E-07
17	654725.375	4183321.75	Res	0.00096	3.98E-07
18	654776.5625	4183323.5	Res	0.00106	4.39E-07
19	654815.1875	4183320.75	Res	0.00115	4.77E-07
20	654849	4183319.75	Res	0.00124	5.14E-07
21	654903.125	4183320.75	Res	0.0014	5.80E-07
22	654962	4183320.75	Res	0.00163	6.76E-07
23	655033.5	4183331.25	Res	0.0019	7.88E-07
24	655076	4183332.25	Res	0.00202	8.37E-07
25	655118.5	4183332.25	Res	0.00205	8.50E-07
26	655147.5	4183332.25	Res	0.00201	8.33E-07
27	655189.0625	4183338	Res	0.0018	7.46E-07
28	655235.4375	4183349.75	Res	0.00154	6.38E-07
29	655279.8125	4183373.75	Res	0.00126	5.22E-07
30	655316.5625	4183400	Res	0.00104	4.31E-07
31	655351.3125	4183447.25	Res	0.00079	3.27E-07
32	655372.5625	4183484	Res	0.00066	2.74E-07
33	655339.1875	4183496.75	Res	0.00069	2.86E-07
34	655318.6875	4183462.25	Res	0.00081	3.36E-07
35	655282.0625	4183447.25	Res	0.00092	3.81E-07
36	655253	4183404	Res	0.00115	4.77E-07
37	655219.5625	4183391	Res	0.00128	5.31E-07
38	655182.9375	4183391	Res	0.00138	5.72E-07
39	655143.0625	4183367.5	Res	0.00166	6.88E-07
40	655095.6875	4183365.25	Res	0.00175	7.25E-07
41	655037.5	4183366.25	Res	0.0017	7.05E-07
42	654983.625	4183363	Res	0.00156	6.47E-07
43	654906.5625	4183375.25	Res	0.00129	5.35E-07
44	654833.8125	4183373.5	Res	0.0011	4.56E-07
45	654777.25	4183388.25	Res	0.00096	3.98E-07

Table B-6: DPM Cancer Risk Calculation

Cancer Risk = (Slope factor x Cair x DBR x A x EF x ED x 10⁻⁶)/AT

Receptor Number	Easting (m)	Northing (m)	Receptor Type	Concentration (ug/m3)	Cancer Risk
46	654722.3125	4183383.25	Res	0.00087	3.61E-07
47	654656.0625	4183325	Res	0.00085	3.52E-07
48	654614	4183326.75	Res	0.00079	3.27E-07
49	654607.5625	4183372	Res	0.00073	3.03E-07
50	654641.5	4183375.25	Res	0.00077	3.19E-07
51	654690	4183409.25	Res	0.0008	3.32E-07
52	654837.0625	4183425.25	Res	0.00103	4.27E-07
53	654903.3125	4183469	Res	0.00108	4.48E-07
54	654985.75	4183433.5	Res	0.0013	5.39E-07
55	655031	4183448	Res	0.00126	5.22E-07
56	655107	4183451.25	Res	0.00118	4.89E-07
57	655216.875	4183470.5	Res	0.00093	3.86E-07
58	655408.9375	4183435.75	Res	0.00073	3.03E-07
59	655458.8125	4183485.75	Res	0.00059	2.45E-07
60	655552	4183467	Res	0.00062	2.57E-07
61	655604.375	4183468.5	Res	0.00059	2.45E-07
62	655604.375	4183510.25	Res	0.00053	2.20E-07
63	655649.25	4183465.5	Res	0.00058	2.40E-07
64	655695.5625	4183473	Res	0.00056	2.32E-07
65	655646.25	4183544.75	Res	0.00047	1.95E-07
66	655728.5	4183497	Res	0.00051	2.11E-07
67	655617.8125	4183431	Res	0.00066	2.74E-07
68	655655.1875	4183411.75	Res	0.00068	2.82E-07
69	655650.75	4183501.5	Res	0.00053	2.20E-07
70	655860.0625	4183311.5	Res	0.00078	3.23E-07
71	655922.875	4183302.5	Res	0.00074	3.07E-07
72	655985.6875	4183302.5	Res	0.00068	2.82E-07
73	656050.75	4183305.5	Res	0.00061	2.53E-07
74	655855.75	4183379	Res	0.00065	2.69E-07
75	655906.375	4183363.75	Res	0.00064	2.65E-07
76	655979.8125	4183361.25	Res	0.0006	2.49E-07
77	655816.0625	4183414.75	Res	0.00061	2.53E-07
78	655866.0625	4183149.75	Res	0.00115	4.77E-07
79	655943.9375	4183173.75	Res	0.00094	3.90E-07
80	656063.625	4183170.25	Res	0.00077	3.19E-07
81	656167.5	4183168.75	Res	0.00065	2.69E-07
82	655896.375	4182828.5	Res	0.00147	6.09E-07
83	655577.125	4182880	Res	0.00473	1.96E-06
84	655551.8125	4182963.5	Res	0.0052	2.16E-06
85	656101.4375	4182378.5	Res	0.00065	2.69E-07
86	655935.5625	4182373	Res	0.00085	3.52E-07
87	655937.0625	4182306.5	Res	0.00076	3.15E-07
88	656000.5625	4182302.25	Res	0.00069	2.86E-07
89	655560.4375	4182299.25	Res	0.00132	5.47E-07
90	655527.9375	4182252	Res	0.00113	4.68E-07
91	655461.5	4182280	Res	0.00131	5.43E-07

Table B-6: DPM Cancer Risk Calculation

$$\text{Cancer Risk} = (\text{Slope factor} \times \text{Cair} \times \text{DBR} \times \text{A} \times \text{EF} \times \text{ED} \times 10^{-6}) / \text{AT}$$

Receptor Number	Easting (m)	Northing (m)	Receptor Type	Concentration (ug/m3)	Cancer Risk
92	654993.3125	4182475	Res	0.00132	5.47E-07
93	654675.75	4182334.75	Res	0.0006	2.49E-07
94	655324.75	4182453.25	Res	0.00346	1.43E-06
95	655254.6875	4182439.25	Res	0.00248	1.03E-06
96	655143.375	4182418.25	Res	0.00165	6.84E-07
97	654729.0625	4182408	Res	0.0007	2.90E-07
98	656046.25	4182389.5	Res	0.00072	2.98E-07
99	655909.5	4182413.25	Res	0.00095	3.94E-07
100	656062	4182431.5	Res	0.00074	3.07E-07
101	656160.625	4182731.25	Res	0.00077	3.19E-07
102	656168.5	4182657.75	Res	0.00075	3.11E-07
103	656235.5625	4182812.75	Res	0.0007	2.90E-07
104	656324.9375	4183178.25	Res	0.00052	2.16E-07
105	654750.6875	4183308.5	Res	0.00103	4.27E-07
106	654796.625	4183309.25	Res	0.00113	4.68E-07
107	654832.5625	4183309.25	Res	0.00122	5.06E-07
108	654877.8125	4183305.75	Res	0.00136	5.64E-07
109	654923.75	4183309.75	Res	0.00151	6.26E-07
110	654975	4183310.5	Res	0.00173	7.17E-07
111	654628.6875	4183312.5	Res	0.00083	3.44E-07
112	655056.9375	4183318.5	Res	0.00208	8.62E-07
113	655097.375	4183317	Res	0.00221	9.16E-07
114	655218.625	4183326	Res	0.00182	7.54E-07
115	655565.875	4181945	Res	0.00047	1.95E-07
116	655489.125	4181793.25	Res	0.00035	1.45E-07
117	654772.75	4182128	Res	0.00046	1.91E-07

Residential Risk Calculation

DPM Solpe Factor (mg/kg-day)	1.1
Exposure Frequency EF (days/year)	350
Exposure Duration ED (years)	70
Daily Breathing Rate (litres/kg-day)	393
Averaging time AT (days)	25550
conversion factor	10 ⁻⁶
A	1

Table B-6: DPM Cancer Risk Calculation					
Cancer Risk = (Slope factor x Cair x DBR x A x EF x ED x 10 ⁻⁶)/AT					
Receptor Number	Easting (m)	Northing (m)	Receptor Type	Concentration (ug/m3)	Cancer Risk
Worker Receptors- DPM Cancer Risk Calculation					
118	655514.125	4183905	Sch/Wrk	0.00022	1.98E-08
119	655103.5625	4183652.5	Sch/Wrk	0.00061	5.48E-08
120	655848.125	4182625	Wrk	0.00149	1.34E-07
121	655548.25	4183635.75	Wrk	0.00039	3.50E-08
Worker Risk Calculation DPM Solpe Factor (mg/kg-day) 1.1 Exposure Frequency EF (days/year) 350 Exposure Duration ED (years) 40 Daily Breathing Rate (litres/kg-day) 149 Averaging time AT (days) 25550 conversion factor 10⁻⁶ A 1					
Sensitive Receptors- DPM Cancer Risk Calculation					
118	655514.125	4183905	Sch	0.00022	1.73E-08
119	655103.5625	4183652.5	Sch	0.00061	4.81E-08
Sensitive Risk Calculation DPM Solpe Factor (mg/kg-day) 1.1 Exposure Frequency EF (days/year) 350 Exposure Duration ED (years) 9 Daily Breathing Rate (litres/kg-day) 581 Averaging time AT (days) 25550 conversion factor 10⁻⁶ A 1					

Table B-7: HARP Output: 70-year Residential Cancer Risk																
REC	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG	MEAT	ORAL	TOTAL	
1	1.03E-09	8.95E-09	1.34E-09	0.00E+00	0.00E+00	0.00E+00	3.27E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.30E-08	4.41E-08	
2	1.08E-09	9.51E-09	1.42E-09	0.00E+00	0.00E+00	0.00E+00	3.48E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.57E-08	4.68E-08	
3	1.16E-09	1.03E-08	1.54E-09	0.00E+00	0.00E+00	0.00E+00	3.76E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.94E-08	5.06E-08	
4	1.22E-09	1.05E-08	1.58E-09	0.00E+00	0.00E+00	0.00E+00	3.86E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.07E-08	5.19E-08	
5	1.44E-09	1.30E-08	1.94E-09	0.00E+00	0.00E+00	0.00E+00	4.74E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.24E-08	6.38E-08	
6	1.58E-09	1.49E-08	2.23E-09	0.00E+00	0.00E+00	0.00E+00	5.45E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.16E-08	7.32E-08	
7	1.61E-09	1.54E-08	2.31E-09	0.00E+00	0.00E+00	0.00E+00	5.65E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.43E-08	7.59E-08	
8	9.25E-10	7.99E-09	1.20E-09	0.00E+00	0.00E+00	0.00E+00	2.92E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.84E-08	3.94E-08	
9	9.90E-10	8.76E-09	1.31E-09	0.00E+00	0.00E+00	0.00E+00	3.21E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.21E-08	4.31E-08	
10	1.04E-09	9.14E-09	1.37E-09	0.00E+00	0.00E+00	0.00E+00	3.34E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.39E-08	4.50E-08	
11	1.07E-09	9.18E-09	1.37E-09	0.00E+00	0.00E+00	0.00E+00	3.36E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.41E-08	4.52E-08	
12	1.25E-09	1.13E-08	1.69E-09	0.00E+00	0.00E+00	0.00E+00	4.12E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.41E-08	5.54E-08	
13	1.36E-09	1.27E-08	1.90E-09	0.00E+00	0.00E+00	0.00E+00	4.65E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.11E-08	6.25E-08	
14	1.40E-09	1.33E-08	1.99E-09	0.00E+00	0.00E+00	0.00E+00	4.87E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.40E-08	6.54E-08	
15	1.33E-09	1.25E-08	1.88E-09	0.00E+00	0.00E+00	0.00E+00	4.59E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.03E-08	6.16E-08	
16	1.23E-09	1.16E-08	1.74E-09	0.00E+00	0.00E+00	0.00E+00	4.26E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.60E-08	5.72E-08	
17	8.51E-10	7.78E-09	1.17E-09	0.00E+00	0.00E+00	0.00E+00	2.85E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.74E-08	3.83E-08	
18	9.42E-10	8.68E-09	1.30E-09	0.00E+00	0.00E+00	0.00E+00	3.18E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-08	4.27E-08	
19	1.04E-09	9.73E-09	1.46E-09	0.00E+00	0.00E+00	0.00E+00	3.56E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.68E-08	4.78E-08	
20	1.11E-09	1.05E-08	1.57E-09	0.00E+00	0.00E+00	0.00E+00	3.83E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.03E-08	5.15E-08	
21	1.15E-09	1.09E-08	1.63E-09	0.00E+00	0.00E+00	0.00E+00	3.98E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.23E-08	5.35E-08	
22	1.19E-09	1.14E-08	1.71E-09	0.00E+00	0.00E+00	0.00E+00	4.17E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.48E-08	5.60E-08	
23	1.05E-09	9.98E-09	1.49E-09	0.00E+00	0.00E+00	0.00E+00	3.65E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-08	4.90E-08	
24	9.66E-10	9.21E-09	1.38E-09	0.00E+00	0.00E+00	0.00E+00	3.37E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.43E-08	4.52E-08	
25	9.02E-10	8.59E-09	1.29E-09	0.00E+00	0.00E+00	0.00E+00	3.14E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.13E-08	4.22E-08	
26	8.71E-10	8.36E-09	1.25E-09	0.00E+00	0.00E+00	0.00E+00	3.06E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.02E-08	4.11E-08	
27	7.90E-10	7.45E-09	1.12E-09	0.00E+00	0.00E+00	0.00E+00	2.73E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.58E-08	3.66E-08	
28	6.53E-10	6.07E-09	9.09E-10	0.00E+00	0.00E+00	0.00E+00	2.22E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.92E-08	2.98E-08	
29	5.24E-10	4.85E-09	7.26E-10	0.00E+00	0.00E+00	0.00E+00	1.77E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.33E-08	2.38E-08	
30	4.32E-10	4.04E-09	6.06E-10	0.00E+00	0.00E+00	0.00E+00	1.48E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-08	1.99E-08	
31	3.60E-10	3.40E-09	5.09E-10	0.00E+00	0.00E+00	0.00E+00	1.24E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.64E-08	1.67E-08	
32	3.25E-10	3.08E-09	4.62E-10	0.00E+00	0.00E+00	0.00E+00	1.13E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E-08	1.51E-08	
33	3.17E-10	2.94E-09	4.41E-10	0.00E+00	0.00E+00	0.00E+00	1.08E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E-08	1.45E-08	
34	3.58E-10	3.32E-09	4.97E-10	0.00E+00	0.00E+00	0.00E+00	1.22E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.60E-08	1.63E-08	
35	4.14E-10	3.80E-09	5.69E-10	0.00E+00	0.00E+00	0.00E+00	1.39E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E-08	1.87E-08	
36	5.19E-10	4.78E-09	7.17E-10	0.00E+00	0.00E+00	0.00E+00	1.75E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.30E-08	2.35E-08	
37	5.97E-10	5.55E-09	8.31E-10	0.00E+00	0.00E+00	0.00E+00	2.03E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.67E-08	2.73E-08	
38	6.60E-10	6.16E-09	9.23E-10	0.00E+00	0.00E+00	0.00E+00	2.26E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.96E-08	3.03E-08	
39	7.70E-10	7.35E-09	1.10E-09	0.00E+00	0.00E+00	0.00E+00	2.69E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.54E-08	3.61E-08	
40	8.13E-10	7.69E-09	1.15E-09	0.00E+00	0.00E+00	0.00E+00	2.81E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.70E-08	3.78E-08	
41	8.98E-10	8.53E-09	1.28E-09	0.00E+00	0.00E+00	0.00E+00	3.12E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.10E-08	4.19E-08	
42	1.00E-09	9.51E-09	1.42E-09	0.00E+00	0.00E+00	0.00E+00	3.48E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.57E-08	4.67E-08	
43	9.98E-10	9.45E-09	1.42E-09	0.00E+00	0.00E+00	0.00E+00	3.46E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.54E-08	4.64E-08	
44	9.72E-10	9.11E-09	1.36E-09	0.00E+00	0.00E+00	0.00E+00	3.33E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.38E-08	4.48E-08	
45	9.04E-10	8.42E-09	1.26E-09	0.00E+00	0.00E+00	0.00E+00	3.08E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.05E-08	4.14E-08	
46	8.15E-10	7.47E-09	1.12E-09	0.00E+00	0.00E+00	0.00E+00	2.73E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.59E-08	3.67E-08	
47	7.74E-10	7.11E-09	1.06E-09	0.00E+00	0.00E+00	0.00E+00	2.60E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.42E-08	3.49E-08	
48	7.34E-10	6.73E-09	1.01E-09	0.00E+00	0.00E+00	0.00E+00	2.46E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.23E-08	3.31E-08	
49	7.00E-10	6.40E-09	9.58E-10	0.00E+00	0.00E+00	0.00E+00	2.34E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.08E-08	3.15E-08	
50	7.22E-10	6.57E-09	9.84E-10	0.00E+00	0.00E+00	0.00E+00	2.40E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.16E-08	3.23E-08	
51	7.59E-10	6.94E-09	1.04E-09	0.00E+00	0.00E+00	0.00E+00	2.54E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.33E-08	3.41E-08	
52	8.62E-10	8.07E-09	1.21E-09	0.00E+00	0.00E+00	0.00E+00	2.95E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.88E-08	3.97E-08	
53	7.53E-10	7.06E-09	1.06E-09	0.00E+00	0.00E+00	0.00E+00	2.58E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.40E-08	3.47E-08	
54	7.55E-10	7.10E-09	1.06E-09	0.00E+00	0.00E+00	0.00E+00	2.60E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.42E-08	3.49E-08	
55	6.72E-10	6.33E-09	9.48E-10	0.00E+00	0.00E+00	0.00E+00	2.32E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.04E-08	3.11E-08	
56	6.02E-10	5.68E-09	8.50E-10	0.00E+00	0.00E+00	0.00E+00	2.08E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.73E-08	2.79E-08	
57	4.75E-10	4.39E-09	6.58E-10	0.00E+00	0.00E+00	0.00E+00	1.61E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.11E-08	2.16E-08	
58	3.84E-10	3.69E-09	5.53E-10	0.00E+00	0.00E+00	0.00E+00	1.35E-08	0.00E+00	0							

Table B-7: HARP Output: 70-year Residential Cancer Risk

REC	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG	MEAT	ORAL	TOTAL
81	5.66E-10	5.34E-09	8.01E-10	0.00E+00	0.00E+00	0.00E+00	1.96E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E-08	2.63E-08
82	1.70E-09	1.55E-08	2.32E-09	0.00E+00	0.00E+00	0.00E+00	5.66E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.44E-08	7.61E-08
83	5.96E-09	5.83E-08	8.73E-09	0.00E+00	0.00E+00	0.00E+00	2.13E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.80E-07	2.86E-07
84	3.69E-09	3.78E-08	5.67E-09	0.00E+00	0.00E+00	0.00E+00	1.38E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.82E-07	1.86E-07
85	1.04E-09	8.65E-09	1.30E-09	0.00E+00	0.00E+00	0.00E+00	3.16E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.16E-08	4.26E-08
86	1.31E-09	1.06E-08	1.58E-09	0.00E+00	0.00E+00	0.00E+00	3.86E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.08E-08	5.21E-08
87	1.22E-09	9.68E-09	1.45E-09	0.00E+00	0.00E+00	0.00E+00	3.54E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E-08	4.78E-08
88	1.11E-09	8.96E-09	1.34E-09	0.00E+00	0.00E+00	0.00E+00	3.28E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.31E-08	4.42E-08
89	2.89E-09	1.70E-08	2.54E-09	0.00E+00	0.00E+00	0.00E+00	6.20E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.15E-08	8.44E-08
90	2.31E-09	1.41E-08	2.11E-09	0.00E+00	0.00E+00	0.00E+00	5.15E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.76E-08	6.99E-08
91	2.60E-09	1.53E-08	2.29E-09	0.00E+00	0.00E+00	0.00E+00	5.60E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.36E-08	7.62E-08
92	1.19E-09	9.80E-09	1.47E-09	0.00E+00	0.00E+00	0.00E+00	3.59E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.71E-08	4.83E-08
93	6.34E-10	5.51E-09	8.26E-10	0.00E+00	0.00E+00	0.00E+00	2.02E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.65E-08	2.71E-08
94	3.38E-09	2.10E-08	3.15E-09	0.00E+00	0.00E+00	0.00E+00	7.70E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-07	1.05E-07
95	2.34E-09	1.64E-08	2.46E-09	0.00E+00	0.00E+00	0.00E+00	6.00E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.88E-08	8.12E-08
96	1.55E-09	1.23E-08	1.85E-09	0.00E+00	0.00E+00	0.00E+00	4.51E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.93E-08	6.09E-08
97	7.27E-10	6.40E-09	9.59E-10	0.00E+00	0.00E+00	0.00E+00	2.34E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.08E-08	3.15E-08
98	1.13E-09	9.35E-09	1.40E-09	0.00E+00	0.00E+00	0.00E+00	3.42E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-08	4.61E-08
99	1.44E-09	1.16E-08	1.73E-09	0.00E+00	0.00E+00	0.00E+00	4.24E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.57E-08	5.71E-08
100	1.16E-09	9.61E-09	1.44E-09	0.00E+00	0.00E+00	0.00E+00	3.51E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.62E-08	4.73E-08
101	1.04E-09	9.36E-09	1.40E-09	0.00E+00	0.00E+00	0.00E+00	3.42E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-08	4.60E-08
102	1.05E-09	9.33E-09	1.40E-09	0.00E+00	0.00E+00	0.00E+00	3.41E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.49E-08	4.59E-08
103	9.01E-10	8.09E-09	1.21E-09	0.00E+00	0.00E+00	0.00E+00	2.96E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.89E-08	3.98E-08
104	5.14E-10	4.84E-09	7.25E-10	0.00E+00	0.00E+00	0.00E+00	1.77E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.33E-08	2.38E-08
105	9.00E-10	8.24E-09	1.23E-09	0.00E+00	0.00E+00	0.00E+00	3.02E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.96E-08	4.05E-08
106	9.97E-10	9.22E-09	1.38E-09	0.00E+00	0.00E+00	0.00E+00	3.37E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.43E-08	4.53E-08
107	1.10E-09	1.03E-08	1.54E-09	0.00E+00	0.00E+00	0.00E+00	3.76E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.94E-08	5.05E-08
108	1.18E-09	1.12E-08	1.68E-09	0.00E+00	0.00E+00	0.00E+00	4.09E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.38E-08	5.50E-08
109	1.21E-09	1.15E-08	1.72E-09	0.00E+00	0.00E+00	0.00E+00	4.19E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.51E-08	5.63E-08
110	1.23E-09	1.18E-08	1.77E-09	0.00E+00	0.00E+00	0.00E+00	4.33E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.70E-08	5.82E-08
111	7.57E-10	6.94E-09	1.04E-09	0.00E+00	0.00E+00	0.00E+00	2.54E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.34E-08	3.41E-08
112	1.06E-09	1.01E-08	1.52E-09	0.00E+00	0.00E+00	0.00E+00	3.70E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.86E-08	4.97E-08
113	9.94E-10	9.48E-09	1.42E-09	0.00E+00	0.00E+00	0.00E+00	3.47E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.56E-08	4.66E-08
114	7.57E-10	7.08E-09	1.06E-09	0.00E+00	0.00E+00	0.00E+00	2.59E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.40E-08	3.48E-08
115	7.67E-10	5.91E-09	8.85E-10	0.00E+00	0.00E+00	0.00E+00	2.16E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.84E-08	2.92E-08
116	5.54E-10	4.43E-09	6.64E-10	0.00E+00	0.00E+00	0.00E+00	1.62E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.13E-08	2.19E-08
117	5.23E-10	4.52E-09	6.78E-10	0.00E+00	0.00E+00	0.00E+00	1.66E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.18E-08	2.23E-08

[illegible]

Table B-8: HARP Output: Residential Chronic HI[illegible]

Table B-9: HARP Output: Worker Cancer Risk

REC	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG	MEAT	ORAL	TOTAL
118	3.68E-11	6.34E-10	8.24E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.16E-10	7.53E-10
119	7.38E-11	1.26E-09	1.64E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-09	1.50E-09
120	3.87E-10	6.33E-09	8.23E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.15E-09	7.54E-09
121	4.94E-11	8.35E-10	1.09E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.44E-10	9.93E-10

Table B-10: HARP Output: Worker Chronic HI

REC	CV	CNS	BONE	DEVEL	ENDO	EYE	GILV	IMMUN	KIDN	REPRO	RESP	SKIN	BLOOD	MAX
118	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-07	0.00E+00	0.00E+00	4.17E-07
119	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.40E-07	0.00E+00	0.00E+00	8.40E-07
120	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.48E-06	0.00E+00	0.00E+00	4.48E-06
121	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.65E-07	0.00E+00	0.00E+00	5.65E-07

Table B-11: HARP Output: 9-year Child Cancer Risk

REC	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG	MEAT	ORAL	TOTAL
118	4.30E-11	4.16E-10	1.65E-10	0.00E+00	0.00E+00	0.00E+00	8.85E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E-09	1.51E-09
119	8.64E-11	8.28E-10	3.28E-10	0.00E+00	0.00E+00	0.00E+00	1.76E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.92E-09	3.00E-09

Table B-12: AERMOD Concentration Output for DPM Sources

Easting (m)	Northing (m)	Average Concentration (ug/m3)	Averaging Period	Source Group	Hours
654835.0625	4182743.25	0.00136	PERIOD	DPM	8760
654838	4182787.5	0.00139	PERIOD	DPM	8760
654839.625	4182833.5	0.00144	PERIOD	DPM	8760
654839.625	4182896.5	0.0015	PERIOD	DPM	8760
654839.625	4182939	0.00152	PERIOD	DPM	8760
654840.4375	4182985	0.00151	PERIOD	DPM	8760
654841.25	4183031.75	0.00149	PERIOD	DPM	8760
654797.8125	4182742.5	0.00124	PERIOD	DPM	8760
654797.8125	4182801.5	0.00125	PERIOD	DPM	8760
654797	4182856.25	0.00128	PERIOD	DPM	8760
654795.375	4182898.25	0.0013	PERIOD	DPM	8760
654795.375	4182942.5	0.00132	PERIOD	DPM	8760
654794.5625	4182983.25	0.00132	PERIOD	DPM	8760
654793.75	4183030	0.00131	PERIOD	DPM	8760
654805.1875	4183096.5	0.00133	PERIOD	DPM	8760
654767.5	4183096.5	0.0012	PERIOD	DPM	8760
654725.375	4183321.75	0.00096	PERIOD	DPM	8760
654776.5625	4183323.5	0.00106	PERIOD	DPM	8760
654815.1875	4183320.75	0.00115	PERIOD	DPM	8760
654849	4183319.75	0.00124	PERIOD	DPM	8760
654903.125	4183320.75	0.0014	PERIOD	DPM	8760
654962	4183320.75	0.00163	PERIOD	DPM	8760
655033.5	4183331.25	0.0019	PERIOD	DPM	8760
655076	4183332.25	0.00202	PERIOD	DPM	8760
655118.5	4183332.25	0.00205	PERIOD	DPM	8760
655147.5	4183332.25	0.00201	PERIOD	DPM	8760
655189.0625	4183338	0.0018	PERIOD	DPM	8760
655235.4375	4183349.75	0.00154	PERIOD	DPM	8760
655279.8125	4183373.75	0.00126	PERIOD	DPM	8760
655316.5625	4183400	0.00104	PERIOD	DPM	8760
655351.3125	4183447.25	0.00079	PERIOD	DPM	8760
655372.5625	4183484	0.00066	PERIOD	DPM	8760
655339.1875	4183496.75	0.00069	PERIOD	DPM	8760
655318.6875	4183462.25	0.00081	PERIOD	DPM	8760
655282.0625	4183447.25	0.00092	PERIOD	DPM	8760
655253	4183404	0.00115	PERIOD	DPM	8760
655219.5625	4183391	0.00128	PERIOD	DPM	8760
655182.9375	4183391	0.00138	PERIOD	DPM	8760
655143.0625	4183367.5	0.00166	PERIOD	DPM	8760
655095.6875	4183365.25	0.00175	PERIOD	DPM	8760
655037.5	4183366.25	0.0017	PERIOD	DPM	8760
654983.625	4183363	0.00156	PERIOD	DPM	8760
654906.5625	4183375.25	0.00129	PERIOD	DPM	8760
654833.8125	4183373.5	0.0011	PERIOD	DPM	8760
654777.25	4183388.25	0.00096	PERIOD	DPM	8760
654722.3125	4183383.25	0.00087	PERIOD	DPM	8760
654656.0625	4183325	0.00085	PERIOD	DPM	8760

Table B-12: AERMOD Concentration Output for DPM Sources

Easting (m)	Northing (m)	Average Concentration (ug/m3)	Averaging Period	Source Group	Hours
654614	4183326.75	0.00079	PERIOD	DPM	8760
654607.5625	4183372	0.00073	PERIOD	DPM	8760
654641.5	4183375.25	0.00077	PERIOD	DPM	8760
654690	4183409.25	0.0008	PERIOD	DPM	8760
654837.0625	4183425.25	0.00103	PERIOD	DPM	8760
654903.3125	4183469	0.00108	PERIOD	DPM	8760
654985.75	4183433.5	0.0013	PERIOD	DPM	8760
655031	4183448	0.00126	PERIOD	DPM	8760
655107	4183451.25	0.00118	PERIOD	DPM	8760
655216.875	4183470.5	0.00093	PERIOD	DPM	8760
655408.9375	4183435.75	0.00073	PERIOD	DPM	8760
655458.8125	4183485.75	0.00059	PERIOD	DPM	8760
655552	4183467	0.00062	PERIOD	DPM	8760
655604.375	4183468.5	0.00059	PERIOD	DPM	8760
655604.375	4183510.25	0.00053	PERIOD	DPM	8760
655649.25	4183465.5	0.00058	PERIOD	DPM	8760
655695.5625	4183473	0.00056	PERIOD	DPM	8760
655646.25	4183544.75	0.00047	PERIOD	DPM	8760
655728.5	4183497	0.00051	PERIOD	DPM	8760
655617.8125	4183431	0.00066	PERIOD	DPM	8760
655655.1875	4183411.75	0.00068	PERIOD	DPM	8760
655650.75	4183501.5	0.00053	PERIOD	DPM	8760
655860.0625	4183311.5	0.00078	PERIOD	DPM	8760
655922.875	4183302.5	0.00074	PERIOD	DPM	8760
655985.6875	4183302.5	0.00068	PERIOD	DPM	8760
656050.75	4183305.5	0.00061	PERIOD	DPM	8760
655855.75	4183379	0.00065	PERIOD	DPM	8760
655906.375	4183363.75	0.00064	PERIOD	DPM	8760
655979.8125	4183361.25	0.0006	PERIOD	DPM	8760
655816.0625	4183414.75	0.00061	PERIOD	DPM	8760
655866.0625	4183149.75	0.00115	PERIOD	DPM	8760
655943.9375	4183173.75	0.00094	PERIOD	DPM	8760
656063.625	4183170.25	0.00077	PERIOD	DPM	8760
656167.5	4183168.75	0.00065	PERIOD	DPM	8760
655896.375	4182828.5	0.00147	PERIOD	DPM	8760
655577.125	4182880	0.00473	PERIOD	DPM	8760
655551.8125	4182963.5	0.0052	PERIOD	DPM	8760
656101.4375	4182378.5	0.00065	PERIOD	DPM	8760
655935.5625	4182373	0.00085	PERIOD	DPM	8760
655937.0625	4182306.5	0.00076	PERIOD	DPM	8760
656000.5625	4182302.25	0.00069	PERIOD	DPM	8760
655560.4375	4182299.25	0.00132	PERIOD	DPM	8760
655527.9375	4182252	0.00113	PERIOD	DPM	8760
655461.5	4182280	0.00131	PERIOD	DPM	8760
654993.3125	4182475	0.00132	PERIOD	DPM	8760
654675.75	4182334.75	0.0006	PERIOD	DPM	8760
655324.75	4182453.25	0.00346	PERIOD	DPM	8760

Table B-12: AERMOD Concentration Output for DPM Sources

Easting (m)	Northing (m)	Average Concentration (ug/m3)	Averaging Period	Source Group	Hours
655254.6875	4182439.25	0.00248	PERIOD	DPM	8760
655143.375	4182418.25	0.00165	PERIOD	DPM	8760
654729.0625	4182408	0.0007	PERIOD	DPM	8760
656046.25	4182389.5	0.00072	PERIOD	DPM	8760
655909.5	4182413.25	0.00095	PERIOD	DPM	8760
656062	4182431.5	0.00074	PERIOD	DPM	8760
656160.625	4182731.25	0.00077	PERIOD	DPM	8760
656168.5	4182657.75	0.00075	PERIOD	DPM	8760
656235.5625	4182812.75	0.0007	PERIOD	DPM	8760
656324.9375	4183178.25	0.00052	PERIOD	DPM	8760
654750.6875	4183308.5	0.00103	PERIOD	DPM	8760
654796.625	4183309.25	0.00113	PERIOD	DPM	8760
654832.5625	4183309.25	0.00122	PERIOD	DPM	8760
654877.8125	4183305.75	0.00136	PERIOD	DPM	8760
654923.75	4183309.75	0.00151	PERIOD	DPM	8760
654975	4183310.5	0.00173	PERIOD	DPM	8760
654628.6875	4183312.5	0.00083	PERIOD	DPM	8760
655056.9375	4183318.5	0.00208	PERIOD	DPM	8760
655097.375	4183317	0.00221	PERIOD	DPM	8760
655218.625	4183326	0.00182	PERIOD	DPM	8760
655565.875	4181945	0.00047	PERIOD	DPM	8760
655489.125	4181793.25	0.00035	PERIOD	DPM	8760
654772.75	4182128	0.00046	PERIOD	DPM	8760
655514.125	4183905	0.00022	PERIOD	DPM	8760
655103.5625	4183652.5	0.00061	PERIOD	DPM	8760
655848.125	4182625	0.00149	PERIOD	DPM	8760
655548.25	4183635.75	0.00039	PERIOD	DPM	8760

Table B-13: Receptor List

ID	Easting (m)	Northing (m)	Type
1	654835.07	4182743.21	Res
2	654837.98	4182787.51	Res
3	654839.62	4182833.4	Res
4	654839.62	4182896.5	Res
5	654839.62	4182939.12	Res
6	654840.44	4182985.01	Res
7	654841.26	4183031.72	Res
8	654797.83	4182742.44	Res
9	654797.83	4182801.45	Res
10	654797.01	4182856.35	Res
11	654795.37	4182898.14	Res
12	654795.37	4182942.39	Res
13	654794.55	4182983.37	Res
14	654793.73	4183030.08	Res
15	654805.21	4183096.45	Res
16	654767.51	4183096.45	Res
17	654725.35	4183321.68	Res
18	654776.55	4183323.61	Res
19	654815.19	4183320.71	Res
20	654849	4183319.75	Res
21	654903.1	4183320.71	Res
22	654962.02	4183320.71	Res
23	655033.51	4183331.34	Res
24	655076.01	4183332.31	Res
25	655118.52	4183332.31	Res
26	655147.5	4183332.31	Res
27	655189.04	4183338.1	Res
28	655235.41	4183349.69	Res
29	655279.84	4183373.84	Res
30	655316.55	4183399.93	Res
31	655351.33	4183447.26	Res
32	655372.58	4183483.97	Res
33	655339.18	4183496.71	Res
34	655318.71	4183462.23	Res
35	655282.07	4183447.14	Res
36	655252.98	4183404.04	Res
37	655219.58	4183391.11	Res
38	655182.94	4183391.11	Res
39	655143.08	4183367.41	Res
40	655095.67	4183365.26	Res
41	655037.48	4183366.33	Res
42	654983.61	4183363.1	Res
43	654906.57	4183375.22	Res
44	654833.84	4183373.61	Res
45	654777.27	4183388.15	Res
46	654722.32	4183383.3	Res
47	654656.06	4183325.12	Res
48	654614.03	4183326.74	Res
49	654607.57	4183371.99	Res

Table B-13: Receptor List

ID	Easting (m)	Northing (m)	Type
50	654641.51	4183375.22	Res
51	654690	4183409.16	Res
52	654837.07	4183425.32	Res
53	654903.34	4183468.96	Res
54	654985.77	4183433.41	Res
55	655031.02	4183447.95	Res
56	655106.98	4183451.18	Res
57	655216.89	4183470.58	Res
58	655408.96	4183435.83	Res
59	655458.81	4183485.68	Res
60	655552.03	4183466.99	Res
61	655604.37	4183468.48	Res
62	655604.37	4183510.36	Res
63	655649.23	4183465.49	Res
64	655695.59	4183472.97	Res
65	655646.24	4183544.75	Res
66	655728.49	4183496.9	Res
67	655617.83	4183431.1	Res
68	655655.21	4183411.66	Res
69	655650.73	4183501.38	Res
70	655860.09	4183311.46	Res
71	655922.9	4183302.49	Res
72	655985.71	4183302.49	Res
73	656050.76	4183305.46	Res
74	655855.74	4183378.91	Res
75	655906.4	4183363.72	Res
76	655979.84	4183361.18	Res
77	655816.05	4183414.64	Res
78	655866.09	4183149.83	Res
79	655943.96	4183173.86	Res
80	656063.65	4183170.26	Res
81	656167.48	4183168.81	Res
82	655896.37	4182828.49	Res
83	655577.15	4182879.97	Res
84	655551.82	4182963.55	Res
85	656101.41	4182378.5	Res
86	655935.57	4182373.07	Res
87	655937.04	4182306.61	Res
88	656000.55	4182302.18	Res
89	655560.44	4182299.23	Res
90	655527.94	4182251.97	Res
91	655461.48	4182280.03	Res
92	654993.31	4182474.98	Res
93	654675.77	4182334.68	Res
94	655324.77	4182453.26	Res
95	655254.66	4182439.24	Res
96	655143.36	4182418.2	Res
97	654729.05	4182407.9	Res
98	656046.25	4182389.5	Res

Table B-13: Receptor List

ID	Easting (m)	Northing (m)	Type
99	655909.53	4182413.16	Res
100	656062.02	4182431.57	Res
101	656160.62	4182731.29	Res
102	656168.5	4182657.67	Res
103	656235.55	4182812.79	Res
104	656324.94	4183178.24	Res
105	654750.71	4183308.49	Res
106	654796.63	4183309.16	Res
107	654832.57	4183309.16	Res
108	654877.82	4183305.83	Res
109	654923.74	4183309.82	Res
110	654974.99	4183310.49	Res
111	654628.67	4183312.57	Res
112	655056.93	4183318.56	Res
113	655097.36	4183317.06	Res
114	655218.65	4183326.05	Res
115	655565.89	4181945.1	Res
116	655489.1	4181793.26	Res
117	654772.75	4182127.91	Res
118	655514.15	4183904.96	Sch/Wrk
119	655103.54	4183652.49	Sch/Wrk
120	655848.13	4182624.88	Wrk
121	655548.27	4183635.64	Wrk

Appendix C

AERMOD Modeling Files

Appendix C: AERMOD File Index

- Each of the UC_HRA* folder includes the following files:

UC_HRA*.AD
UC_HRA*.dat
UC_HRA*.adi
UC_HRA*.ADO
UC_HRA*.bpi
UC_HRA*.ini
UC_HRA*.isc
UC_HRA*.pro
UC_HRA*.sup

Where,

* =

0 – for year 2000 meteorological data
1 – for year 2001 meteorological data
2 – for year 2002 meteorological data
3 – for year 2003 meteorological data
4 – for year 2004 meteorological data

- Met_Data_Stockton folder includes the meteorological files for all the five years

Appendix D

HARP Modeling Files

Appendix D: HARP File Index

Folder	File Name
HARP	UC_HRA2_FOOD.XOQ
	UC_HRA2_FOOD.SRC
	UC_HRA2_FOOD.sit
	UC_HRA2_FOOD.RSK
	UC_HRA2_FOOD.ini
	UC_HRA2_FOOD.ems
HARP On-Ramp Files	UC_HRA2_FOOD_AUTOMATION_FILE.INI
	UC_HRA2_FOOD_SUMMARY_FILE.TXT
HARP- HRA Reports	Rep_Can_9yrC_DerOEH_AllRec_AllSrc_AllCh_ByRec.txt
	Rep_Can_70yr_DerAdj_AllRec_AllSrc_AllCh_ByRec.txt
	Rep_Can_WRK_Avg_AllRec_AllSrc_AllCh_ByRec.txt
	Rep_Chr_Res_DerOEH_AllRec_AllSrc_AllCh_ByRec.txt
	Rep_Chr_Wrk_PtEst_AllRec_AllSrc_AllCh_ByRec.txt

Air Modeling Results

Urbemis 2007 Version 9.2.4

Combined Annual Emissions Reports (Tons/Year)

File Name: H:\PROJECTS\Union Crossing\Construction URBEMIS\Union Crossing Mass Site Grading.urb924

Project Name: Union Crossing Initial Mass Site Grading

Project Location: San Joaquin County

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>
2009 TOTALS (tons/year unmitigated)	0.21	2.15	0.97	0.00	3.67	0.10	3.77	0.77	0.09	0.86	220.22
2009 TOTALS (tons/year mitigated)	0.21	2.15	0.97	0.00	1.74	0.10	1.84	0.36	0.09	0.46	220.22
Percent Reduction	0.00	0.00	0.00	0.00	52.63	0.00	51.22	52.59	0.00	46.90	0.00

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>

12/17/2008 8:37:04 PM

2009	0.21	2.15	0.97	0.00	3.67	0.10	3.77	0.77	0.09	0.86	220.22
Mass Grading 05/01/2009-07/31/2009	0.21	2.15	0.97	0.00	3.67	0.10	3.77	0.77	0.09	0.86	220.22
Mass Grading Dust	0.00	0.00	0.00	0.00	3.66	0.00	3.66	0.76	0.00	0.76	0.00
Mass Grading Off Road Diesel	0.15	1.18	0.60	0.00	0.00	0.06	0.06	0.00	0.06	0.06	99.25
Mass Grading On Road Diesel	0.06	0.97	0.32	0.00	0.00	0.04	0.04	0.00	0.03	0.04	116.75
Mass Grading Worker Trips	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.22

Phase Assumptions

Phase: Mass Grading 5/1/2009 - 7/31/2009 - Initial mass site grading for overall site and cut/fill.

Total Acres Disturbed: 50.25

Maximum Daily Acreage Disturbed: 8.38

Fugitive Dust Level of Detail: High

Onsite Haulage: 486.9 ton-miles/day; Offsite haulage: 0 ton-mils/day

On Road Truck Travel (VMT): 878.79

Off-Road Equipment:

- 1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
- 1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 8 hours per day
- 2 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day
- 1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

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Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Annual Tons Per Year, Mitigated

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>
2009	0.21	2.15	0.97	0.00	1.74	0.10	1.84	0.36	0.09	0.46	220.22
Mass Grading 05/01/2009-07/31/2009	0.21	2.15	0.97	0.00	1.74	0.10	1.84	0.36	0.09	0.46	220.22
Mass Grading Dust	0.00	0.00	0.00	0.00	1.73	0.00	1.73	0.36	0.00	0.36	0.00
Mass Grading Off Road Diesel	0.15	1.18	0.60	0.00	0.00	0.06	0.06	0.00	0.06	0.06	99.25
Mass Grading On Road Diesel	0.06	0.97	0.32	0.00	0.00	0.04	0.04	0.00	0.03	0.04	116.75
Mass Grading Worker Trips	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.22

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Mass Grading 5/1/2009 - 7/31/2009 - Initial mass site grading for overall site and cut/fill.

For Soil Stabilizing Measures, the Water exposed surfaces 2x daily watering mitigation reduces emissions by:

PM10: 55% PM25: 55%

For Unpaved Roads Measures, the Reduce speed on unpaved roads to less than 15 mph mitigation reduces emissions by:

PM10: 44% PM25: 44%

Estimated Ton-Miles of Exported Soil
(Input for High-Level of Detail for Fugitive Dust from Off-Site Haulage in URBEMIS)

Project Name: Input

Building ID: Input

Excavation

Number of Haul Trucks per Day

Total Cut/Fill Volume Input CY

Total Number of Haul Trucks

Number of Months for Excavation Input

Haul Truck Trips per Day

Soil Type	Dry Density (g/cm3)
Sand	1.52
Sandy Loam	1.44
Loam	1.36
Silt Loam	1.28
Clay Loam	1.28
Clay	1.20

Note: Dry density in most soils varies within the range 1.1 to 1.6

Ton-Mile per Day Calculation

Soil Type Input
 Soil Density (g/m3) g/cm3

Soil Density (lbs/CY) lbs/CY

Soil Density (tons/CY) tons/CY

Haul Distance (Round Trip On-Site) Input Miles

Ton-Miles per Day <-----> Haul truck trips per day * 20 CY/truck * tons/CY * miles/trip

Urbemis 2007 Version 9.2.4

Combined Annual Emissions Reports (Tons/Year)

File Name: H:\PROJECTS\Union Crossing\Construction URBEMIS\Phase I Construction.urb924

Project Name: Union Crossing Phase 1 Construction

Project Location: San Joaquin County

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>
2009 TOTALS (tons/year unmitigated)	1.19	2.47	2.71	0.00	0.61	0.17	0.78	0.13	0.16	0.29	327.11
2009 TOTALS (tons/year mitigated)	1.19	2.47	2.71	0.00	0.29	0.17	0.47	0.06	0.16	0.22	327.11
Percent Reduction	0.00	0.00	0.00	0.00	52.14	0.00	40.56	51.76	0.00	23.05	0.00
2010 TOTALS (tons/year unmitigated)	1.95	1.04	1.56	0.00	0.00	0.07	0.08	0.00	0.06	0.07	187.36
2010 TOTALS (tons/year mitigated)	1.95	1.04	1.56	0.00	0.00	0.07	0.08	0.00	0.06	0.07	187.36
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>

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2010	1.95	1.04	1.56	0.00	0.00	0.07	0.08	0.00	0.06	0.07	187.36
Building 07/01/2009-05/31/2010	0.23	1.04	1.54	0.00	0.00	0.07	0.07	0.00	0.06	0.07	185.31
Building Off Road Diesel	0.20	0.89	0.60	0.00	0.00	0.06	0.06	0.00	0.06	0.06	86.73
Building Vendor Trips	0.01	0.11	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.50
Building Worker Trips	0.03	0.05	0.85	0.00	0.00	0.00	0.01	0.00	0.00	0.00	79.08
Coating 11/02/2009-05/31/2010	1.71	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.05
Architectural Coating	1.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.05

Phase Assumptions

Phase: Fine Grading 6/1/2009 - 6/30/2009 - Northern Retail Site Grading (21.91 ac)

Total Acres Disturbed: 21.91

Maximum Daily Acreage Disturbed: 5.48

Fugitive Dust Level of Detail: Default

10 lbs per acre-day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 8 hours per day

2 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

Phase: Paving 7/1/2009 - 10/31/2009 - Paving for access paths and 987 parking spots

Acres to be Paved: 7.36

Off-Road Equipment:

4 Cement and Mortar Mixers (10 hp) operating at a 0.56 load factor for 6 hours per day

1 Pavers (100 hp) operating at a 0.62 load factor for 7 hours per day

2 Paving Equipment (104 hp) operating at a 0.53 load factor for 6 hours per day

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1 Rollers (95 hp) operating at a 0.56 load factor for 7 hours per day

Phase: Building Construction 7/1/2009 - 5/31/2010 - Bldg construction for Phase 1 (225.8 ksf)

Off-Road Equipment:

1 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

2 Forklifts (145 hp) operating at a 0.3 load factor for 6 hours per day

1 Generator Sets (49 hp) operating at a 0.74 load factor for 8 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

3 Welders (45 hp) operating at a 0.45 load factor for 8 hours per day

Phase: Architectural Coating 11/2/2009 - 5/31/2010 - AC for Phase 1 uses

Rule: Residential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 130

Rule: Residential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 130

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Annual Tons Per Year, Mitigated

<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>

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2010	1.95	1.04	1.56	0.00	0.00	0.07	0.08	0.00	0.06	0.07	187.36
Building 07/01/2009-05/31/2010	0.23	1.04	1.54	0.00	0.00	0.07	0.07	0.00	0.06	0.07	185.31
Building Off Road Diesel	0.20	0.89	0.60	0.00	0.00	0.06	0.06	0.00	0.06	0.06	86.73
Building Vendor Trips	0.01	0.11	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.50
Building Worker Trips	0.03	0.05	0.85	0.00	0.00	0.00	0.01	0.00	0.00	0.00	79.08
Coating 11/02/2009-05/31/2010	1.71	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.05
Architectural Coating	1.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.05

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Fine Grading 6/1/2009 - 6/30/2009 - Northern Retail Site Grading (21.91 ac)

For Soil Stabilizing Measures, the Water exposed surfaces 2x daily watering mitigation reduces emissions by:

PM10: 55% PM25: 55%

For Unpaved Roads Measures, the Reduce speed on unpaved roads to less than 15 mph mitigation reduces emissions by:

PM10: 44% PM25: 44%

Urbemis 2007 Version 9.2.4

Combined Annual Emissions Reports (Tons/Year)

File Name: H:\PROJECTS\Union Crossing\Construction URBEMIS\Phase II Construction.urb924

Project Name: Union Cross Phase II Construction

Project Location: San Joaquin County

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>
2010 TOTALS (tons/year unmitigated)	0.71	2.20	2.27	0.00	0.48	0.16	0.63	0.10	0.14	0.24	290.64
2010 TOTALS (tons/year mitigated)	0.71	2.20	2.27	0.00	0.23	0.16	0.38	0.05	0.14	0.19	290.64
Percent Reduction	0.00	0.00	0.00	0.00	52.13	0.00	39.31	51.74	0.00	21.36	0.00
2011 TOTALS (tons/year unmitigated)	2.13	2.31	3.09	0.00	0.01	0.16	0.17	0.00	0.15	0.15	401.58
2011 TOTALS (tons/year mitigated)	2.13	2.31	3.09	0.00	0.01	0.16	0.17	0.00	0.15	0.15	401.58
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>

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2011	2.13	2.31	3.09	0.00	0.01	0.16	0.17	0.00	0.15	0.15	401.58
Building 07/01/2010-12/31/2011	0.50	2.31	3.07	0.00	0.01	0.16	0.17	0.00	0.15	0.15	399.64
Building Off Road Diesel	0.44	2.04	1.41	0.00	0.00	0.15	0.15	0.00	0.14	0.14	210.76
Building Vendor Trips	0.02	0.19	0.16	0.00	0.00	0.01	0.01	0.00	0.01	0.01	37.35
Building Worker Trips	0.05	0.08	1.50	0.00	0.01	0.00	0.01	0.00	0.00	0.01	151.53
Coating 11/01/2010-12/31/2011	1.63	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.94
Architectural Coating	1.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.94

Phase Assumptions

Phase: Fine Grading 6/1/2010 - 6/30/2010 - Site grading for 17.22 acres

Total Acres Disturbed: 17.21

Maximum Daily Acreage Disturbed: 4.3

Fugitive Dust Level of Detail: Default

10 lbs per acre-day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

1 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 6 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

Phase: Paving 7/1/2010 - 10/31/2010 - Paving for 777 parking spaces

Acres to be Paved: 5.8

Off-Road Equipment:

4 Cement and Mortar Mixers (10 hp) operating at a 0.56 load factor for 6 hours per day

1 Pavers (100 hp) operating at a 0.62 load factor for 7 hours per day

2 Paving Equipment (104 hp) operating at a 0.53 load factor for 6 hours per day

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1 Rollers (95 hp) operating at a 0.56 load factor for 7 hours per day

Phase: Building Construction 7/1/2010 - 12/31/2011 - Central Retail Site (178 ksf)

Off-Road Equipment:

1 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

2 Forklifts (145 hp) operating at a 0.3 load factor for 6 hours per day

1 Generator Sets (49 hp) operating at a 0.74 load factor for 8 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

3 Welders (45 hp) operating at a 0.45 load factor for 8 hours per day

Phase: Architectural Coating 11/1/2010 - 12/31/2011 - Architectural coatings for Central Retail Site

Rule: Residential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 130

Rule: Residential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 130

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Annual Tons Per Year, Mitigated

<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>

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2011	2.13	2.31	3.09	0.00	0.01	0.16	0.17	0.00	0.15	0.15	401.58
Building 07/01/2010-12/31/2011	0.50	2.31	3.07	0.00	0.01	0.16	0.17	0.00	0.15	0.15	399.64
Building Off Road Diesel	0.44	2.04	1.41	0.00	0.00	0.15	0.15	0.00	0.14	0.14	210.76
Building Vendor Trips	0.02	0.19	0.16	0.00	0.00	0.01	0.01	0.00	0.01	0.01	37.35
Building Worker Trips	0.05	0.08	1.50	0.00	0.01	0.00	0.01	0.00	0.00	0.01	151.53
Coating 11/01/2010-12/31/2011	1.63	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.94
Architectural Coating	1.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.94

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Fine Grading 6/1/2010 - 6/30/2010 - Site grading for 17.22 acres

For Soil Stabilizing Measures, the Water exposed surfaces 2x daily watering mitigation reduces emissions by:

PM10: 55% PM25: 55%

For Unpaved Roads Measures, the Reduce speed on unpaved roads to less than 15 mph mitigation reduces emissions by:

PM10: 44% PM25: 44%

Urbemis 2007 Version 9.2.4

Combined Annual Emissions Reports (Tons/Year)

File Name: H:\PROJECTS\Union Crossing\Construction URBEMIS\Phase III Construction.urb924

Project Name: Union Crossing Phase III Construction

Project Location: San Joaquin County

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>
2012 TOTALS (tons/year unmitigated)	0.97	2.39	2.00	0.00	0.16	0.17	0.32	0.03	0.15	0.18	298.17
2012 TOTALS (tons/year mitigated)	0.97	2.39	2.00	0.00	0.07	0.17	0.24	0.02	0.15	0.17	298.17
Percent Reduction	0.00	0.00	0.00	0.00	51.86	0.00	25.11	51.29	0.00	9.10	0.00

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>

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2012	0.97	2.39	2.00	0.00	0.16	0.17	0.32	0.03	0.15	0.18	298.17
Fine Grading 01/01/2012-01/31/2012	0.03	0.24	0.14	0.00	0.15	0.01	0.16	0.03	0.01	0.04	25.85
Fine Grading Dust	0.00	0.00	0.00	0.00	0.15	0.00	0.15	0.03	0.00	0.03	0.00
Fine Grading Off Road Diesel	0.03	0.24	0.13	0.00	0.00	0.01	0.01	0.00	0.01	0.01	24.72
Fine Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fine Grading Worker Trips	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13
Asphalt 02/01/2012-03/31/2012	0.05	0.32	0.24	0.00	0.00	0.03	0.03	0.00	0.02	0.02	32.92
Paving Off-Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving Off Road Diesel	0.05	0.31	0.19	0.00	0.00	0.03	0.03	0.00	0.02	0.02	27.35
Paving On Road Diesel	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17
Paving Worker Trips	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.40
Building 02/01/2012-12/31/2012	0.39	1.83	1.62	0.00	0.00	0.13	0.13	0.00	0.12	0.12	238.81
Building Off Road Diesel	0.37	1.77	1.26	0.00	0.00	0.12	0.12	0.00	0.11	0.11	193.73
Building Vendor Trips	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.91
Building Worker Trips	0.01	0.02	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.17
Coating 06/01/2012-12/31/2012	0.50	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.59
Architectural Coating	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.59

Phase Assumptions

Phase: Fine Grading 1/1/2012 - 1/31/2012 - Grading for 5.55 acres

Total Acres Disturbed: 5.55

Maximum Daily Acreage Disturbed: 1.39

Fugitive Dust Level of Detail: Default

10 lbs per acre-day

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On Road Truck Travel (VMT): 0

Off-Road Equipment:

- 1 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day
- 1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 6 hours per day
- 1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day
- 1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

Phase: Paving 2/1/2012 - 3/31/2012 - Asphalt paving for 263 parking spots

Acres to be Paved: 1.96

Off-Road Equipment:

- 4 Cement and Mortar Mixers (10 hp) operating at a 0.56 load factor for 6 hours per day
- 1 Pavers (100 hp) operating at a 0.62 load factor for 7 hours per day
- 1 Paving Equipment (104 hp) operating at a 0.53 load factor for 8 hours per day
- 1 Rollers (95 hp) operating at a 0.56 load factor for 7 hours per day
- 1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

Phase: Building Construction 2/1/2012 - 12/31/2012 - Bldg construction for Phase III uses (46.2 ksf)

Off-Road Equipment:

- 1 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
- 2 Forklifts (145 hp) operating at a 0.3 load factor for 6 hours per day
- 1 Generator Sets (49 hp) operating at a 0.74 load factor for 8 hours per day
- 1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
- 3 Welders (45 hp) operating at a 0.45 load factor for 8 hours per day

Phase: Architectural Coating 6/1/2012 - 12/31/2012 - AC for Phase III uses

Rule: Residential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 130

Rule: Residential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 130

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

CONSTRUCTION EMISSION ESTIMATES Annual Tons Per Year, Mitigated

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Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Fine Grading 1/1/2012 - 1/31/2012 - Grading for 5.55 acres

For Soil Stabilizing Measures, the Water exposed surfaces 2x daily watering mitigation reduces emissions by:

PM10: 55% PM25: 55%

For Unpaved Roads Measures, the Reduce speed on unpaved roads to less than 15 mph mitigation reduces emissions by:

PM10: 44% PM25: 44%

Urbemis 2007 Version 9.2.4

Combined Annual Emissions Reports (Tons/Year)

File Name: H:\PROJECTS\Union Crossing\Union Crossing Operational Emissions.urb924

Project Name: Union Crossing Operational Emissions

Project Location: San Joaquin County

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (tons/year, unmitigated)	0.55	0.79	0.81	0.00	0.00	0.00	952.90

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (tons/year, unmitigated)	17.74	24.47	177.16	0.15	13.35	3.06	15,416.35

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (tons/year, unmitigated)	18.29	25.26	177.97	0.15	13.35	3.06	16,369.25

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Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
Natural Gas	0.06	0.79	0.67	0.00	0.00	0.00	952.65
Hearth	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landscape	0.01	0.00	0.14	0.00	0.00	0.00	0.25
Consumer Products	0.00						
Architectural Coatings	0.48						
TOTALS (tons/year, unmitigated)	0.55	0.79	0.81	0.00	0.00	0.00	952.90

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Strip mall	17.74	24.47	177.16	0.15	13.35	3.06	15,416.35
TOTALS (tons/year, unmitigated)	17.74	24.47	177.16	0.15	13.35	3.06	15,416.35

Operational Settings:

Includes correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2013 Season: Annual

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses						
Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Strip mall		45.90	1000 sq ft	450.00	20,655.00	84,215.38
					20,655.00	84,215.38
Vehicle Fleet Mix						
Vehicle Type	Percent Type		Non-Catalyst		Catalyst	Diesel
Light Auto	45.5		0.7		99.1	0.2
Light Truck < 3750 lbs	11.5		1.7		93.1	5.2
Light Truck 3751-5750 lbs	21.1		0.5		99.5	0.0
Med Truck 5751-8500 lbs	11.4		0.9		99.1	0.0
Lite-Heavy Truck 8501-10,000 lbs	2.1		0.0		76.2	23.8
Lite-Heavy Truck 10,001-14,000 lbs	0.7		0.0		42.9	57.1
Med-Heavy Truck 14,001-33,000 lbs	1.1		0.0		18.2	81.8
Heavy-Heavy Truck 33,001-60,000 lbs	1.6		0.0		0.0	100.0
Other Bus	0.0		0.0		0.0	0.0
Urban Bus	0.1		0.0		0.0	100.0
Motorcycle	3.8		55.3		44.7	0.0
School Bus	0.1		0.0		0.0	100.0
Motor Home	1.0		0.0		90.0	10.0
Travel Conditions						
	Residential			Commute	Commercial	
	Home-Work	Home-Shop	Home-Other		Non-Work	Customer
Urban Trip Length (miles)	10.8	7.3	7.5	9.5	7.4	7.4

	<u>Travel Conditions</u>					
	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Rural Trip Length (miles)	16.8	7.1	7.9	14.7	6.6	6.6
Trip speeds (mph)	35.0	35.0	35.0	35.0	35.0	35.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Strip mall				2.0	1.0	97.0

**Union Crossing
SJVAPCD Rule 9510 Calculations**

Construction Emissions

Year	Phase	Exhaust Emissions (tons/year)	
		NOX	PM10
2009	Mass Grading	2.15	0.10
2009	Phase I	2.47	0.18
2010	Phase I	1.05	0.07
2010	Phase II	2.2	0.16
2011	Phase II	2.31	0.17
2012	Phase III	2.39	0.16
Total		12.57	0.84
Rule 9510 Reductions		2.51	0.38
Mitigated Total		10.06	0.46

Emission Reductions	
NOX	PM10
20%	45%

Operational Emissions

Source	Emissions (tons/year)	
	NOX	PM10
Proposed Project (2013)	25.26	13.35
Rule 9510 Reductions	8.42	6.68
Mitigated Total	16.84	6.68

Emission Reductions	
NOX	PM10
33%	50%

Appendix Union Crossing GHG Emissions Calculations

URBEMIS Output Summary	CO2 Estimates(lb/day)	Conversion Factors	Total CO2 Emissions
Construction Emissions			
2009 Mass Site Grading	322 tons/yr	0.907 metric ton/english ton	292 Metric tons/year
2009 Phase 1	327 tons/yr	0.907 metric ton/english ton	297 Metric tons/year
2010 Phase 1	187 tons/yr	0.907 metric ton/english ton	170 Metric tons/year
2010 Phase 2	291 tons/yr	0.907 metric ton/english ton	264 Metric tons/year
2011 Phase 2	402 tons/yr	0.907 metric ton/english ton	365 Metric tons/year
2012 Phase 3	298 tons/yr	0.907 metric ton/english ton	270 Metric tons/year
			1,657 Metric tons
Area-Source Emissions			
Operational Year 2013	953 tons/yr	0.907 metric ton/english ton	864 Metric tons/year
Mobile-Source Emissions			
Operational Year 2013	15,416 tons/yr	0.907 metric ton/english ton	13,983 Metric tons/year
Total Direct Operational Emissions			14,847 Metric tons/year

Indirect Emissions from Electricity Consumption

							Emission	Emission		Emission		Total CO2e		
KWh/du/year	# du	KWh/ksf/year		# ksf	Total KWh	MWh	Factor (lb	Factor (lb	Factor (lb	GWP	GWP	(Metric		
				Commercial			CO2/MWh)	CH4/MWh)	N2O/MWh)			Tons/year)		
7,000		0	16,750	450	7,537,500	7,538	CALI	804.54	1	0.0067	23	0.0037	296	2,755

Indirect Emissions from Water Use (includes conveyance, treatment, distribution, and wastewater treatment)

KWh/million gallons/year*	KWh/acre- ft/year	acre-ft/year	Total KWh	MWh	Region	Emission Factor (lb CO2/MWh)	GWP	Emission Factor (lb CH4/MWh)	GWP	Emission Factor (lb N2O/MWh)	GWP	Total CO2e (Metric Tons/year)	
3,950	1287	131	168,679	169	CALI	804.54		1	0.0067	23	0.0037	296	62

*for Northern California; Southern California estimates 12,700 KWh/MG/year

Total Indirect Emissions	2,817

Assumptions:

130 gallons/employee/day (GED) for retail uses

500 sf retail/employee

3.069 acre-ft = 1 Million gallon

Total Direct & Indirect Emissions	17,664

Sources:

California Energy Commission [CEC] 2000. California Energy Demand Staff Report P200-00-002

California Climate Action Registry [CCAR] General Reporting Protocol v 2.2 March 2007

California Energy Commission [CEC] 2005. California Energy - Water Relationship Staff Report CEC-700-2005-011-SF

Gleick, Peter. 2003 Waste Not, Want Not: The Potential for Urban Water Conservation in California. Pacific Institute. November 2003.

APPENDIX D

Noise Modeling Results

Appendix D

Traffic Noise Prediction Model, (FHWA RD-77-108)

Model Input Sheet

Project Name : Union Crossing

Project Number : 7110215.01

Modeling Condition : Existing

Ground Type : Hard

Metric (L_{eq} , L_{dn} , CNEL) : L_{dn}

K Factor :

Traffic Desc. (Peak or ADT) : ADT

[illegible]

EDAW | **AECOM**

K Factor :
Traffic Desc. (Peak or ADT) : ADT

[illegible]

Appendix D
Traffic Noise Prediction Model, (FHWA RD-77-108)
Model Input Sheet

Project Name : Union Crossing
Project Number : 7110215.01
Modeling Condition : Existing
Ground Type : Hard
Metric (L_{eq}, L_{dn}, CNEL) : Ldn



K Factor :
Traffic Desc. (Peak or ADT) : ADT

Segment	Roadway	Segment		Traffic Vol.	Speed (Mph)	Distance to CL	% Autos	%MT	% HT	Day %	Eve %	Night %	Offset (dB)
		From	To										
1	SR 120	I-5	Yosemite Avenue	116,100	55	100	94	1	5	63		37	
2	SR 120	Yosemite Avenue	Airport Way	115,500	55	100	94	1	5	63		37	
3	SR 120	Airport Way	Union Road	114,100	55	100	94	1	5	63		37	
4	SR 120	Union Road	Main Street	103,000	55	100	94	1	5	63		37	
5	SR 120	Main Street	US - 99	89,900	55	100	94	1	5	63		37	
6	Airport Way	Yosemite Avenue	Daniels Street	16,200	40	100	97.5	1.5	1	87		13	
7	Airport Way	Daniels Street	State Route 120	14,700	40	100	97.5	1.5	1	87		13	
8	Airport Way	State Route 120	Atherton Road	25,900	40	100	97.5	1.5	1	87		13	
9	Airport Way	Atherton Road	Woodward Avenue	34,900	40	100	97.5	1.5	1	87		13	
10	Airport Way	Woodward Avenue	Peach/McKinley Avenue	48,300	55	100	97.5	1.5	1	87		13	
11	Union Road	Yosemite Avenue	Wawona Street	27,500	40	100	97.5	1.5	1	87		13	
12	Union Road	Wawona Street	State Route 120	14,600	40	100	97.5	1.5	1	87		13	
13	Union Road	State Route 120	Atherton Road	21,200	40	100	97.5	1.5	1	87		13	
14	Union Road	Atherton Road	Woodward Avenue	26,100	40	100	97.5	1.5	1	87		13	
15	Union Road	Woodward Avenue	Peach/McKinley Avenue	26,000	40	100	97.5	1.5	1	87		13	
16	Main Street	Mission Ridge Drive	State Route 120	20,000	40	100	97.5	1.5	1	87		13	
17	Main Street	State Route 120	Atherton Road	17,700	40	100	97.5	1.5	1	87		13	
18	Main Street	Atherton Road	Woodward Avenue	29,700	40	100	97.5	1.5	1	87		13	
19	Main Street	Woodward Avenue	Sedan Avenue	28,500	40	100	97.5	1.5	1	87		13	
20	Woodward Avenue	McKinley Avenue	Airport Way	24,700	45	100	97.5	1.5	1	87		13	
21	Woodward Avenue	Airport Way	Oleander Road	11,900	45	100	97.5	1.5	1	87		13	
22	Woodward Avenue	Oleander Road	Union Road	16,500	45	100	97.5	1.5	1	87		13	
23	Woodward Avenue	Union Road	Tinnin Road	16,600	45	100	97.5	1.5	1	87		13	
24	Woodward Avenue	Tinnin Road	Main Street	15,200	45	100	97.5	1.5	1	87		13	
25	Woodward Avenue	Main Street	Van Ryn Avenue	11,600	45	100	97.5	1.5	1	87		13	
26	Atherton Drive	Airport Way	Union Road	14100	35	100	97.5	1.5	1	87		13	
27	Atherton Drive	Union Road	Main Street	19300	35	100	97.5	1.5	1	87		13	

Appendix D
Traffic Noise Prediction Model, (FHWA RD-77-108)
Predicted Noise Levels

Project Name : Union Crossing
Project Number : 7110215.01
Modeling Condition : Existing
Metric (Leq, Ldn, CNEL) : Ldn



Segment	Roadway	Segment		Noise Levels, dB Ldn				Distance to Traffic Noise Contours, Feet				
		From	To	Auto	MT	HT	Total	70 dB	65 dB	60 dB	55 dB	50 dB
1	SR 120	I-5	Yosemite Avenue	79.9	67.2	78.2	82.3	1681	5317	16814	53171	168143
2	SR 120	Yosemite Avenue	Airport Way	79.9	67.2	78.2	82.2	1673	5290	16727	52897	167274
3	SR 120	Airport Way	Union Road	79.8	67.2	78.1	82.2	1652	5226	16525	52256	165246
4	SR 120	Union Road	Main Street	79.4	66.7	77.7	81.7	1492	4717	14917	47172	149171
5	SR 120	Main Street	US - 99	78.8	66.1	77.1	81.1	1302	4117	13020	41172	130199
6	Airport Way	Yosemite Avenue	Daniels Street	64.5	55.3	58.4	65.8	38	121	384	1214	3841
7	Airport Way	Daniels Street	State Route 120	64.1	54.9	57.9	65.4	35	110	348	1102	3485
8	Airport Way	State Route 120	Atherton Road	66.5	57.3	60.4	67.9	61	194	614	1942	6140
9	Airport Way	Atherton Road	Woodward Avenue	67.8	58.6	61.7	69.2	83	262	827	2616	8274
10	Airport Way	Woodward Avenue	Peach/McKinley Avenue	73.2	62.2	64.4	74.1	254	804	2541	8036	25412
11	Union Road	Yosemite Avenue	Wawona Street	66.8	57.6	60.7	68.1	65	206	652	2062	6519
12	Union Road	Wawona Street	State Route 120	64.0	54.8	57.9	65.4	35	109	346	1095	3461
13	Union Road	State Route 120	Atherton Road	65.7	56.5	59.5	67.0	50	159	503	1589	5026
14	Union Road	Atherton Road	Woodward Avenue	66.6	57.4	60.4	67.9	62	196	619	1957	6188
15	Union Road	Woodward Avenue	Peach/McKinley Avenue	66.6	57.3	60.4	67.9	62	195	616	1949	6164
16	Main Street	Mission Ridge Drive	State Route 120	65.4	56.2	59.3	66.8	47	150	474	1499	4741
17	Main Street	State Route 120	Atherton Road	64.9	55.7	58.7	66.2	42	133	420	1327	4196
18	Main Street	Atherton Road	Woodward Avenue	67.1	57.9	61.0	68.5	70	223	704	2227	7041
19	Main Street	Woodward Avenue	Sedan Avenue	67.0	57.7	60.8	68.3	68	214	676	2137	6757
20	Woodward Avenue	McKinley Avenue	Airport Way	67.8	57.9	60.7	68.9	78	247	781	2471	7814
21	Woodward Avenue	Airport Way	Oleander Road	64.6	54.8	57.5	65.8	38	119	376	1190	3765
22	Woodward Avenue	Oleander Road	Union Road	66.1	56.2	58.9	67.2	52	165	522	1651	5220
23	Woodward Avenue	Union Road	Tinnin Road	66.1	56.2	58.9	67.2	53	166	525	1661	5251
24	Woodward Avenue	Tinnin Road	Main Street	65.7	55.8	58.6	66.8	48	152	481	1521	4809
25	Woodward Avenue	Main Street	Van Ryn Avenue	64.5	54.6	57.4	65.6	37	116	367	1160	3670
26	Atherton Drive	Airport Way	Union Road	62.2	53.8	57.2	63.9	24	77	244	770	2436
27	Atherton Drive	Union Road	Main Street	63.6	55.1	58.6	65.2	33	105	333	1054	3334

Appendix D
Traffic Noise Prediction Model, (FHWA RD-77-108)
Model Input Sheet

Project Name : Union Crossing
Project Number : 7110215.01
Modeling Condition : Existing
Ground Type : Hard
Metric (L_{eq}, L_{dn}, CNEL) : Ldn



K Factor :
Traffic Desc. (Peak or ADT) : ADT

Segment	Roadway	From	To	Traffic Vol.	Speed (Mph)	Distance to CL	% Autos	%MT	% HT	Day %	Eve %	Night %	Offset (dB)
1	SR 120	I-5	Yosemite Avenue	118,100	55	100	94	1	5	63		37	
2	SR 120	Yosemite Avenue	Airport Way	117,500	55	100	94	1	5	63		37	
3	SR 120	Airport Way	Union Road	116,400	55	100	94	1	5	63		37	
4	SR 120	Union Road	Main Street	104,200	55	100	94	1	5	63		37	
5	SR 120	Main Street	US - 99	90,500	55	100	94	1	5	63		37	
6	Airport Way	Yosemite Avenue	Daniels Street	16,500	40	100	97.5	1.5	1	87		13	
7	Airport Way	Daniels Street	State Route 120	15,800	40	100	97.5	1.5	1	87		13	
8	Airport Way	State Route 120	Atherton Road	26,600	40	100	97.5	1.5	1	87		13	
9	Airport Way	Atherton Road	Woodward Avenue	35,600	40	100	97.5	1.5	1	87		13	
10	Airport Way	Woodward Avenue	Peach/McKinley Avenue	48,300	55	100	97.5	1.5	1	87		13	
11	Union Road	Yosemite Avenue	Wawona Street	28,100	40	100	97.5	1.5	1	87		13	
12	Union Road	Wawona Street	State Route 120	15,000	40	100	97.5	1.5	1	87		13	
13	Union Road	State Route 120	Atherton Road	23,800	40	100	97.5	1.5	1	87		13	
14	Union Road	Atherton Road	Woodward Avenue	30,200	40	100	97.5	1.5	1	87		13	
15	Union Road	Woodward Avenue	Peach/McKinley Avenue	38,100	40	100	97.5	1.5	1	87		13	
16	Main Street	Mission Ridge Drive	State Route 120	27,500	40	100	97.5	1.5	1	87		13	
17	Main Street	State Route 120	Atherton Road	20,500	40	100	97.5	1.5	1	87		13	
18	Main Street	Atherton Road	Woodward Avenue	30,900	40	100	97.5	1.5	1	87		13	
19	Main Street	Woodward Avenue	Sedan Avenue	28,500	40	100	97.5	1.5	1	87		13	
20	Woodward Avenue	McKinley Avenue	Airport Way	24,700	45	100	97.5	1.5	1	87		13	
21	Woodward Avenue	Airport Way	Oleander Road	12,800	45	100	97.5	1.5	1	87		13	
22	Woodward Avenue	Oleander Road	Union Road	17,400	45	100	97.5	1.5	1	87		13	
23	Woodward Avenue	Union Road	Tinnin Road	18,300	45	100	97.5	1.5	1	87		13	
24	Woodward Avenue	Tinnin Road	Main Street	17,300	45	100	97.5	1.5	1	87		13	
25	Woodward Avenue	Main Street	Van Ryn Avenue	13,300	45	100	97.5	1.5	1	87		13	
26	Atherton Drive	Airport Way	Union Road	15500	35	100	97.5	1.5	1	87		13	
27	Atherton Drive	Union Road	Main Street	19900	35	100	97.5	1.5	1	87		13	

Appendix D
Traffic Noise Prediction Model, (FHWA RD-77-108)
Predicted Noise Levels

Project Name : Union Crossing
Project Number : 7110215.01
Modeling Condition : Existing
Metric (Leq, Ldn, CNEL) : Ldn



Segment	Roadway	Segment		Noise Levels, dB Ldn				Distance to Traffic Noise Contours, Feet				
		From	To	Auto	MT	HT	Total	70 dB	65 dB	60 dB	55 dB	50 dB
1	SR 120	I-5	Yosemite Avenue	79.9	67.3	78.2	82.3	1710	5409	17104	54087	171040
2	SR 120	Yosemite Avenue	Airport Way	79.9	67.3	78.2	82.3	1702	5381	17017	53813	170171
3	SR 120	Airport Way	Union Road	79.9	67.3	78.2	82.3	1686	5331	16858	53309	168577
4	SR 120	Union Road	Main Street	79.4	66.8	77.7	81.8	1509	4772	15091	47722	150909
5	SR 120	Main Street	US - 99	78.8	66.2	77.1	81.2	1311	4145	13107	41447	131068
6	Airport Way	Yosemite Avenue	Daniels Street	64.6	55.4	58.4	65.9	39	124	391	1237	3912
7	Airport Way	Daniels Street	State Route 120	64.4	55.2	58.2	65.7	37	118	375	1185	3746
8	Airport Way	State Route 120	Atherton Road	66.7	57.4	60.5	68.0	63	199	631	1994	6306
9	Airport Way	Atherton Road	Woodward Avenue	67.9	58.7	61.8	69.3	84	267	844	2669	8440
10	Airport Way	Woodward Avenue	Peach/McKinley Avenue	73.2	62.2	64.4	74.1	254	804	2541	8036	25412
11	Union Road	Yosemite Avenue	Wawona Street	66.9	57.7	60.7	68.2	67	211	666	2107	6662
12	Union Road	Wawona Street	State Route 120	64.2	55.0	58.0	65.5	36	112	356	1125	3556
13	Union Road	State Route 120	Atherton Road	66.2	57.0	60.0	67.5	56	178	564	1784	5642
14	Union Road	Atherton Road	Woodward Avenue	67.2	58.0	61.1	68.5	72	226	716	2264	7160
15	Union Road	Woodward Avenue	Peach/McKinley Avenue	68.2	59.0	62.1	69.6	90	286	903	2856	9032
16	Main Street	Mission Ridge Drive	State Route 120	66.8	57.6	60.7	68.1	65	206	652	2062	6519
17	Main Street	State Route 120	Atherton Road	65.5	56.3	59.4	66.9	49	154	486	1537	4860
18	Main Street	Atherton Road	Woodward Avenue	67.3	58.1	61.2	68.6	73	232	733	2317	7326
19	Main Street	Woodward Avenue	Sedan Avenue	67.0	57.7	60.8	68.3	68	214	676	2137	6757
20	Woodward Avenue	McKinley Avenue	Airport Way	67.8	57.9	60.7	68.9	78	247	781	2471	7814
21	Woodward Avenue	Airport Way	Oleander Road	64.9	55.1	57.8	66.1	40	128	405	1281	4049
22	Woodward Avenue	Oleander Road	Union Road	66.3	56.4	59.1	67.4	55	174	550	1741	5505
23	Woodward Avenue	Union Road	Tinnin Road	66.5	56.6	59.4	67.6	58	183	579	1831	5789
24	Woodward Avenue	Tinnin Road	Main Street	66.3	56.4	59.1	67.4	55	173	547	1731	5473
25	Woodward Avenue	Main Street	Van Ryn Avenue	65.1	55.2	58.0	66.2	42	133	421	1331	4207
26	Atherton Drive	Airport Way	Union Road	62.6	54.2	57.6	64.3	27	85	268	847	2677
27	Atherton Drive	Union Road	Main Street	63.7	55.3	58.7	65.4	34	109	344	1087	3437

APPENDIX E

California Native Diversity Database and
California Native Plant Society List Results

California Native Diversity Database Results

California Department of Fish and Game
Natural Diversity Database
Union Crossing Project, Manteca, CA
Manteca, Lathrop, Vernalis, and Ripon 7.5-minute U.S. Geologic Survey Quadrangles

Common Name	Scientific Name	Element Code	Federal Status	State Status	Global Rank	State Rank	CNPS	CDFG
1 California horned lark	Eremophila alpestris actia	ABPAT02011			G5T3Q	S3		
2 California linderiella	Linderiella occidentalis	ICBRA06010			G3	S2S3		
3 California tiger salamander	Ambystoma californiense	AAAAA01180	Threatened		G2G3	S2S3		SC
4 Conservancy fairy shrimp	Branchinecta conservatio	ICBRA03010	Endangered		G1	S1		
5 Delta button-celery	Eryngium racemosum	PDAP10Z0S0		Endangered	G2Q	S2.1	1B.1	
6 Elderberry Savanna	Elderberry Savanna	CTT63440CA			G2	S2.1		
7 Great Valley Cottonwood Riparian Forest	Great Valley Cottonwood Riparian Forest	CTT61410CA			G2	S2.1		
8 Great Valley Mixed Riparian Forest	Great Valley Mixed Riparian Forest	CTT61420CA			G2	S2.2		
9 Great Valley Valley Oak Riparian Forest	Great Valley Valley Oak Riparian Forest	CTT61430CA			G1	S1.1		
10 Sacramento anthicid beetle	Anthicus sacramento	IICOL49010			G1	S1		
11 Suisun Marsh aster	Symphyotrichum lentum	PDASTE8470			G2	S2.2	1B.2	
12 Swainson's hawk	Buteo swainsoni	ABNKC19070		Threatened	G5	S2		
13 Wright's trichocoronis	Trichocoronis wrightii var. wrightii	PDAST9F031			G4T3	S1.1	2.1	
14 burrowing owl	Athene cunicularia	ABNSB10010			G4	S2		SC
15 cackling (=Aleutian Canada) goose	Branta hutchinsii leucopareia	ABNJB05035	Delisted		G5T4	S2		
16 lesser saltscale	Atriplex minuscula	PDCH042M0			G1	S1.1	1B.1	
17 merlin	Falco columbarius	ABNKD06030			G5	S3		
18 moestan blister beetle	Lytta moesta	IICOL4C020			G2	S2		
19 riparian (=San Joaquin Valley) woodrat	Neotoma fuscipes riparia	AMAFF08081	Endangered		G5T1Q	S1		SC
20 riparian brush rabbit	Sylvilagus bachmani riparius	AMAE01021	Endangered	Endangered	G5T1	S1		
21 slough thistle	Cirsium crassicaule	PDAST2E0U0			G2	S2.2	1B.1	
22 tricolored blackbird	Agelaius tricolor	ABPBXB0020			G2G3	S2		SC
23 valley elderberry longhorn beetle	Desmocerus californicus dimorphus	IICOL48011	Threatened		G3T2	S2		
24 vernal pool fairy shrimp	Branchinecta lynchi	ICBRA03030	Threatened		G3	S2S3		
25 western yellow-billed cuckoo	Coccyzus americanus occidentalis	ABNRB02022	Candidate	Endangered	G5T3Q	S1		
26 yellow-headed blackbird	Xanthocephalus xanthocephalus	ABPBXB3010			G5	S3S4		SC

SNAME	CNAME	ELMCODE	OCCNUMBER	KQUADNA	ACCURACY
Lytta moesta	moestan blister beetle	IICOL4C020	9	Manteca	1 mile
Symphyotrichum lentum	Suisun Marsh aster	PDASTE8470	145	Lathrop	1 mile
Xanthocephalus xanthocephalus	yellow-headed blackbird	ABPBXB3010	5	Lathrop	1 mile
Cirsium crassicaule	slough thistle	PDAST2E0U0	2	Lathrop	1 mile
Eryngium racemosum	Delta button-celery	PDAP10Z0S0	3	Lathrop	1 mile
Agelaius tricolor	tricolored blackbird	ABPBXB0020	99	Lathrop	1 mile
Agelaius tricolor	tricolored blackbird	ABPBXB0020	100	Manteca	1 mile
Great Valley Cottonwood Riparian Forest	Great Valley Cottonwood Riparian Forest	CTT61410CA	19	Vernalis	specific area
Athene cunicularia	burrowing owl	ABNSB10010	342	Lathrop	nonspecific area
Trichocoronis wrightii var. wrightii	Wright's trichocoronis	PDAST9F031	6	Lathrop	2/5 mile
Sylvilagus bachmani riparius	riparian brush rabbit	AMAEB01021	4	Lathrop	specific area
Buteo swainsoni	Swainson's hawk	ABNKC19070	159	Vernalis	1/5 mile
Agelaius tricolor	tricolored blackbird	ABPBXB0020	95	Lathrop	1/5 mile
Buteo swainsoni	Swainson's hawk	ABNKC19070	164	Ripon	1/5 mile
Sylvilagus bachmani riparius	riparian brush rabbit	AMAEB01021	3	Lathrop	specific area
Buteo swainsoni	Swainson's hawk	ABNKC19070	687	Ripon	1/10 mile
Buteo swainsoni	Swainson's hawk	ABNKC19070	697	Lathrop	1/10 mile
Athene cunicularia	burrowing owl	ABNSB10010	251	Lathrop	1/10 mile
Ambystoma californiense	California tiger salamander	AAAAA01180	37	Lathrop	1/10 mile
Buteo swainsoni	Swainson's hawk	ABNKC19070	1221	Lathrop	specific area
Buteo swainsoni	Swainson's hawk	ABNKC19070	1608	Lathrop	specific area
Buteo swainsoni	Swainson's hawk	ABNKC19070	391	Lathrop	specific area
Anthonisus sacramento	Sacramento anthicid beetle	IICOL49010	10	Vernalis	nonspecific area
Buteo swainsoni	Swainson's hawk	ABNKC19070	944	Lathrop	specific area
Athene cunicularia	burrowing owl	ABNSB10010	265	Lathrop	80 meters
Buteo swainsoni	Swainson's hawk	ABNKC19070	1668	Lathrop	80 meters
Buteo swainsoni	Swainson's hawk	ABNKC19070	1682	Lathrop	80 meters
Buteo swainsoni	Swainson's hawk	ABNKC19070	1655	Lathrop	80 meters
Buteo swainsoni	Swainson's hawk	ABNKC19070	937	Lathrop	80 meters

PRESENCE	OCCTYPE	OCCRANK	SENSITIVE	SITEDATE	ELMDATE	OWNERMGT	FEDLIST	CALLIST
Possibly Extirpated	Natural/Native occurrence	U	N	19XXXXXX	19XXXXXX	UNKNOWN	None	None
Presumed Extant	Natural/Native occurrence	U	N	18920909	18920909	UNKNOWN	None	None
Presumed Extant	Natural/Native occurrence	U	N	18940510	18940510	UNKNOWN	None	None
Possibly Extirpated	Natural/Native occurrence	X	N	19740718	19330720	UNKNOWN	None	None
Possibly Extirpated	Natural/Native occurrence	X	N	19840828	XXXXXXXX	PVT	None	Endangered
Presumed Extant	Natural/Native occurrence	U	N	19740605	19740605	UNKNOWN	None	None
Presumed Extant	Natural/Native occurrence	U	N	19360603	19360603	UNKNOWN	None	None
Presumed Extant	Natural/Native occurrence	C	N	19851028	19851028	PVT	None	None
Presumed Extant	Natural/Native occurrence	A	N	20060712	20060712	DOD-SHARPE DEPOT	None	None
Presumed Extant	Natural/Native occurrence	U	N	19140927	19140927	UNKNOWN	None	None
Presumed Extant	Natural/Native occurrence	U	N	2001XXXX	2001XXXX	UNKNOWN	Endangered	Endangered
Presumed Extant	Natural/Native occurrence	U	N	19840506	19840506	PVT	None	Threatened
Presumed Extant	Natural/Native occurrence	U	N	19710505	19710505	UNKNOWN	None	None
Presumed Extant	Natural/Native occurrence	U	N	19840506	19840506	PVT	None	Threatened
Presumed Extant	Natural/Native occurrence	B	N	20030203	20030203	UNKNOWN	Endangered	Endangered
Presumed Extant	Natural/Native occurrence	U	N	19970508	19970508	UNKNOWN	None	Threatened
Presumed Extant	Natural/Native occurrence	B	N	19980414	19980414	UNKNOWN	None	Threatened
Presumed Extant	Natural/Native occurrence	C	N	20000121	20000121	PVT	None	None
Presumed Extant	Natural/Native occurrence	C	N	19960411	19960411	PVT	Threatened	None
Presumed Extant	Natural/Native occurrence	U	N	20030501	20030501	UNKNOWN	None	Threatened
Presumed Extant	Natural/Native occurrence	U	N	20030501	20030501	UNKNOWN	None	Threatened
Presumed Extant	Natural/Native occurrence	U	N	20030507	20030507	PVT	None	Threatened
Presumed Extant	Natural/Native occurrence	U	N	19900922	19900922	UNKNOWN	None	None
Presumed Extant	Natural/Native occurrence	A	N	20010516	20010516	UNKNOWN	None	Threatened
Presumed Extant	Natural/Native occurrence	C	N	19970314	19970314	UNKNOWN	None	None
Presumed Extant	Natural/Native occurrence	U	N	20030501	20030501	UNKNOWN	None	Threatened
Presumed Extant	Natural/Native occurrence	B	N	20040511	20040511	PVT	None	Threatened
Presumed Extant	Natural/Native occurrence	U	N	20030613	20030613	UNKNOWN	None	Threatened
Presumed Extant	Natural/Native occurrence	A	N	20010621	20010621	UNKNOWN	None	Threatened

GRANK	SRANK	CNPSLIST
G2	S2	
G2	S2.2	1B.2
G5	S3S4	
G2	S2.2	1B.1
G2Q	S2.1	1B.1
G2G3	S2	
G2G3	S2	
G2	S2.1	
G4	S2	
G4T3	S1.1	2.1
G5T1	S1	
G5	S2	
G2G3	S2	
G5	S2	
G5T1	S1	
G5	S2	
G5	S2	
G4	S2	
G2G3	S2S3	
G5	S2	
G5	S2	
G5	S2	
G1	S1	
G5	S2	
G4	S2	
G5	S2	
G5	S2	
G5	S2	
G5	S2	

Agelaius tricolor

tricolored blackbird

Element Code: ABPBXB0020

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G2G3

CDFG Status: SC

State: None

State: S2

_____ **Habitat Associations** _____

General: HIGHLY COLONIAL SPECIES, MOST NUMEROUS IN CENTRAL VALLEY & VICINITY. LARGELY ENDEMIC TO CALIFORNIA.

Micro: REQUIRES OPEN WATER, PROTECTED NESTING SUBSTRATE, & FORAGING AREA WITH INSECT PREY WITHIN A FEW KM OF THE COLONY.

Occurrence No. 74

Map Index: 11650

EO Index: 24747

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1974-06-05

Origin: Natural/Native occurrence

Site: 1974-06-05

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 1989-08-10

Quad Summary: Solyo (3712153/444D), Vernalis (3712163/444A)

County Summary: Stanislaus, San Joaquin

Lat/Long: 37.63798° / -121.27050°

Township: 03S

UTM: Zone-10 N4167056 E652594

Range: 06E

Mapping Precision: NON-SPECIFIC

Section: 35 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 1 mile

Elevation: 75 ft

Location: APPROX 2 MI E OF JUNCT OF MAZE RD AND RIVER RD, NE OF VERNALIS.

Location Detail: COLONY OF 500 TO 1000 OBS BY DE HAVEN NESTING IN CATTAILS.

Ecological:

Threat:

General:

Owner/Manager: UNKNOWN

Agelaius tricolor

tricolored blackbird

Element Code: ABPBXB0020

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2G3	CDFG Status: SC
State: None	State: S2	

Habitat Associations

General: HIGHLY COLONIAL SPECIES, MOST NUMEROUS IN CENTRAL VALLEY & VICINITY. LARGELY ENDEMIC TO CALIFORNIA.

Micro: REQUIRES OPEN WATER, PROTECTED NESTING SUBSTRATE, & FORAGING AREA WITH INSECT PREY WITHIN A FEW KM OF THE COLONY.

Occurrence No. 75

Map Index: 11702

EO Index: 24745

Dates Last Seen

Occ Rank: Unknown

Element: 1974-06-05

Origin: Natural/Native occurrence

Site: 1974-06-05

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 1989-08-10

Quad Summary: Vernalis (3712163/444A), Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.63992° / -121.24633°

Township: 03S

UTM: Zone-10 N4167310 E654723

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 30 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 1 mile

Elevation: 50 ft

Location: JUNCTION OF MAZE RD AND RIVER RD, APPROX 9 MI SW OF RIPON.

Location Detail: COLONY OBS BY DE HAVEN AT POST-FLEDGING STAGE.

Ecological:

Threat:

General:

Owner/Manager: UNKNOWN

Agelaius tricolor

tricolored blackbird

Element Code: ABPBXB0020

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2G3	CDFG Status: SC
State: None	State: S2	

Habitat Associations

General: HIGHLY COLONIAL SPECIES, MOST NUMEROUS IN CENTRAL VALLEY & VICINITY. LARGELY ENDEMIC TO CALIFORNIA.

Micro: REQUIRES OPEN WATER, PROTECTED NESTING SUBSTRATE, & FORAGING AREA WITH INSECT PREY WITHIN A FEW KM OF THE COLONY.

Occurrence No. 76	Map Index: 11926	EO Index: 11814	— Dates Last Seen —
Occ Rank: Unknown			Element: 1971-05-05
Origin: Natural/Native occurrence			Site: 1971-05-05
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 1991-07-25

Quad Summary: Salida (3712161/443A), Westley (3712152/443C), Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.63770° / -121.14243°	Township: 03S
UTM: Zone-10 N4167241 E663895	Range: 07E
Mapping Precision: NON-SPECIFIC	Section: 36 Qtr: XX
Symbol Type: POINT	Meridian: M
Radius: 1 mile	Elevation: 45 ft

Location: ALONG MAZE BLVD, APPROX 7 MI W OF MODESTO.

Location Detail: COLONY OF APPROX 1500, AT NESTLING STAGE, OBS BY DE HAVEN. COLONY SIZE APPROX 0.75 ACRE.

Ecological: SALT MARSH POND WITH CATTAIL AND BULRUSH BY NONIRRIGATED PASTURE.

Threat:

General:

Owner/Manager: UNKNOWN

Agelaius tricolor

tricolored blackbird

Element Code: ABPBXB0020

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2G3	CDFG Status: SC
State: None	State: S2	

Habitat Associations

General: HIGHLY COLONIAL SPECIES, MOST NUMEROUS IN CENTRAL VALLEY & VICINITY. LARGELY ENDEMIC TO CALIFORNIA.

Micro: REQUIRES OPEN WATER, PROTECTED NESTING SUBSTRATE, & FORAGING AREA WITH INSECT PREY WITHIN A FEW KM OF THE COLONY.

Occurrence No. 95	Map Index: 11686	EO Index: 24732	Dates Last Seen
Occ Rank: Unknown			Element: 1971-05-05
Origin: Natural/Native occurrence			Site: 1971-05-05
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 1991-07-25

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.79714° / -121.26327°	Township: 02S
UTM: Zone-10 N4184728 E652905	Range: 06E
Mapping Precision: NON-SPECIFIC	Section: 01 Qtr: XX
Symbol Type: POINT	Meridian: M
Radius: 1/5 mile	Elevation: 20 ft

Location: 0.25 MI W OF HWY 120 AND SWANSON RD JCT, APPROX 2.5 MI W OF MANTECA.

Location Detail: NESTING (FLEDGLING STAGE) IN GIANT CANE; OBS BY DE HAVEN. COLONY SIZE APPROX 0.25 ACRE.

Ecological: NO WATER PRESENT.

Threat:

General:

Owner/Manager: UNKNOWN

Agelaius tricolor

tricolored blackbird

Element Code: ABPBXB0020

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2G3	CDFG Status: SC
State: None	State: S2	

Habitat Associations

General: HIGHLY COLONIAL SPECIES, MOST NUMEROUS IN CENTRAL VALLEY & VICINITY. LARGELY ENDEMIC TO CALIFORNIA.

Micro: REQUIRES OPEN WATER, PROTECTED NESTING SUBSTRATE, & FORAGING AREA WITH INSECT PREY WITHIN A FEW KM OF THE COLONY.

Occurrence No. 96	Map Index: 11583	EO Index: 12696	— Dates Last Seen —
Occ Rank: Unknown			Element: 1972-05-26
Origin: Natural/Native occurrence			Site: 1972-05-26
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 1991-07-25

Quad Summary: Stockton West (3712183/462A), Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.86964° / -121.32273°	Township: 01S
UTM: Zone-10 N4192677 E647525	Range: 06E
Mapping Precision: NON-SPECIFIC	Section: 4 Qtr: XX
Symbol Type: POINT	Meridian: M
Radius: 1 mile	Elevation: 5 ft

Location: 0.75 MI SE OF JUNCT OF SAN JOAQUIN RIVER AND RD J-9.

Location Detail: COLONY OF APPROX 5000 OBS BY DE HAVEN NESTING IN CATTAIL/BULRUSH HABITAT; FLEDGLING STAGE OF NESTING. COLONY SIZE 0.75 ACRE.

Ecological:

Threat:

General:

Owner/Manager: UNKNOWN

Agelaius tricolor

tricolored blackbird

Element Code: ABPBXB0020

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2G3	CDFG Status: SC
State: None	State: S2	

Habitat Associations

General: HIGHLY COLONIAL SPECIES, MOST NUMEROUS IN CENTRAL VALLEY & VICINITY. LARGELY ENDEMIC TO CALIFORNIA.

Micro: REQUIRES OPEN WATER, PROTECTED NESTING SUBSTRATE, & FORAGING AREA WITH INSECT PREY WITHIN A FEW KM OF THE COLONY.

Occurrence No. 99	Map Index: 11611	EO Index: 24729	Dates Last Seen
Occ Rank: Unknown			Element: 1974-06-05
Origin: Natural/Native occurrence			Site: 1974-06-05
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 1989-08-10

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.78839° / -121.30334°	Township: 02S
UTM: Zone-10 N4183692 E649395	Range: 06E
Mapping Precision: NON-SPECIFIC	Section: 3 Qtr: XX
Symbol Type: POINT	Meridian: M
Radius: 1 mile	Elevation: 15 ft

Location: ALONG HWY 120, 5 MI W OF MANTECA.

Location Detail: COLONY OF 25-50 OBS BY NEFF IN GIANT CANE IN MAY 1972; POST-FLEDGING. COLONY OF >500 OBS BY NEFF NESTING IN GIANT CANE IN JUNE 1974; POST-FLEDGING AND NEW CLUTCHES.

Ecological:

Threat:

General:

Owner/Manager: PVT

Agelaius tricolor

tricolored blackbird

Element Code: ABPBXB0020

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2G3	CDFG Status: SC
State: None	State: S2	

Habitat Associations

General: HIGHLY COLONIAL SPECIES, MOST NUMEROUS IN CENTRAL VALLEY & VICINITY. LARGELY ENDEMIC TO CALIFORNIA.

Micro: REQUIRES OPEN WATER, PROTECTED NESTING SUBSTRATE, & FORAGING AREA WITH INSECT PREY WITHIN A FEW KM OF THE COLONY.

Occurrence No. 100

Map Index: 11786

EO Index: 24727

Dates Last Seen

Occ Rank: Unknown

Element: 1936-06-03

Origin: Natural/Native occurrence

Site: 1936-06-03

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 1989-08-10

Quad Summary: Manteca (3712172/461C)

County Summary: San Joaquin

Lat/Long: 37.77909° / -121.21884°

Township: 02S

UTM: Zone-10 N4182799 E656855

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 08 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 1 mile

Elevation: 35 ft

Location: CANAL S OF MANTECA.

Location Detail: COLONY OF APPROX 750 OBS BY NEFF NESTING IN CATTAILS.

Ecological:

Threat:

General:

Owner/Manager: UNKNOWN

Ambystoma californiense

California tiger salamander

Element Code: AAAAA01180

Status	NDDB Element Ranks	Other Lists
Federal: Threatened State: None	Global: G2G3 State: S2S3	CDFG Status: SC

Habitat Associations

General: CENTRAL VALLEY DPS LISTED AS THREATENED. SANTA BARBARA & SONOMA COUNTIES DPS LISTED AS ENDANGERED.

Micro: NEED UNDERGROUND REFUGES, ESPECIALLY GROUND SQUIRREL BURROWS & VERNAL POOLS OR OTHER SEASONAL WATER SOURCES FOR BREEDING

Occurrence No. 33	Map Index: 11958	EO Index: 28428	— Dates Last Seen —
Occ Rank: None			Element: 1912-04-06
Origin: Natural/Native occurrence			Site: 1912-04-06
Presence: Extirpated			
Trend: Unknown			Record Last Updated: 2001-09-18

Quad Summary: Salida (3712161/443A), Ripon (3712162/443B)

County Summary: San Joaquin, Stanislaus

Lat/Long: 37.73520° / -121.12660°	Township: 02S
UTM: Zone-10 N4178087 E665076	Range: 08E
Mapping Precision: NON-SPECIFIC	Section: 30 Qtr: NE
Symbol Type: POINT	Meridian: M
Radius: 1 mile	Elevation: 65 ft

Location: RIPON.

Location Detail:

Ecological:

Threat:

General: STORER 1915 AND 1910. MVZ# 8240. JENNINGS CONSIDERS THIS SITE EXTIRPATED.

Owner/Manager: UNKNOWN

Ambystoma californiense

California tiger salamander

Element Code: AAAAA01180

Status	NDDB Element Ranks	Other Lists
Federal: Threatened State: None	Global: G2G3 State: S2S3	CDFG Status: SC

Habitat Associations

General: CENTRAL VALLEY DPS LISTED AS THREATENED. SANTA BARBARA & SONOMA COUNTIES DPS LISTED AS ENDANGERED.

Micro: NEED UNDERGROUND REFUGES, ESPECIALLY GROUND SQUIRREL BURROWS & VERNAL POOLS OR OTHER SEASONAL WATER SOURCES FOR BREEDING

Occurrence No. 37	Map Index: 11647	EO Index: 28418	— Dates Last Seen —
Occ Rank: Fair			Element: 1996-04-11
Origin: Natural/Native occurrence			Site: 1996-04-11
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 2001-03-13

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.78368° / -121.27287°	Township: 02S
UTM: Zone-10 N4183219 E652087	Range: 06E
Mapping Precision: NON-SPECIFIC	Section: 02 Qtr: SE
Symbol Type: POINT	Meridian: M
Radius: 1/10 mile	Elevation: 15 ft

Location: SOUTH SIDE OF HIGHWAY 120, NEAR THE JUNCTION OF MCKINLEY ROAD, SOUTH OF LATHROP

Location Detail: 1974 OBSERVATION WAS ON THE MATLEY PROPERTY 2785 BRONZAN ROAD, W MCKINLEY.

Ecological: HABITAT CONSISTS OF A SEASONAL POND CREATED BY THE BERM OF HIGHWAY 20. SITE IS SURROUNDED BY RESIDENTIAL DEVELOPMENT.

Threat:

General: OBSERVED IN 1974 (S. MCGINNIS, PERSONAL COMMUNICATION). ~50 LARVAE OBSERVED ON 11 APR 1996.

Owner/Manager: PVT

Ambystoma californiense

California tiger salamander

Element Code: AAAAA01180

Status	NDDB Element Ranks	Other Lists
Federal: Threatened State: None	Global: G2G3 State: S2S3	CDFG Status: SC

Habitat Associations
General: CENTRAL VALLEY DPS LISTED AS THREATENED. SANTA BARBARA & SONOMA COUNTIES DPS LISTED AS ENDANGERED. Micro: NEED UNDERGROUND REFUGES, ESPECIALLY GROUND SQUIRREL BURROWS & VERNAL POOLS OR OTHER SEASONAL WATER SOURCES FOR BREEDING

Occurrence No. 119	Map Index: 20949	EO Index: 17606	Dates Last Seen
Occ Rank: Unknown			Element: 1992-02-19
Origin: Natural/Native occurrence			Site: 1992-02-19
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 2001-09-10

Quad Summary: Westley (3712152/443C), Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.62378° / -121.15429°	Township: 03S
UTM: Zone-10 N4165675 E662880	Range: 07E
Mapping Precision: NON-SPECIFIC	Section: 36 Qtr: SW
Symbol Type: POINT	Meridian: M
Radius: 2/5 mile	Elevation: 40 ft

Location: ALONG PARADISE ROAD, IN THE VICINITY OF ITS JUNCTION WITH CALIFORNIA AVENUE AND HUNTINGTON ROAD, 8 MILES WNW OF MODESTO.

Location Detail: SPECIMENS IN 1991 WERE FOUND IN THE VICINITY OF HUNTINGTON RD X PARADISE RD; THE 1990 AND 1992 SPECIMENS WERE FOUND ALONG CALIFORNIA AVENUE, NEAR PARADISE ROAD.

Ecological: HABITAT CONSISTS OF VERNAL POOLS.

Threat: THREATENED BY DEVELOPMENT AND AGRICULTURAL PRACTICES.

General: 1 CTS FOUND DOR ON 14 JANUARY 1990. 5 LARVAE COLLECTED (MRJ-0512, O513, 0625, CAS# 179030), 3 APR 1991. SHAFFER SITE 136, 1991. 1992: 2 CTS OBSERVED DURING INTERMITTENT RAIN, 19:15-20:30 HRS (MEASUREMENTS AS FOLLOWS: 85MM-SVL, 10MM-SVL).

Owner/Manager: UNKNOWN

Ambystoma californiense

California tiger salamander

Element Code: AAAAA01180

Status	NDDB Element Ranks	Other Lists
Federal: Threatened State: None	Global: G2G3 State: S2S3	CDFG Status: SC

Habitat Associations
General: CENTRAL VALLEY DPS LISTED AS THREATENED. SANTA BARBARA & SONOMA COUNTIES DPS LISTED AS ENDANGERED. Micro: NEED UNDERGROUND REFUGES, ESPECIALLY GROUND SQUIRREL BURROWS & VERNAL POOLS OR OTHER SEASONAL WATER SOURCES FOR BREEDING

Occurrence No. 617	Map Index: 46500	EO Index: 46500	— Dates Last Seen —
Occ Rank: Unknown			Element: 1973-XX-XX
Origin: Natural/Native occurrence			Site: 1973-XX-XX
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 2001-11-13

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.64029° / -121.15905°	Township: 03S
UTM: Zone-10 N4167499 E662423	Range: 07E
Mapping Precision: NON-SPECIFIC	Section: 26 Qtr: SE
Symbol Type: POLYGON	Meridian: M
Area:	Elevation: 40 ft

Location: ALONG GATES ROAD NEAR HWY 132. ABOUT 1.9 MILES EAST OF FINNEGAN'S CUT (SAN JOAQUIN RIVER). WEST OF MODESTO.

Location Detail: FOUND AT A RANCH HOUSE ON GATES ROAD.

Ecological:

Threat:

General: OBSERVATION IN FALL 1973.

Owner/Manager: UNKNOWN

Anthicus sacramento

Sacramento anthicid beetle

Element Code: IICOL49010

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G1

CDFG Status:

State: None

State: S1

_____ **Habitat Associations** _____

General: RESTRICTED TO SAND DUNE AREAS OF THE SACRAMENTO-SAN JOAQUIN DELTA.

Micro: INHABIT SAND SLIPFACES AMONG BAMBOO AND WILLOW BUT MAY NOT DEPEND ON PRESENCE OF THESE PLANT SPECIES.

Occurrence No. 10

Map Index: 57316

EO Index: 57332

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1990-09-22

Origin: Natural/Native occurrence

Site: 1990-09-22

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 2004-11-02

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.72401° / -121.29769°

Township: 02S

UTM: Zone-10 N4176558 E650022

Range: 06E

Mapping Precision: NON-SPECIFIC

Section: 34

Qtr: XX

Symbol Type: POLYGON

Meridian: M

Area:

Elevation: 10 ft

Location: DREDGED MATERIAL DISPOSAL SITE AT MOUTH OF BANTA CARBONA CANAL.

Location Detail:

Ecological: UNKNOWN.

Threat:

General: 1 ADULT COLLECTED IN PITFALL TRAP.

Owner/Manager: UNKNOWN

Anthicus sacramento

Sacramento anthicid beetle

Element Code: IICOL49010

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G1

CDFG Status:

State: None

State: S1

_____ **Habitat Associations** _____

General: RESTRICTED TO SAND DUNE AREAS OF THE SACRAMENTO-SAN JOAQUIN DELTA.

Micro: INHABIT SAND SLIPFACES AMONG BAMBOO AND WILLOW BUT MAY NOT DEPEND ON PRESENCE OF THESE PLANT SPECIES.

Occurrence No. 11

Map Index: 57330

EO Index: 57346

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1990-09-08

Origin: Natural/Native occurrence

Site: 1990-09-08

Presence: Presumed Extant

Record Last Updated: 2004-10-12

Trend: Unknown

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.70964° / -121.27747°

Township: 03S

UTM: Zone-10 N4174996 E651833

Range: 06E

Mapping Precision: NON-SPECIFIC

Section: 02

Qtr: XX

Symbol Type: POLYGON

Meridian: M

Area:

Elevation: 10 ft

Location: LARGE POINT BAR ON NORTH BANK AT BEND OF SAN JOAQUIN RIVER AT RIVER MILE 65.2R.

Location Detail:

Ecological: SAND BAR.

Threat:

General: 1 ADULT COLLECTED IN 6 PITFALL TRAPS BETWEEN 2-8 SEP 1990.

Owner/Manager: UNKNOWN

Anthicus sacramento

Sacramento anthicid beetle

Element Code: IICOL49010

_____ Status _____ NDDB Element Ranks _____ Other Lists _____

Federal: None

Global: G1

CDFG Status:

State: None

State: S1

_____ Habitat Associations _____

General: RESTRICTED TO SAND DUNE AREAS OF THE SACRAMENTO-SAN JOAQUIN DELTA.

Micro: INHABIT SAND SLIPFACES AMONG BAMBOO AND WILLOW BUT MAY NOT DEPEND ON PRESENCE OF THESE PLANT SPECIES.

Occurrence No. 12

Map Index: 57332

EO Index: 57348

_____ Dates Last Seen _____

Occ Rank: Unknown

Element: 1990-09-08

Origin: Natural/Native occurrence

Site: 1990-09-08

Presence: Presumed Extant

Record Last Updated: 2004-10-12

Trend: Unknown

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.70038° / -121.27457°

Township: 03S

UTM: Zone-10 N4173974 E652108

Range: 06E

Mapping Precision: NON-SPECIFIC

Section: 02

Qtr: XX

Symbol Type: POLYGON

Meridian: M

Area:

Elevation: 10 ft

Location: POINT BAR ON EAST BANK OF BEND AT RIVER MILE 69.0R ON SAN JOAQUIN RIVER.

Location Detail:

Ecological: SAND BAR - SMALL BEACH AREA.

Threat:

General: 2 ADULTS COLLECTED IN 4 PITFALL TRAPS BETWEEN 2 - 8 SEP 1990.

Owner/Manager: UNKNOWN

Anthicus sacramento

Sacramento anthicid beetle

Element Code: IICOL49010

_____ Status _____ NDDB Element Ranks _____ Other Lists _____

Federal: None

Global: G1

CDFG Status:

State: None

State: S1

_____ Habitat Associations _____

General: RESTRICTED TO SAND DUNE AREAS OF THE SACRAMENTO-SAN JOAQUIN DELTA.

Micro: INHABIT SAND SLIPFACES AMONG BAMBOO AND WILLOW BUT MAY NOT DEPEND ON PRESENCE OF THESE PLANT SPECIES.

Occurrence No. 13

Map Index: 57334

EO Index: 57350

_____ Dates Last Seen _____

Occ Rank: Unknown

Element: 1990-09-08

Origin: Natural/Native occurrence

Site: 1990-09-08

Presence: Presumed Extant

Record Last Updated: 2004-10-12

Trend: Unknown

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.68316° / -121.26955°

Township: 03S

UTM: Zone-10 N4172071 E652585

Range: 06E

Mapping Precision: NON-SPECIFIC

Section: 12

Qtr: XX

Symbol Type: POLYGON

Meridian: M

Area:

Elevation: 0 ft

Location: SANDY BANK ON RIVER BEND AT RIVER MILE 70.8R ON THE SAN JOAQUIN RIVER.

Location Detail:

Ecological: ERODING SANDY BANK.

Threat:

General: 1 ADULT COLLECTED IN 4 PITFALL TRAPS SET BETWEEN 2 & 8 SEP 1990.

Owner/Manager: UNKNOWN

Athene cunicularia

burrowing owl

Element Code: ABNSB10010

Status	NDDB Element Ranks	Other Lists
Federal: None State: None	Global: G4 State: S2	CDFG Status: SC

Habitat Associations
General: OPEN, DRY ANNUAL OR PERENIAL GRASSLANDS, DESERTS & SCRUBLANDS CHARACTERIZED BY LOW-GROWING VEGETATION. Micro: SUBTERRANEAN NESTER, DEPENDENT UPON BURROWING MAMMALS, MOST NOTABLY, THE CALIFORNIA GROUND SQUIRREL.

Occurrence No. 251	Map Index: 36447	EO Index: 31444	— Dates Last Seen —
Occ Rank: Fair			Element: 2000-01-21
Origin: Natural/Native occurrence			Site: 2000-01-21
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 2000-01-01

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.79797° / -121.26440°	Township: 01S
UTM: Zone-10 N4184818 E652804	Range: 06E
Mapping Precision: NON-SPECIFIC	Section: 36 Qtr: SW
Symbol Type: POINT	Meridian: M
Radius: 1/10 mile	Elevation: 25 ft

Location: NORTH SIDE OF YOSEMITE AVENUE, 0.3 MILE EAST OF THE INTERSECTION OF YOSEMITE AVENUE AND MCKINLEY AVENUE, SE OF LATHROP

Location Detail: BURROW IS LOCATED IN A NEWLY-CREATED DETENTION BASIN NORTH OF THE SAN JOAQUIN RAIL STATION PARKING LOT.

Ecological: HABITAT SURROUNDING BURROW CONSISTS OF WINTER WHEAT TO THE WEST, A SMALL BAND OF ANNUAL GRASSLAND TO THE EAST, AND THE REMAINDER IS SCRAPED CLEAN.

Threat: THREATENED BY DEVELOPMENT.

General: 2 ADULTS AND 2 JUVENILES OBSERVED ON 24 JUL 1997. 1 ADULT OBSERVED ON 21 JAN 2000.

Owner/Manager: PVT

Athene cunicularia

burrowing owl

Element Code: ABNSB10010

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4	CDFG Status: SC
State: None	State: S2	

Habitat Associations
General: OPEN, DRY ANNUAL OR PERENIAL GRASSLANDS, DESERTS & SCRUBLANDS CHARACTERIZED BY LOW-GROWING VEGETATION.
Micro: SUBTERRANEAN NESTER, DEPENDENT UPON BURROWING MAMMALS, MOST NOTABLY, THE CALIFORNIA GROUND SQUIRREL.

Occurrence No. 265	Map Index: 38438	EO Index: 33445	— Dates Last Seen —
Occ Rank: Fair			Element: 1997-03-14
Origin: Natural/Native occurrence			Site: 1997-03-14
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 1998-03-23

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.82534° / -121.25893°	Township: 01S
UTM: Zone-10 N4187864 E653229	Range: 06E
Mapping Precision: SPECIFIC	Section: 25 Qtr: NE
Symbol Type: POINT	Meridian: M
Radius: 80 meters	Elevation: 20 ft

Location: 0.3 MILES WSW OF INTERSECTION OF LATHROP RD & DURHAM FERRY RD. 0.75 MILES EAST OF LATHROP.

Location Detail:

Ecological: HABITAT CONSISTS OF IRRIGATED PASTURE.

Threat: POSSIBLE THREAT FROM COMMERCIAL CONSTRUCTION.

General: ON 14 MARCH 1997, A PAIR OF OWLS WAS OBSERVED, POSSIBLY WITH EGGS.

Owner/Manager: UNKNOWN

Athene cunicularia

burrowing owl

Element Code: ABNSB10010

Status	NDDB Element Ranks	Other Lists
Federal: None State: None	Global: G4 State: S2	CDFG Status: SC

Habitat Associations
General: OPEN, DRY ANNUAL OR PERENIAL GRASSLANDS, DESERTS & SCRUBLANDS CHARACTERIZED BY LOW-GROWING VEGETATION.
Micro: SUBTERRANEAN NESTER, DEPENDENT UPON BURROWING MAMMALS, MOST NOTABLY, THE CALIFORNIA GROUND SQUIRREL.

Occurrence No. 342	Map Index: 42086	EO Index: 42086	— Dates Last Seen —
Occ Rank: Good			Element: 2007-06-22
Origin: Natural/Native occurrence			Site: 2007-06-22
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 2008-06-11

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.83738° / -121.27284°	Township: 01S
UTM: Zone-10 N4189178 E651979	Range: 06E
Mapping Precision: NON-SPECIFIC	Section: 23 Qtr: XX
Symbol Type: POLYGON	Meridian: M
Area:	Elevation: 20 ft

Location: SHARPE DEPOT, LATHROP.

Location Detail: BURROWS BETWEEN ABANDONED RUNWAY & RR TRACKS. ARTIFICIAL BURROWS INSTALLED IN 1999 TO MITIGATE HABITAT LOSS FROM CONSTRUCTION OF LARGE BUILDING. 1999: 4 PAIRS USED ARTIFICIAL BURROWS. 2000: 5 PRS USED NATURAL BURROWS, 5 PRS USED ARTIFICIAL.

Ecological: HABITAT CONSISTS OF MOWED NON-NATIVE GRASSLAND VEGETATION, DOMINATED BY YELLOW STAR THISTLE AND BERMUDA GRASS; SURROUNDED BY A MILITARY SUPPLY/STORAGE AREA.

Threat: THREATENED BY PROLIFERATION OF YELLOW STAR THISTLE (EVEN THOUGH VEGETATION IS MOWED), CONSTRUCTION, AND PREDATION.

General: 8 PRS 1997. 4 PRS/YNG 1998. 7 PRS/JUVS 1999. 32 ADS/24 JUV 2000. 13 PRS/55 JUV 2001. 20 PRS/56 JUV MAY-JUN 2002. 19 PRS/41 JUVS 15 JUN 2003. 43 AD/57 JUV JUN 2004. 37 AD/60 JUV MAY-JUN 2005. 19 PRS/68 JUV JUL 2006. 15 PRS/47 JUVS 2007.

Owner/Manager: DOD-SHARPE DEPOT

Athene cunicularia

burrowing owl

Element Code: ABNSB10010

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G4

CDFG Status: SC

State: None

State: S2

_____ **Habitat Associations** _____

General: OPEN, DRY ANNUAL OR PERENIAL GRASSLANDS, DESERTS & SCRUBLANDS CHARACTERIZED BY LOW-GROWING VEGETATION.

Micro: SUBTERRANEAN NESTER, DEPENDENT UPON BURROWING MAMMALS, MOST NOTABLY, THE CALIFORNIA GROUND SQUIRREL.

Occurrence No. 741

Map Index: 62003

EO Index: 62039

_____ **Dates Last Seen** _____

Occ Rank: Fair

Element: 2003-03-15

Origin: Natural/Native occurrence

Site: 2003-03-15

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 2005-07-18

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.74901° / -121.34249°

Township: 02S

UTM: Zone-10 N4179261 E646024

Range: 06E

Mapping Precision: SPECIFIC

Section: 20 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 20 ft

Location: JUST EAST OF THE INTERSECTION OF KASSON ROAD AND MANCUSO ROAD, EAST OF BANTA

Location Detail: BURROW IS LOCATED BETWEEN THE ROAD SHOULDER AND THE ADJACENT AGRICULTURAL FIELD.

Ecological: HABITAT CONSISTS OF MIXED AGRICULTURE AND RANCHETTES.

Threat:

General: 1 ADULT OWL OBSERVED AT THE BURROW ENTRANCE ON 15 MAR 2003.

Owner/Manager: PVT

Atriplex minuscula

lesser saltscale

Element Code: PDCHE042M0

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G1

CNPS List: 1B.1

State: None

State: S1.1

_____ **Habitat Associations** _____

General: CHENOPOD SCRUB, PLAYAS, VALLEY AND FOOTHILL GRASSLAND.

Micro: IN ALKALI SINK AND GRASSLAND IN SANDY, ALKALINE SOILS. 20-100M.

Occurrence No. 29

Map Index: 24325

EO Index: 56452

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1954-09-03

Origin: Natural/Native occurrence

Site: 1954-09-03

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 2004-08-19

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.63764° / -121.16807°

Township: 03S

UTM: Zone-10 N4167190 E661634

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 26

Qtr: S

Symbol Type: POLYGON

Meridian: M

Area:

Elevation: 40 ft

Location: "3.2 MI EAST OF BRIDGE ON ROAD FROM VERNALIS TO MODESTO." MAPPED E OF BRIDGE OVER SAN JOAQUIN RIVER ALONG HWY 132.

Location Detail: MAPPED ABOUT 3.5 MI SSE OF CASWELL MEMORIAL STATE PARK.

Ecological: LOW ALKALINE AREAS.

Threat:

General: ORIGINALLY COLLECTED AS A. DEPRESSA, IDENTIFIED AS A. MINUSCULA BY PRESTON. FORMER A. DEPRESSA OCCURRENCE #18.

Owner/Manager: UNKNOWN

Branchinecta conservatio

Conservancy fairy shrimp

Element Code: ICBRA03010

_____ Status _____	_____ NDDB Element Ranks _____	_____ Other Lists _____
Federal: Endangered	Global: G1	CDFG Status:
State: None	State: S1	

_____ Habitat Associations _____
General: ENDEMIC TO THE GRASSLANDS OF THE NORTHERN TWO-THIRDS OF THE CENTRAL VALLEY; FOUND IN LARGE, TURBID POOLS.
Micro: INHABIT ASTATIC POOLS LOCATED IN SWALES FORMED BY OLD, BRAIDED ALLUVIUM; FILLED BY WINTER/SPRING RAINS, LAST UNTIL JUNE.

Occurrence No. 12	Map Index: 38253	EO Index: 41871	_____ Dates Last Seen _____
Occ Rank: Unknown			Element: 1991-04-01
Origin: Natural/Native occurrence			Site: 1991-04-01
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 1999-11-10

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.64044° / -121.18315°	Township: 03S
UTM: Zone-10 N4167475 E660297	Range: 07E
Mapping Precision: NON-SPECIFIC	Section: 27 Qtr: SE
Symbol Type: POLYGON	Meridian: M
Area:	Elevation: 35 ft

Location: MAPES RANCH, NE OF THE INTERSECTION OF HWY 132 AND MAPES RANCH RD, ON S SIDE OF RILEY SLOUGH, 10 MILES WEST OF MODESTO.

Location Detail: IN POOL #S 2 AND 3 COLLECTION BY JENNIFER LAURSEN (DENTON BELK'S COLLECTION ACC #S DB995, DB996)

Ecological: HABITAT CONSISTS OF AN ALKALI SINK VERNAL POOL COMPLEX ON FRESNO SERIES SOIL; ASSOCIATED PLANT SPECIES INCLUDES SUAEDA, HEMIZONIA, ELEOCHARIS AND STELLARIA MEDIA. ADJACENT PARCELS HAVE BEEN LEVELED FOR IRRIGATED PASTURE.

Threat:

General: 2 COLLECTIONS MADE, NUMBER OF INDIVIDUALS NOT GIVEN. ALSO OBSERVED IN THE AREA, LINDERIELLA OCCIDENTALIS, BRANCHINECTA LYNCHI.

Owner/Manager: PVT

Branchinecta lynchi

vernal pool fairy shrimp

Element Code: ICBRA03030

Status	NDDB Element Ranks	Other Lists
Federal: Threatened State: None	Global: G3 State: S2S3	CDFG Status:

Habitat Associations
General: ENDEMIC TO THE GRASSLANDS OF THE CENTRAL VALLEY, CENTRAL COAST MTNS, AND SOUTH COAST MTNS, IN ASTATIC RAIN-FILLED POOLS. Micro: INHABIT SMALL, CLEAR-WATER SANDSTONE-DEPRESSION POOLS AND GRASSED SWALE, EARTH SLUMP, OR BASALT-FLOW DEPRESSION POOLS.

Occurrence No. 188	Map Index: 11802	EO Index: 31855	Dates Last Seen
Occ Rank: Unknown			Element: 1991-04-01
Origin: Natural/Native occurrence			Site: 1991-04-01
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 1997-09-24

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.65409° / -121.20439°	Township: 03S
UTM: Zone-10 N4168953 E658393	Range: 07E
Mapping Precision: NON-SPECIFIC	Section: 21 Qtr: S
Symbol Type: POINT	Meridian: M
Radius: 1 mile	Elevation: 25 ft

Location: MAPES RANCH, NORTH OF HWY 132, EAST OF SAN JOAQUIN RIVER, AND WEST OF MODESTO

Location Detail: BRANCHINECTA LYNCHI FOUND IN POOLS #1, 2, AND 12.

Ecological: HABITAT CONSISTS OF VERNAL POOLS.

Threat:

General: COLLECTED BY JENNIFER LAURSEN ON 1 APRIL 1991; SENT TO DENTON BELK FOR IDENTIFICATION (DB#994, 995, AND 997).

Owner/Manager: PVT, USFWS

Branchinecta lynchi

vernal pool fairy shrimp

Element Code: ICBRA03030

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: Threatened

Global: G3

CDFG Status:

State: None

State: S2S3

_____ **Habitat Associations** _____

General: ENDEMIC TO THE GRASSLANDS OF THE CENTRAL VALLEY, CENTRAL COAST MTNS, AND SOUTH COAST MTNS, IN ASTATIC RAIN-FILLED POOLS.

Micro: INHABIT SMALL, CLEAR-WATER SANDSTONE-DEPRESSION POOLS AND GRASSED SWALE, EARTH SLUMP, OR BASALT-FLOW DEPRESSION POOLS.

Occurrence No. 193

Map Index: 38253

EO Index: 33260

_____ **Dates Last Seen** _____

Occ Rank: Good

Element: 1998-01-27

Origin: Natural/Native occurrence

Site: 1998-01-27

Presence: Presumed Extant

Record Last Updated: 1998-03-02

Trend: Unknown

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.64044° / -121.18315°

Township: 03S

UTM: Zone-10 N4167475 E660297

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 27 **Qtr:** SE

Symbol Type: POLYGON

Meridian: M

Area:

Elevation: 35 ft

Location: NNE OF THE INTERSECTION OF HWY 132 AND MAPES RANCH ROAD, ON THE SOUTH SIDE OF RILEY SLOUGH, 10 MILES WEST OF MODESTO.

Location Detail:

Ecological: HABITAT CONSISTS OF AN ALKALI SINK VERNAL POOL COMPLEX ON FRESNO SERIES SOIL; ASSOCIATED PLANT SPECIES INCLUDES DISTICHLIS SPICATA, SUAEDA, HEMIZONIA, ELEOCHARIS AND STELLARIA MEDIA. ADJACENT PARCELS HAVE BEEN LEVELED FOR IRRIGATED PASTURE.

Threat:

General: POOLS 1, 4, 7, 9, AND 11 CONTAIN HUNDREDS OF BRANCHINECTA LYNCHI; SEVERAL POOLS ALSO CONTAIN LINDERIELLA OCCIDENTALIS

Owner/Manager: PVT

Branchinecta lynchi

vernal pool fairy shrimp

Element Code: ICBRA03030

Status	NDDB Element Ranks	Other Lists
Federal: Threatened State: None	Global: G3 State: S2S3	CDFG Status:

Habitat Associations
General: ENDEMIC TO THE GRASSLANDS OF THE CENTRAL VALLEY, CENTRAL COAST MTNS, AND SOUTH COAST MTNS, IN ASTATIC RAIN-FILLED POOLS. Micro: INHABIT SMALL, CLEAR-WATER SANDSTONE-DEPRESSION POOLS AND GRASSED SWALE, EARTH SLUMP, OR BASALT-FLOW DEPRESSION POOLS.

Occurrence No. 194	Map Index: 38254	EO Index: 33261	— Dates Last Seen —
Occ Rank: Fair			Element: 1998-01-27
Origin: Natural/Native occurrence			Site: 1998-01-27
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 1998-03-02

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.64987° / -121.16276°	Township: 03S
UTM: Zone-10 N4168556 E662075	Range: 07E
Mapping Precision: SPECIFIC	Section: 26 Qtr: NE
Symbol Type: POINT	Meridian: M
Radius: 80 meters	Elevation: 40 ft

Location: JUST NORTH OF THE HETCH HETCHY AQUEDUCT, 0.2 MILE WEST OF GATES ROAD, 5 MILES SSW OF RIPON
Location Detail: POOL IS LOCATED AT THE BASE OF AN ELECTRICAL TRANSMISSION LINE TOWER.
Ecological: HABITAT CONSISTS OF EXTENSIVE MIMA MOUND TOPOGRAPHY ON ALKALI SOILS; DOMINATED BY DISTICHLIS SPICATA.
Threat: THREATS INCLUDE TRANSMISSION LINE MAINTENANCE ACTIVITIES.
General: 10 INDIVIDUALS OBSERVED.
Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Branta hutchinsii leucopareia

cackling (=Aleutian Canada) goose

Element Code: ABNJB05035

Status	NDDB Element Ranks	Other Lists
Federal: Delisted	Global: G5T4	CDFG Status:
State: None	State: S2	

Habitat Associations

General: WINTERS ON LAKES AND INLAND PRAIRIES.

Micro: FORAGES ON NATURAL PASTURE OR THAT CULTIVATED TO GRAIN; LOAFS ON LAKES, RESERVOIRS, PONDS.

Occurrence No. 6	Map Index: 11802	EO Index: 27362	Dates Last Seen
Occ Rank: Excellent			Element: 1991-12-29
Origin: Natural/Native occurrence			Site: 1991-12-29
Presence: Presumed Extant			
Trend: Unknown		Record Last Updated: 2008-01-23	

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.65409° / -121.20439°	Township: 03S
UTM: Zone-10 N4168953 E658393	Range: 07E
Mapping Precision: NON-SPECIFIC	Section: 21 Qtr: S
Symbol Type: POINT	Meridian: M
Radius: 1 mile	Elevation: 25 ft

Location: FAITH RANCH, MAPES RANCH & DOCTORS' PONDS, W OF MODESTO (NEAR THE JUNCTION OF THE STANISLAUS AND SAN JOAQUIN RIVERS).

Location Detail: INCLUDES MAPES RANCH & DOCTORS' PONDS. 1978: 1500 BIRDS OBSERVED FEEDING IN FLOOD-IRRIGATED CATTLE PASTURES; ROOSTED IN NEARBY STOCK PONDS AT NIGHT. 1986-1987 OBSERVATIONS ON PONDS AND PASTURES OF THE RANCHES.

Ecological:

Threat:

General: 1977: UP TO 1271 BIRDS AT FAITH RANCH. 300 BIRDS OBS AT MAPES RANCH 2 DEC 1984. 2900 OBS 17 DEC 1986. 2000 & 3000 BIRDS OBS AT DOCTORS' PONDS 5 & 17 FEB 1987. 50-200 BIRDS OBS AT FAITH RANCH IN WINTER OF 1986-1987 & 3500 OBS 29 DEC 1991.

Owner/Manager: PVT, USFWS

Branta hutchinsii leucopareia

cackling (=Aleutian Canada) goose

Element Code: ABNJB05035

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: Delisted

Global: G5T4

CDFG Status:

State: None

State: S2

_____ **Habitat Associations** _____

General: WINTERS ON LAKES AND INLAND PRAIRIES.

Micro: FORAGES ON NATURAL PASTURE OR THAT CULTIVATED TO GRAIN; LOAFs ON LAKES, RESERVOIRS, PONDS.

Occurrence No. 15

Map Index: 67829

EO Index: 67977

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1984-03-21

Origin: Natural/Native occurrence

Site: 1984-03-21

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 2007-01-18

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.65936° / -121.14653°

Township: 03S

UTM: Zone-10 N4169637 E663486

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 24

Qtr: XX

Symbol Type: POINT

Meridian: M

Radius: 2/5 mile

Elevation: 50 ft

Location: ABOUT 2.5MI ENEOF MAPES RANCH, SW OF INTERSECTION OF SHOEMAKER AVE AND DUNN RD.

Location Detail: BIRDS FEEDING IN CORNFIELD.

Ecological:

Threat:

General: BIRDS OBSERVED FROM 21 FEB TO 21 MAR 1984.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G5	CDFG Status:
State: Threatened	State: S2	

Habitat Associations

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 17	Map Index: 11557	EO Index: 27288	Dates Last Seen
Occ Rank: Unknown			Element: 1979-08-03
Origin: Natural/Native occurrence			Site: 1982-06-29
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 1989-08-10

Quad Summary: Vernalis (3712163/444A), Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.74880° / -121.34133°	Township: 02S
UTM: Zone-10 N4179239 E646127	Range: 06E
Mapping Precision: NON-SPECIFIC	Section: 20 Qtr: NW
Symbol Type: POINT	Meridian: M
Radius: 1/5 mile	Elevation: 20 ft

Location: HWY I-5 & KASSON RD.

Location Detail:

Ecological:

Threat:

General: DFG SWHA #SJ007. TWO ADULTS OBSERVED, BUT NO NEST FOUND IN 1979; SITE INACTIVE IN 1982.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 49

Map Index: 11727

EO Index: 27244

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1979-07-27

Origin: Natural/Native occurrence

Site: 1984-06-07

Presence: Presumed Extant

Record Last Updated: 1989-08-10

Trend: Unknown

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.64159° / -121.23577°

Township: 03S

UTM: Zone-10 N4167513 E655651

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 30 **Qtr:** SE

Symbol Type: POINT

Meridian: M

Radius: 1/5 mile

Elevation: 37 ft

Location: ON N SIDE OF HWY 132 APPROX 0.25 W OF BRIDGE OVER SAN JOAQUIN RIVER.

Location Detail:

Ecological:

Threat:

General: DFG SWHA #ST003. ONE BIRD OF UNKNOWN AGE SEEN IN 1979. NO NEST OR ADULTS FOUND IN 1984.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 50

Map Index: 11810

EO Index: 7810

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1988-XX-XX

Origin: Natural/Native occurrence

Site: 1988-XX-XX

Presence: Presumed Extant

Record Last Updated: 1993-03-31

Trend: Unknown

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.63303° / -121.19773°

Township: 03S

UTM: Zone-10 N4166627 E659026

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 33 **Qtr:** NE

Symbol Type: POINT

Meridian: M

Radius: 1/5 mile

Elevation: 25 ft

Location: SAN JOAQUIN RIVER, NEAR FINNEGAN CUT, 0.25 MILE SOUTH OF HWY 132, 7 MILES SSW OF RIPON

Location Detail:

Ecological: NESTING HABITAT CONSISTS OF RIPARIAN SURROUNDED BY CROPLAND.

Threat:

General: DFG SWHA #ST004. ADULTS SOARING, BUT NO NEST FOUND, IN 1979, 1984, 1985, AND 1986. IN 1987, THE NEST SITE WAS FOUND SOUTH OF THE AREA WHERE BIRDS WERE OBSERVED SOARING. NESTING ALSO OCCURRED IN 1988, WITH UNKNOWN RESULTS.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 116

Map Index: 11714

EO Index: 27189

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1981-06-23

Origin: Natural/Native occurrence

Site: 1984-06-05

Presence: Presumed Extant

Record Last Updated: 1989-08-10

Trend: Unknown

Quad Summary: Ripon (3712162/443B)

County Summary: San Joaquin

Lat/Long: 37.67242° / -121.24105°

Township: 03S

UTM: Zone-10 N4170925 E655121

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 18 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 1/5 mile

Elevation: 25 ft

Location: STURGEON BEND ON THE SAN JOAQUIN RIVER; AT INDIAN VALLEY RESORT, OFF OF TWO RIVERS ROAD

Location Detail:

Ecological: HABITAT CONSISTS OF COTTONWOOD RIPARIAN.

Threat:

General: DFG SWHA #SJ013. 1 ADULT OBSERVED IN 1981, BUT NO NEST FOUND. NO BIRDS OR NEST OBSERVED IN 1984.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G5	CDFG Status:
State: Threatened	State: S2	

Habitat Associations

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 117

Map Index: 11753

EO Index: 27190

Dates Last Seen

Occ Rank: Unknown

Element: 1984-06-05

Origin: Natural/Native occurrence

Site: 1984-06-05

Presence: Presumed Extant

Record Last Updated: 1989-08-10

Trend: Unknown

Quad Summary: Ripon (3712162/443B), Vernalis (3712163/444A)

County Summary: San Joaquin, Stanislaus

Lat/Long: 37.66538° / -121.23596°

Township: 03S

UTM: Zone-10 N4170153 E655585

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 19 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 1 mile

Elevation: 25 ft

Location: NEAR THE CONFLUENCE OF THE SAN JOAQUIN & STANISLAUS RIVERS

Location Detail:

Ecological: NEST TREE IS A COTTONWOOD.

Threat:

General: DFG SWHA #SJ012. 1 ADULT OBSERVED ON THE NEST IN 1984.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 118

Map Index: 11659

EO Index: 27188

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1981-06-23

Origin: Natural/Native occurrence

Site: 1984-06-05

Presence: Presumed Extant

Record Last Updated: 1989-08-10

Trend: Unknown

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.70575° / -121.26911°

Township: 03S

UTM: Zone-10 N4174578 E652578

Range: 06E

Mapping Precision: NON-SPECIFIC

Section: 1 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 1/5 mile

Elevation: 20 ft

Location: SAN JOAQUIN RIVER

Location Detail:

Ecological:

Threat:

General: DFG SWHA #SJ014. 3 ADULTS OBSERVED IN 1981, BUT NO NEST WAS FOUND. NO ADULTS OR NEST FOUND IN 1982 OR 1984.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 148

Map Index: 11780

EO Index: 27148

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1984-06-05

Origin: Natural/Native occurrence

Site: 1984-06-05

Presence: Presumed Extant

Record Last Updated: 1989-08-10

Trend: Unknown

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus, San Joaquin

Lat/Long: 37.69020° / -121.21772°

Township: 03S

UTM: Zone-10 N4172937 E657141

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 8 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 1/5 mile

Elevation: 35 ft

Location: 0.1 MILE SOUTH OF DIVISION ROAD, ON MANTECA ROAD, CLOSE TO CASWELL MEMORIAL STATE PARK

Location Detail:

Ecological:

Threat:

General: DFG SWHA #SJ011. ADULTS OBSERVED SOARING IN THIS AREA IN 1981, 1983, AND 1984. INACTIVE NEST LOCATED IN 1982.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 159

Map Index: 11685

EO Index: 27140

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1984-05-06

Origin: Natural/Native occurrence

Site: 1984-05-06

Presence: Presumed Extant

Record Last Updated: 1989-08-10

Trend: Unknown

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.70798° / -121.26078°

Township: 03S

UTM: Zone-10 N4174839 E653308

Range: 06E

Mapping Precision: NON-SPECIFIC

Section: 01 **Qtr:** NE

Symbol Type: POINT

Meridian: M

Radius: 1/5 mile

Elevation: 20 ft

Location: RED BRIDGE SLOUGH; 0.75 MILE NORTH OF RIVER JUNCTION FARMS ROAD, 0.5 MILES EAST OF SAN JOAQUIN RIVER

Location Detail: THIS TERRITORY IS CLOSE TO DFG SWHA #SJ014.

Ecological: NEST FOUND IN A COTTONWOOD.

Threat:

General: DFG SWHA #SJ026. 1 LIGHT ADULT & 1 DARK PHASE ADULT OBSERVED ON 6 MAY 1984.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 163

Map Index: 11668

EO Index: 27134

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1984-06-12

Origin: Natural/Native occurrence

Site: 1984-06-12

Presence: Presumed Extant

Record Last Updated: 1989-08-10

Trend: Unknown

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.67436° / -121.26577°

Township: 03S

UTM: Zone-10 N4171100 E652937

Range: 06E

Mapping Precision: NON-SPECIFIC

Section: 13 **Qtr:** NW

Symbol Type: POINT

Meridian: M

Radius: 1/5 mile

Elevation: 25 ft

Location: SAN JOAQUIN RIVER AND AIRPORT WAY JUNCTION

Location Detail:

Ecological: NEST TREE IS AN OAK.

Threat:

General: DFG SWHA #SJ027. 2 ADULTS (1 LIGHT & 1 DARK PHASE); FEMALE ON NEST.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 164

Map Index: 11726

EO Index: 27133

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1984-05-06

Origin: Natural/Native occurrence

Site: 1984-05-06

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 1989-08-10

Quad Summary: Ripon (3712162/443B)

County Summary: San Joaquin

Lat/Long: 37.70603° / -121.23772°

Township: 03S

UTM: Zone-10 N4174660 E655345

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 06

Qtr: NE

Symbol Type: POINT

Meridian: M

Radius: 1/5 mile

Elevation: 25 ft

Location: AIRPORT WAY AND TRAHERN ROAD JUNCTION.

Location Detail:

Ecological: NEST TREE IS AN OAK.

Threat:

General: DFG SWHA #SJ025. 1 LIGHT PHASE ADULT, 1 MEDIUM PHASE ADULT, AND 2 YOUNG IN NEST OBSERVED ON 6 MAY 1984.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 165

Map Index: 11755

EO Index: 7811

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1988-XX-XX

Origin: Natural/Native occurrence

Site: 1988-XX-XX

Presence: Presumed Extant

Record Last Updated: 2006-11-20

Trend: Unknown

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.63768° / -121.22681°

Township: 03S

UTM: Zone-10 N4167095 E656450

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 32 **Qtr:** NW

Symbol Type: POINT

Meridian: M

Radius: 1/5 mile

Elevation: 25 ft

Location: SAN JOAQUIN RIVER, 0.25 MILE DOWNSTREAM OF THE HIGHWAY 132 BRIDGE OVER THE RIVER (MAZE BLVD), 7 MILES SSW OF RIPON.

Location Detail:

Ecological: NESTING HABITAT CONSISTS OF RIPARIAN SURROUNDED BY CROPLAND.

Threat:

General: ONE ADULT OBSERVED SOARING NORTH OF THE BRIDGE IN 1984, BUT NO NEST FOUND. NEST SITE FOUND IN 1987, WITH 2 YOUNG FLEDGED. 2 ADULTS OBSERVED NESTING AGAIN IN 1988, WITH UNKNOWN RESULTS.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 263

Map Index: 11824

EO Index: 27045

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1984-06-12

Origin: Natural/Native occurrence

Site: 1984-06-12

Presence: Presumed Extant

Record Last Updated: 1989-08-10

Trend: Unknown

Quad Summary: Ripon (3712162/443B)

County Summary: San Joaquin, Stanislaus

Lat/Long: 37.68992° / -121.19772°

Township: 03S

UTM: Zone-10 N4172940 E658905

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 09 **Qtr:** NE

Symbol Type: POINT

Meridian: M

Radius: 1/5 mile

Elevation: 40 ft

Location: STANISLAUS RIVER; 0.75 MILE NE OF BECKWITH ROAD/PAGE ROAD, WEST OF CASWELL MEMORIAL STATE PARK

Location Detail:

Ecological:

Threat:

General: DFG SWHA #ST006. 2 ADULTS OBS SOARING; NO NEST FOUND.

Owner/Manager: DPR-CASWELL MEMORIAL SP

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 264

Map Index: 11679

EO Index: 27044

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1979-07-27

Origin: Natural/Native occurrence

Site: 1984-06-07

Presence: Presumed Extant

Record Last Updated: 1995-10-27

Trend: Unknown

Quad Summary: Vernalis (3712163/444A)

County Summary: Stanislaus, San Joaquin

Lat/Long: 37.64714° / -121.26078°

Township: 03S

UTM: Zone-10 N4168088 E653433

Range: 06E

Mapping Precision: NON-SPECIFIC

Section: 25 **Qtr:** NE

Symbol Type: POINT

Meridian: M

Radius: 1/5 mile

Elevation: 50 ft

Location: WEST OF KASSON ROAD/J4, BETWEEN GREENWOOD ROAD AND MAZE ROAD NEAR THE STANISLAUS RIVER

Location Detail: AREA UNSURVEYED, BUT SOURCE SAYS SEC 25.

Ecological:

Threat:

General: DFG SWHA #ST002. 1 ADULT OBSERVED IN 1979, BUT NO NEST FOUND. SITE INACTIVE IN 1984.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 266

Map Index: 11681

EO Index: 27042

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2003-06-20

Origin: Natural/Native occurrence

Site: 2003-06-20

Presence: Presumed Extant

Record Last Updated: 2006-08-03

Trend: Unknown

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.66576° / -121.25884°

Township: 03S

UTM: Zone-10 N4170157 E653566

Range: 06E

Mapping Precision: SPECIFIC

Section: 24 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 30 ft

Location: JUST EAST OF KASSON ROAD, 0.8 MILE SOUTH OF AIRPORT WAY, ~9 MILES SW OF RIPON.

Location Detail: 2000 AND 2003 NEST TREES WERE VALLEY OAKS.

Ecological: NEST TREE WAS A VALLEY OAK; SURROUNDING FORAGING HABITAT CONSISTS OF RIPARIAN TO THE NE AND SE, AND ROW CROPS TO THE NW AND SW.

Threat:

General: NESTS OBSERVED IN 1982-83 IN OAKS ALONG THE RIPARIAN ZONE. 3 SOARING ADULTS IN 1984, BUT NO NESTS FOUND. ADULT OBSERVED TAKING FOOD TO NEST ON 5 JUN 2000. 2 FEATHERED CHICKS OBSERVED IN THE NEST ON 20 JUN 2003; ADULT FLEW IN WITH PREY.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 283

Map Index: 11662

EO Index: 8931

_____ **Dates Last Seen** _____

Occ Rank: Good

Element: 1990-05-25

Origin: Natural/Native occurrence

Site: 1990-05-25

Presence: Presumed Extant

Trend: Stable

Record Last Updated: 1996-02-23

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.67201° / -121.26760°

Township: 03S

UTM: Zone-10 N4170836 E652780

Range: 06E

Mapping Precision: SPECIFIC

Section: 13 **Qtr:** SW

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 25 ft

Location: 0.2 MI SOUTH OF THE INTERSECTION OF KASSON ROAD AND AIRPORT ROAD, ON THE EAST SIDE OF KASSON ROAD, SAN JOAQUIN CITY.

Location Detail: NEST IS LOCATED IN AN 80-FT VALLEY OAK TREE, IMMEDIATELY N OF THIRD TELEPHONE POLE FROM THE INTERSECTION, WITHIN A GROVE OF 5-10 MATURE VALLEY OAKS.

Ecological: HABITAT IS GREAT VALLEY RIPARIAN LOCATED ON UPPER TERRACE RIPARIAN ALONG THE SAN JOAQUIN RIVER.

Threat: THREATENED BY SOME CLEARING ACTIVITY; OWNER MAY BE PROCEEDING WITH PLANS TO DEVELOP A RECREATION AREA AT THIS SITE.

General: 1987, ONE ADULT AND 3 FLEDGLINGS OBSERVED AT THE NEST. 1990, ONE ADULT OBSERVED ON NEST; APPEARED TO BE INCUBATING EGGS.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 386

Map Index: 21220

EO Index: 18632

_____ **Dates Last Seen** _____

Occ Rank: Good

Element: 1992-XX-XX

Origin: Natural/Native occurrence

Site: 1992-XX-XX

Presence: Presumed Extant

Record Last Updated: 1993-06-10

Trend: Unknown

Quad Summary: Manteca (3712172/461C)

County Summary: San Joaquin

Lat/Long: 37.85892° / -121.14257°

Township: 01S

UTM: Zone-10 N4191788 E663396

Range: 08E

Mapping Precision: NON-SPECIFIC

Section: 07 **Qtr:** SW

Symbol Type: POINT

Meridian: M

Radius: 1/5 mile

Elevation: 50 ft

Location: 0.5 MI SSE OF THE JUNCTION OF JACK TONE ROAD AND WILDWOOD ROAD, 6 MI NE OF MANTECA.

Location Detail:

Ecological: NEST TREE IS A LONE OAK TREE SURROUNDED BY AGRICULTURAL FIELDS; CROP TYPES INCLUDE HAY, CORN, SUGAR BEETS, AND CRUCIFERAE VEGETABLES. VINEYARD RECENTLY PUT IN TO THE NORTHWEST OF THE NEST SITE.

Threat:

General: DFG SWHA #SJ051. BIRDS WERE FIRST KNOWN TO NEST HERE IN 1988, ALTHOUGH NO YOUNG WERE FLEDGED. ONE DOWNY CHICK OBSERVED ON 22 MAY 1990. BIRDS NESTED AGAIN IN 1991, ALTHOUGH UNSUCCESSFULLY. IN 1992, 3 YOUNG WERE FLEDGED.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 387

Map Index: 21219

EO Index: 9047

_____ **Dates Last Seen** _____

Occ Rank: Excellent

Element: 1990-05-31

Origin: Natural/Native occurrence

Site: 1990-05-31

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 1993-06-14

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.82271° / -121.33793°

Township: 01S

UTM: Zone-10 N4187445 E646281

Range: 06E

Mapping Precision: NON-SPECIFIC

Section: 20 **Qtr:** SW

Symbol Type: POINT

Meridian: M

Radius: 1/5 mile

Elevation: 10 ft

Location: ROBERTS ISLAND, SOUTH OF THE JUNCTION OF UNDINE ROAD AND ROBERTS ROAD, 3 MI WEST OF LATHROP.

Location Detail:

Ecological: NEST TREE IS A VALLEY OAK WITHIN A GROUP OF LARGE VALLEY OAKS AROUND FARM BUILDINGS; SURROUNDING HABITAT IS AGRICULTURAL LAND.

Threat:

General: DFG SWHA #SJ057. ONE ADULT OBSERVED CARRYING A VOLE TO THE NEST, INDICATING THE PRESENCE OF NESTLING(S), ALTHOUGH NONE WERE VISIBLE. 2 YOUNG WERE EVENTUALLY FLEDGED IN 1990.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 391

Map Index: 21509

EO Index: 17717

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2003-05-07

Origin: Natural/Native occurrence

Site: 2003-05-07

Presence: Presumed Extant

Record Last Updated: 2006-08-01

Trend: Unknown

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.78581° / -121.30913°

Township: 02S

UTM: Zone-10 N4183397 E648889

Range: 06E

Mapping Precision: SPECIFIC

Section: 03 **Qtr:** XX

Symbol Type: POLYGON

Meridian: M

Area: 11.6 acres

Elevation: 15 ft

Location: WEST SIDE OF THE SAN JOAQUIN RIVER, NORTH OF I-5, 5 MILES WEST OF MANTECA.

Location Detail: 1992 NEST TREE WAS LOCATED JUST WEST OF THE MOSSDALE MARINA.

Ecological: 2003: NEST TREE WAS A LARGE VALLEY OAK; SURROUNDING HABITAT IS RIPARIAN TO THE NE AND SW, AND ROW CROPS TO THE SE AND NW.

Threat: UNKNOWN THREATS.

General: BIRD(S) FIRST OBSERVED ON 20 MAY 1992 CARRYING PREY INTO NEST TREE; NEST DISCOVERED ON A RETURN VISIT ON 22 MAY 1992, WHEN 1 BIRD WAS OBSERVED ON THE NEST. BIRD INCUBATING ON 7 MAY 2003; 1 FEATHERED CHICK LATER OBSERVED.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 588

Map Index: 23636

EO Index: 16755

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1991-XX-XX

Origin: Natural/Native occurrence

Site: 1991-XX-XX

Presence: Presumed Extant

Record Last Updated: 1996-01-03

Trend: Unknown

Quad Summary: Manteca (3712172/461C)

County Summary: San Joaquin

Lat/Long: 37.85761° / -121.19627°

Township: 01S

UTM: Zone-10 N4191549 E658674

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 10 **Qtr:** SW

Symbol Type: POINT

Meridian: M

Radius: 2/5 mile

Elevation: 35 ft

Location: VICINITY OF LONE TREE CREEK, 0.7 MI NW OF THE INTERSECTION OF FRENCH CAMP ROAD & AUSTIN ROAD, 3 MILES NORTH OF MANTECA.

Location Detail:

Ecological: NEST TREE IS AN OAK.

Threat:

General: DFG SWHA #?. 1 YOUNG FLEDGED IN 1991.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 591

Map Index: 23635

EO Index: 7710

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1992-XX-XX

Origin: Natural/Native occurrence

Site: 1992-XX-XX

Presence: Presumed Extant

Record Last Updated: 1996-01-03

Trend: Unknown

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus, San Joaquin

Lat/Long: 37.71770° / -121.15576°

Township: 02S

UTM: Zone-10 N4176094 E662545

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 36 **Qtr:** W

Symbol Type: POINT

Meridian: M

Radius: 1/5 mile

Elevation: 35 ft

Location: STANISLAUS RIVER, RM-11.8(L), OPPOSITE THE JUNCTION OF MONCURE ROAD AND MOHLER AVENUE, 1.5 MILES SW OF RIPON.

Location Detail: IN 1990, THE NEST TREE WAS LOCATED ON THE SAN JOAQUIN COUNTY SIDE OF THE RIVER; THE BIRDS NESTED ON THE STANISLAUS COUNTY SIDE OF THE RIVER IN 1991 AND 1992.

Ecological: NEST TREE WAS AN OAK IN 1991.

Threat:

General: DFG SWHA #ST. THIS NEST SITE WAS ACTIVE IN 1990, 1991, AND 1992, WITH 3 YOUNG FLEDGED IN 1990.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G5	CDFG Status:
State: Threatened	State: S2	

Habitat Associations
General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH
Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 681	Map Index: 33403	EO Index: 22464	Dates Last Seen
Occ Rank: Fair			Element: 2002-07-17
Origin: Natural/Native occurrence			Site: 2002-07-17
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 2006-05-11

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.76337° / -121.34603°	Township: 02S
UTM: Zone-10 N4180849 E645684	Range: 06E
Mapping Precision: SPECIFIC	Section: 18 Qtr: XX
Symbol Type: POINT	Meridian: M
Radius: 80 meters	Elevation: 10 ft

Location: WEST SIDE OF BERRY AVENUE, 0.1 MILE SOUTH THE INTERSECTION WITH CANAL BOULEVARD, 5 MILES NORTH OF TRACY

Location Detail: THERE WERE 3 VALLEY OAKS IN A ROW; THE 1996 NEST TREE WAS THE CENTER ONE, WITH THE NEST LOCATED IN THE UPPER PORTION OF THE TREE. THE 2002 NEST TREE WAS WITHIN A FARMSTEAD TO THE SOUTH, ALONG BERRY AVENUE.

Ecological: NEST TREE IS A LARGE VALLEY OAK; SURROUNDING FORAGING HABITAT CONSISTS OF AGRICULTURAL FIELDS PLANTED IN ROW CROPS TO THE SE AND SW, FALLOW FIELDS TO THE NE, AND ROADWAY/COMMERCIAL TO THE NW.

Threat:

General: NEST AND 2 ADULTS OBSERVED ON 26 MAR 1996. 2000: NEST CONTAINING 2 DOWNY YOUNG OBSERVED ON 9 JUN. 2002: NESTING SUSPECTED ON 20 APR; NEST WITH 1 FEATHERED CHICK OBSERVED ON 27 JUN; 2 JUV PERCHED IN NEST TREE ON 17 JUL.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G5	CDFG Status:
State: Threatened	State: S2	

Habitat Associations
General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH
Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 687	Map Index: 36010	EO Index: 31008	Dates Last Seen
Occ Rank: Unknown			Element: 1997-05-08
Origin: Natural/Native occurrence			Site: 1997-05-08
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 1997-07-07

Quad Summary: Ripon (3712162/443B)

County Summary: San Joaquin

Lat/Long: 37.71988° / -121.21556°	Township: 02S
UTM: Zone-10 N4176234 E657269	Range: 07E
Mapping Precision: NON-SPECIFIC	Section: 32 Qtr: NE
Symbol Type: POINT	Meridian: M
Radius: 1/10 mile	Elevation: 35 ft

Location: WEST SIDE OF MANTECA ROAD, JUST SOUTH OF THE INTERSECTION OF MANTECA ROAD AND MELTON ROAD, 4 MILES WSW OF RIPON.

Location Detail: LOCATED IN A LONE WILLOW IN A MAN-MADE CANAL, 150 METERS SOUTH OF MELTON ROAD.

Ecological: NEST TREE IS A LONE WILLOW ALONG A CANAL, STANDING 15-20 FEET ABOVE THE LEVEE; SURROUNDED BY HAY FIELDS.

Threat: POSSIBLE THREAT OF DISTURBANCE FROM CANAL MAINTENANCE ACTIVITIES AND ADJACENT HAY-BALING. ACTIVITIES.

General: ONE ADULT OBSERVED AT NEST ON 8 MAY 1997.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 688

Map Index: 36025

EO Index: 31023

_____ **Dates Last Seen** _____

Occ Rank: Good

Element: 1997-06-19

Origin: Natural/Native occurrence

Site: 1997-06-19

Presence: Presumed Extant

Record Last Updated: 1997-07-08

Trend: Unknown

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.69482° / -121.26836°

Township: 03S

UTM: Zone-10 N4173366 E652667

Range: 06E

Mapping Precision: SPECIFIC

Section: 12 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 20 ft

Location: JUST EAST OF SAN JOAQUIN RIVER, ON THE NW EDGE OF DURHAM FERRY STATE RECREATION AREA.

Location Detail:

Ecological: HABITAT CONSISTS OF RIPARIAN ADJACENT TO A SLOUGH; VEGETATED BY VALLEY OAK, COTTONWOOD, AND WILLOW. SURROUNDING AREA CONSISTS OF PARK LAND TO THE SOUTH AND AGRICULTURAL TO THE NORTH, EAST, AND WEST.

Threat:

General: 2 ADULTS (1 LIGHT MORPH, 1 DARK MORPH) OBSERVED PERCHED IN A COTTONWOOD NEAR THE NEST.

Owner/Manager: SJQ COUNTY

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 689

Map Index: 36026

EO Index: 31024

_____ **Dates Last Seen** _____

Occ Rank: Good

Element: 1997-06-19

Origin: Natural/Native occurrence

Site: 1997-06-19

Presence: Presumed Extant

Record Last Updated: 1997-07-08

Trend: Unknown

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.69368° / -121.26373°

Township: 03S

UTM: Zone-10 N4173247 E653077

Range: 06E

Mapping Precision: SPECIFIC

Section: 12 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 20 ft

Location: 0.5 MILE EAST OF SAN JOAQUIN RIVER, 0.1 MILE NORTH OF DURHAM FERRY STATE RECREATION AREA.

Location Detail:

Ecological: HABITAT CONSISTS OF RIPARIAN ADJACENT TO A SLOUGH, DOMINATED BY VALLEY OAK, COTTONWOOD, AND WILLOW. SURROUNDING AREA CONSISTS OF PARK LAND TO THE SOUTH AND AGRICULTURAL LAND TO THE NORTH, EAST, AND WEST.

Threat:

General: 1 (LIGHT MORPH) ADULT OBSERVED ON NEST.

Owner/Manager: SJQ COUNTY

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 697

Map Index: 38803

EO Index: 33810

_____ **Dates Last Seen** _____

Occ Rank: Good

Element: 1998-04-14

Origin: Natural/Native occurrence

Site: 1998-04-14

Presence: Presumed Extant

Record Last Updated: 1998-05-18

Trend: Unknown

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.79613° / -121.26609°

Township: 02S

UTM: Zone-10 N4184611 E652658

Range: 06E

Mapping Precision: NON-SPECIFIC

Section: 01 **Qtr:** NW

Symbol Type: POINT

Meridian: M

Radius: 1/10 mile

Elevation: 25 ft

Location: SOUTH SIDE OF YOSEMITE AVENUE, 0.3 MILE EAST OF MCKINLEY AVENUE, SOUTH OF LATHROP.

Location Detail: NEST IS LOCATED IN A WIND BREAK BETWEEN AN AGRICULTURAL FIELD AND HOUSES.

Ecological: NEST TREE IS A COTTONWOOD; SURROUNDED BY AGRICULTURAL FIELDS (ROW CROPS) AND ASSOCIATED RESIDENCES.

Threat:

General: 2 ADULTS/NEST OBSERVED ON 14 APRIL 1998.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 937

Map Index: 45622

EO Index: 45622

_____ **Dates Last Seen** _____

Occ Rank: Excellent

Element: 2001-06-21

Origin: Natural/Native occurrence

Site: 2001-06-21

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 2002-03-12

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.80628° / -121.32392°

Township: 01S

UTM: Zone-10 N4185644 E647546

Range: 06E

Mapping Precision: SPECIFIC

Section: 33 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 18 ft

Location: SAN JOAQUIN RIVER, AT THE HEAD OF OLD RIVER, SW OF LATHROP

Location Detail: 2000 NEST TREE WAS A COTTONWOOD, LOCATED ON THE NORTH BANK OF OLD RIVER, AT THE ELBOW. 2001 NEST TREE WAS A 35-FT TALL WILLOW.

Ecological: NEST TREE IS A 35-FT TALL WILLOW, WITHIN A GROUP OF 3 TREES; SURROUNDED BY SUBSTANTIAL ALFALFA FIELDS.

Threat: THREATENED BY HUMAN DISTURBANCE (BOATS, CARS, FARM MACHINERY) AND LIVESTOCK.

General: NEST WAS MONITORED THROUGH THE 2000 NESTING SEASON; 2 ADULTS AND 1 JUVENILE OBSERVED ON 14 JUN 2000. 2 ADULTS AND 2 YOUNG OBSERVED ON 21 JUN 2001; YOUNG WERE BANDED.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 944

Map Index: 45715

EO Index: 45715

_____ **Dates Last Seen** _____

Occ Rank: Excellent

Element: 2001-05-16

Origin: Natural/Native occurrence

Site: 2001-05-16

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 2003-07-10

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.81072° / -121.32260°

Township: 01S

UTM: Zone-10 N4186139 E647654

Range: 06E

Mapping Precision: SPECIFIC

Section: 33 **Qtr:** XX

Symbol Type: POLYGON

Meridian: M

Area: 11.3 acres

Elevation: 25 ft

Location: ALONG SAN JOAQUIN RIVER, 0.3 MILE DOWNSTREAM OF THE HEAD OF OLD RIVER, WEST OF LATHROP

Location Detail: 2000 NEST TREE WAS A 40-50' TALL BLACK WALNUT ON THE NORTH BANK. 2001 NEST TREE WAS A COTTONWOOD ON THE SOUTH BANK.

Ecological: NEST TREE IS A COTTONWOOD; SURROUNDED BY MATURE RIPARIAN FOREST AND AGRICULTURE (INCLUDING SUBSTANTIAL ALFALFA).

Threat: THREATENED BY RECREATIONAL USE OF THE AREA (BOATERS & FISHERMEN).

General: 2 ADULTS OBSERVED NESTING DURING 2000, BUT THE NEST FAILED AND THE ADULTS ABANDONED; FEMALE OBSERVED ON THE NEST ON 8 MAY 2000, AND NEST WAS ACTIVE ON 7 JUL 2000. 2 ADULTS OBSERVED NESTING ON 16 MAY 2001, BUT THE NEST LATER FAILED.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 997

Map Index: 47404

EO Index: 47404

_____ **Dates Last Seen** _____

Occ Rank: Good

Element: 2001-05-16

Origin: Natural/Native occurrence

Site: 2001-05-16

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 2002-03-12

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.81945° / -121.34580°

Township: 01S

UTM: Zone-10 N4187072 E645594

Range: 06E

Mapping Precision: SPECIFIC

Section: 30 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 10 ft

Location: EAST SIDE OF OLD RIVER, DOWNSTREAM OF THE HEAD OF OLD RIVER, SOUTH OF STOCKTON

Location Detail: NEST TREE IS LOCATED ON THE LAND SIDE OF THE LEVEE.

Ecological: NEST TREE IS A LARGE OAK, WITHIN A CLUSTER OF OAKS, WILLOWS, AND COTTONWOODS; SURROUNDED BY AGRICULTURAL FIELDS.

Threat: POSSIBLE THREAT OF DISTURBANCE FROM HUMAN RECREATIONAL USE OF AREA (BOATING, FISHING, ETC).

General: PAIR OBSERVED NESTING ON 19 APR 2000. PAIR OBSERVED NESTING ON 16 MAY 2001; FEMALE ON NEST.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1109

Map Index: 50998

EO Index: 50998

_____ **Dates Last Seen** _____

Occ Rank: Excellent

Element: 1999-07-06

Origin: Natural/Native occurrence

Site: 1999-07-06

Presence: Presumed Extant

Record Last Updated: 2003-04-16

Trend: Unknown

Quad Summary: Union Island (3712174/462C), Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.79152° / -121.37565°

Township: 02S

UTM: Zone-10 N4183926 E643021

Range: 05E

Mapping Precision: SPECIFIC

Section: 01 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 10 ft

Location: WEST SIDE OF PARADISE ROAD, 0.3 MILE SOUTH OF DELTA AVENUE, NE OF TRACY

Location Detail:

Ecological: NEST TREE IS A LONE COTTONWOOD NEXT TO SOME HOUSES; SURROUNDING FORAGING HABITAT CONSISTS OF ALFALFA.

Threat:

General: NEST SITE ACTIVE IN 1997 AND 1998. 2 ADULTS AND 2 JUVENILES OBSERVED AT THE NEST SITE ON 6 JUL 1999.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1110

Map Index: 51000

EO Index: 51000

_____ **Dates Last Seen** _____

Occ Rank: Excellent

Element: 2000-04-19

Origin: Natural/Native occurrence

Site: 2000-04-19

Presence: Presumed Extant

Record Last Updated: 2003-04-16

Trend: Unknown

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.81382° / -121.33465°

Township: 01S

UTM: Zone-10 N4186464 E646587

Range: 06E

Mapping Precision: SPECIFIC

Section: 29 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 10 ft

Location: EAST SIDE OF OLD RIVER, 0.75 MILE UPSTREAM FROM THE SAN JOAQUIN RIVER CONFLUENCE, NORTH OF TRACY

Location Detail:

Ecological: NEST TREE IS AN OAK WITHIN REMNANT RIPARIAN ON A DISTURBED LEVEE SLOPE; SURROUNDING FORAGING HABITAT CONSISTS OF AGRICULTURE.

Threat:

General: NEST SITE ACTIVE IN 1998 AND 1999. 2 ADULTS OBSERVED AT THE NEST SITE ON 19 APR 2000.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1111

Map Index: 51001

EO Index: 51001

_____ **Dates Last Seen** _____

Occ Rank: Excellent

Element: 2000-05-03

Origin: Natural/Native occurrence

Site: 2000-05-03

Presence: Presumed Extant

Record Last Updated: 2003-04-16

Trend: Unknown

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.82062° / -121.31955°

Township: 01S

UTM: Zone-10 N4187243 E647903

Range: 06E

Mapping Precision: SPECIFIC

Section: 28 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 10 ft

Location: EAST SIDE OF SAN JOAQUIN RIVER, 0.25 MILE EAST OF THE SOUTH END OF UNDINE ROAD, NE OF TRACY

Location Detail:

Ecological: NEST TREE IS A LARGE OAK WITHIN WITHIN A LINE OF OAKS, JUST OFF THE LEVEE; SURROUNDING FORAGING HABITAT CONSISTS OF AGRICULTURE (MAINLY ROW CROPS AND ALFALFA).

Threat:

General: NEST SITE ACTIVE IN 1998 AND 1999. 2 ADULTS OBSERVED AT THE NEST SITE ON 3 MAY 2000.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G5	CDFG Status:
State: Threatened	State: S2	

Habitat Associations

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1112

Map Index: 51002

EO Index: 51002

Dates Last Seen

Occ Rank: Excellent

Element: 2001-04-16

Origin: Natural/Native occurrence

Site: 2001-04-16

Presence: Presumed Extant

Record Last Updated: 2003-04-16

Trend: Unknown

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.80762° / -121.35015°

Township: 01S

UTM: Zone-10 N4185752 E645234

Range: 06E

Mapping Precision: SPECIFIC

Section: 31 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 10 ft

Location: STEWART ROAD, 0.4 MILE EAST OF PARADISE ROAD, NE OF TRACY

Location Detail:

Ecological: NEST TREE IS ONE OF TWO ROADSIDE OAKS; SURROUNDING FORAGING HABITAT CONSISTS OF ALFALFA.

Threat:

General: 2 ADULTS OBSERVED DURING NEST-BUILDING ON 16 APR 2001.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1113

Map Index: 51003

EO Index: 51003

_____ **Dates Last Seen** _____

Occ Rank: Good

Element: 2001-04-27

Origin: Natural/Native occurrence

Site: 2001-04-27

Presence: Presumed Extant

Record Last Updated: 2003-04-16

Trend: Unknown

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.86532° / -121.31645°

Township: 01S

UTM: Zone-10 N4192207 E648086

Range: 06E

Mapping Precision: SPECIFIC

Section: 09 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 10 ft

Location: NORTH SIDE OF BOWMAN ROAD, 0.4 MILE EAST OF BOWMAN BRIDGE OVER THE SAN JOAQUIN RIVER, SOUTH OF STOCKTON

Location Detail:

Ecological: NEST TREE IS SURROUNDED BY RURAL AGRICULTURE WITH A FEW HOUSES, BUT GOOD FORAGE CROPS.

Threat: THREATENED BY URBAN ENCROACHMENT.

General: 2 ADULTS OBSERVED NESTING ON 27 APR 2001.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1114

Map Index: 51005

EO Index: 51005

_____ **Dates Last Seen** _____

Occ Rank: Good

Element: 2001-05-12

Origin: Natural/Native occurrence

Site: 2001-05-12

Presence: Presumed Extant

Record Last Updated: 2003-04-17

Trend: Unknown

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.83343° / -121.36235°

Township: 01S

UTM: Zone-10 N4188597 E644110

Range: 06E

Mapping Precision: SPECIFIC

Section: 19 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation:

Location: SOUTH SIDE OF UNDINE ROAD, 1.3 MILES WEST OF ROBERTS ROAD, NW OF TRACY

Location Detail: NEST TREE LOCATED NEXT TO A FARM HOUSE.

Ecological: NEST TREE IS A COTTONWOOD; SURROUNDING FORAGING HABITAT CONSISTS OF VINEYARDS, ORCHARDS, AND SOME GOOD FORAGE CROPS.

Threat:

General: ACTIVE NEST IN 2000. 2 ADULTS OBSERVED NESTING ON 12 MAY 2001.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1190

Map Index: 51170

EO Index: 51170

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2000-06-15

Origin: Natural/Native occurrence

Site: 2000-06-15

Presence: Presumed Extant

Record Last Updated: 2003-04-30

Trend: Unknown

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.83943° / -121.31726°

Township: 01S

UTM: Zone-10 N4189334 E648066

Range: 06E

Mapping Precision: SPECIFIC

Section: 21 **Qtr:** NE

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 10 ft

Location: SAN JOAQUIN RIVER, AT RIVER MILE 50(L), 5 MILES NW OF MANTECA

Location Detail:

Ecological: NEST TREE IS A 70' TALL COTTONWOOD

Threat:

General: ADULT(S) OBSERVED AT THE NEST ON 15 JUN 2000.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1193

Map Index: 51179

EO Index: 51179

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2000-06-06

Origin: Natural/Native occurrence

Site: 2000-06-06

Presence: Presumed Extant

Record Last Updated: 2003-05-01

Trend: Unknown

Quad Summary: Ripon (3712162/443B)

County Summary: San Joaquin

Lat/Long: 37.69276° / -121.24450°

Township: 03S

UTM: Zone-10 N4173177 E654775

Range: 07E

Mapping Precision: SPECIFIC

Section: 07 **Qtr:** NW

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 30 ft

Location: ALONG AIRPORT WAY, 0.45 MILE NE OF THE INTERSECTION WITH DIVISION ROAD, EAST OF DURHAM FERRY STATE RECREATION AREA

Location Detail:

Ecological: NEST TREE IS A 25' TALL VALLEY OAK; SURROUNDING FORAGING HABITAT CONSISTS OF ROW CROPS IN ALL DIRECTIONS.

Threat: POSSIBLY THREATENED BY ROAD CONSTRUCTION/MAINTENANCE.

General: ADULTS OBSERVED NEST-BUILDING ON 6 JUN 2000.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1198

Map Index: 51190

EO Index: 51190

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2000-06-20

Origin: Natural/Native occurrence

Site: 2000-06-20

Presence: Presumed Extant

Record Last Updated: 2003-05-01

Trend: Unknown

Quad Summary: Union Island (3712174/462C), Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.85878° / -121.37668°

Township: 01S

UTM: Zone-10 N4191388 E642800

Range: 05E

Mapping Precision: SPECIFIC

Section: 12 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 5 ft

Location: WEST SIDE OF MIDDLE RIVER, 1.3 MILES SSE OF THE INTERSECTION OF HOWARD ROAD AND WING LEVEE ROAD, 7 MILES NORTH OF TRACY

Location Detail:

Ecological: NEST TREE IS A 30' TALL VALLEY OAK; SURROUNDED BY RIPARIAN TO THE SE AND SW, AND BY ROW CROPS TO THE NE AND NW.

Threat:

General: ADULTS OBSERVED FEEDING 2 PARTIALLY-FEATHERED YOUNG IN THE NEST ON 20 JUN 2000.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1221

Map Index: 51733

EO Index: 51733

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2003-05-01

Origin: Natural/Native occurrence

Site: 2003-05-01

Presence: Presumed Extant

Record Last Updated: 2006-11-16

Trend: Unknown

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.80259° / -121.31233°

Township: 01S

UTM: Zone-10 N4185254 E648573

Range: 06E

Mapping Precision: SPECIFIC

Section: 33 **Qtr:** XX

Symbol Type: POLYGON

Meridian: M

Area: 17.0 acres

Elevation: 15 ft

Location: EAST BANK OF OLD RIVER, 1.2 MILES SW OF THE INTERSECTION OF LOUISE AVENUE AND I-5, SW OF LATHROP

Location Detail: NEST TREE WAS A 25' WILLOW IN 2000; NEST TREE WAS A 45' COTTONWOOD IN 2003.

Ecological: NEST TREE WAS A COTTONWOOD; SURROUNDED BY RIPARIAN TO THE SE, AND ROW CROPS TO THE NE, NW, AND SW.

Threat:

General: NEST WITH 2 FEATHERED YOUNG OBSERVED ON 7 JUL 2000. 1 ADULT OBSERVED SITTING IN THE NEST ON 1 MAY 2003.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1486

Map Index: 62633

EO Index: 62670

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2002-06-24

Origin: Natural/Native occurrence

Site: 2002-06-24

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 2005-09-21

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.67561° / -121.15039°

Township: 03S

UTM: Zone-10 N4171434 E663110

Range: 07E

Mapping Precision: SPECIFIC

Section: 13 **Qtr:** NW

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 45 ft

Location: 0.6 MILE SE OF THE INTERSECTION OF BECKWITH ROAD AND GATES ROAD, 4 MILES SSW OF RIPON

Location Detail: NEST TREE LOCATED ALONG LATERAL NO. 7.

Ecological: NEST TREE WAS A WILLOW; SURROUNDED BY ROW CROPS IN ALL DIRECTIONS.

Threat:

General: 2 ADULTS OBSERVED SITTING IN NEST TREE ON 21 JUN 2002; ON 24 JUN 2002, ADULTS OBSERVED FLYING TO AND FROM NEST TREE AND SITTING IN THE NEST.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1587

Map Index: 63290

EO Index: 63382

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2002-07-18

Origin: Natural/Native occurrence

Site: 2002-07-18

Presence: Presumed Extant

Record Last Updated: 2005-12-01

Trend: Unknown

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.86883° / -121.27610°

Township: 01S

UTM: Zone-10 N4192662 E651627

Range: 06E

Mapping Precision: SPECIFIC

Section: 11 **Qtr:** NE

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 22 ft

Location: BETWEEN SOUTH HARLAN ROAD AND SOUTH MCKINLEY ROAD, 1 MILE SOUTH OF FRENCH CAMP, SW OF STOCKTON AIRPORT

Location Detail: NEST TREE LOCATED NEXT TO HOUSE, ON THE WEST SIDE OF THE RAILROAD TRACKS AND EAST OF I-5.

Ecological: NEST TREE WAS A LARGE WILLOW; SURROUNDED BY GRASSLANDS TO THE NE AND SW, RESIDENTIAL/URBAN TO THE SE, AND COMMERCIAL/HIGHWAY TO THE NW

Threat:

General: NEST AND COPULATING ADULTS OBSERVED ON 19 APR; 1 ADULT IN NEST ON 24 MAY, BUT NO YOUNG VISIBLE; 2 CHICKS OBSERVED IN THE NEST ON 9 JUN; 2 JUVENILES AND 1 ADULT OBSERVED ON 18 JUL 2002.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1607

Map Index: 63869

EO Index: 63964

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2002-06-10

Origin: Natural/Native occurrence

Site: 2002-06-10

Presence: Presumed Extant

Record Last Updated: 2006-02-02

Trend: Unknown

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.76484° / -121.33187°

Township: 02S

UTM: Zone-10 N4181034 E646928

Range: 06E

Mapping Precision: SPECIFIC

Section: 17 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 15 ft

Location: NORTH SIDE OF TOM PAINE SLOUGH, JUST SOUTH OF THE JUNCTION OF I-5 AND I-205, SW OF MANTECA

Location Detail:

Ecological: NEST TREE WAS A COTTONWOOD; SURROUNDED BY GRASSLAND TO THE NE, SE, AND SW, AND ROW CROPS TO THE NW.

Threat:

General: 1 ADULT OBSERVED AT THE NEST ON 30 MAY; 1 DOWNY CHICK OBSERVED IN THE NEST WITH 1 ADULT AT THE NEST EDGE ON 10 JUN 2002.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1608

Map Index: 63875

EO Index: 63970

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2003-05-01

Origin: Natural/Native occurrence

Site: 2003-05-01

Presence: Presumed Extant

Record Last Updated: 2006-11-16

Trend: Unknown

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.79298° / -121.30698°

Township: 02S

UTM: Zone-10 N4184196 E649064

Range: 06E

Mapping Precision: SPECIFIC

Section: 03 **Qtr:** XX

Symbol Type: POLYGON

Meridian: M

Area: 13.0 acres

Elevation: 17 ft

Location: ALONG THE SAN JOAQUIN RIVER, 0.4 MILE NORTH OF THE I-5 CROSSING OF THE SAN JOAQUIN RIVER, 4 MILES WEST OF MANTECA

Location Detail: NEST TREE (VALLEY OAK) ON THE EAST BANK USED IN 2002; NEST TREE (COTTONWOOD) ON THE WEST BANK USED IN 2003.

Ecological: NEST TREE WAS A COTTONWOOD; SURROUNDED BY RIPARIAN TO THE NE AND SE, AND ROW CROPS TO THE NW AND SW.

Threat:

General: ACTIVE NEST OBSERVED ON 30 MAY; 2 PARTIALLY-FEATHERED CHICKS OBSERVED IN THE NEST ON 10 JUN; ONLY 1 JUVENILE REMAINED IN THE NEST BY 7 JUL 2002. ADULT OBSERVED IN THE NEST ON 1 MAY 2003.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1614

Map Index: 63906

EO Index: 64001

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2002-06-24

Origin: Natural/Native occurrence

Site: 2002-06-24

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 2006-02-07

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.64148° / -121.20944°

Township: 03S

UTM: Zone-10 N4167545 E657975

Range: 07E

Mapping Precision: SPECIFIC

Section: 28 **Qtr:** SW

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 30 ft

Location: 0.25 MILE NORTH OF HIGHWAY 132, NORTH OF THE SAN JOAQUIN RIVER, 8 MILES SW OF RIPON

Location Detail:

Ecological: NEST TREE WAS A VALLEY OAK; SURROUNDED BY RIPARIAN TO THE SE AND SW, AND PASTURELAND TO THE NE AND NW.

Threat:

General: 4 FEATHERED YOUNG AND 1 ADULT OBSERVED AT THE NEST ON 24 JUN 2002.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1615

Map Index: 63907

EO Index: 64002

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2002-06-24

Origin: Natural/Native occurrence

Site: 2002-06-24

Presence: Presumed Extant

Record Last Updated: 2006-02-07

Trend: Unknown

Quad Summary: Salida (3712161/443A), Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.68218° / -121.12632°

Township: 03S

UTM: Zone-10 N4172204 E665218

Range: 08E

Mapping Precision: SPECIFIC

Section: 07 **Qtr:** SE

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 30 ft

Location: NORTH SIDE OF BECKWITH ROAD, 0.2 MILE WEST OF HART ROAD, 3 MILES SW OF SALIDA

Location Detail:

Ecological: NEST TREE WAS A SYCAMORE; SURROUNDED BY ROW CROPS TO THE NE AND NW, AND ORCHARDS/VINEYARDS TO THE SW, AND SE.

Threat:

General: 1 LARGE, FEATHERED CHICK AND 2 ADULTS OBSERVED IN THE NEST TREE ON 24 JUN 2002.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1623

Map Index: 64668

EO Index: 64747

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2002-06-23

Origin: Natural/Native occurrence

Site: 2002-07-17

Presence: Presumed Extant

Record Last Updated: 2006-05-11

Trend: Unknown

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.76445° / -121.36142°

Township: 02S

UTM: Zone-10 N4180945 E644326

Range: 06E

Mapping Precision: SPECIFIC

Section: 18 **Qtr:** NW

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 32 ft

Location: SOUTH SIDE OF I-205, 0.1 MILE WEST OF WHERE CALIFORNIA AVENUE CROSSES I-205, 3 MILES NE OF TRACY.

Location Detail:

Ecological: NEST TREE WAS A EUCALYPTUS; SURROUNDED BY FALLOW FIELDS TO THE NE, ROW CROPS TO THE SE AND SW, AND ROADWAYS/COMMERCIAL TO THE NW.

Threat:

General: ADULTS OBSERVED SOARING AND LANDING ON 20 APR; 2 DOWNY HEADS VISIBLE IN NEST ON 3 JUN; 1 ADULT AND 1 JUVENILE OBSERVED AT NEST ON 27 JUN; NO HAWKS PRESENT ON 17 JUL 2002.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1624

Map Index: 64669

EO Index: 64748

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2002-07-17

Origin: Natural/Native occurrence

Site: 2002-07-17

Presence: Presumed Extant

Record Last Updated: 2006-05-11

Trend: Unknown

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.73910° / -121.35694°

Township: 02S

UTM: Zone-10 N4178139 E644770

Range: 06E

Mapping Precision: SPECIFIC

Section: 30 **Qtr:** NW

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 35 ft

Location: 1 MILE SW OF THE INTERSECTION OF KASSON ROAD AND I-5, EAST OF TRACY.

Location Detail:

Ecological: NEST TREE WAS A LARGE VALLEY OAK IN THE MIDDLE OF A FIELD; SURROUNDED BY ROW CROPS IN ALL DIRECTIONS.

Threat:

General: 2 ADULTS OBSERVED IN THE NEST TREE (1 ON NEST) ON 3 JUN; 2 CHICKS PERCHED IN THE FIELD ON 27 JUN, 1 FLEW TO NEST; 1 ADULT AND 1 JUVENILE OBSERVED ON 17 JUL 2002.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1625

Map Index: 64670

EO Index: 64749

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2002-07-15

Origin: Natural/Native occurrence

Site: 2002-07-15

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 2006-05-11

Quad Summary: Ripon (3712162/443B), Salida (3712161/443A)

County Summary: San Joaquin, Stanislaus

Lat/Long: 37.72252° / -121.12598°

Township: 02S

UTM: Zone-10 N4176681 E665158

Range: 08E

Mapping Precision: SPECIFIC

Section: 31 **Qtr:** NE

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 45 ft

Location: SOUTH SIDE OF STANISLAUS RIVER, JUST EAST OF THE NORTH END OF HALL ROAD, SOUTH OF RIPON.

Location Detail:

Ecological: NEST TREE WAS A COTTONWOOD; SURROUNDED BY RIPARIAN TO THE NE AND NW, AND ORCHARDS/VINEYARDS TO THE SE AND SW.

Threat: POSSIBLE THREAT FROM A CHEMICAL CONTAMINATION SITE ON THE NORTH SIDE OF THE RIVER.

General: 2 ADULTS OBSERVED FIGHTING WITH A RTHA OVER THE NEST TREE ON 19 APR; ADULT PRESENT, BUT UNABLE TO SEE INTO NEST ON 16 JUN; 2 ADULTS AND 1 LARGE JUVENILE PRESENT ON 15 JUL 2002.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1631

Map Index: 64689

EO Index: 64768

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2002-07-18

Origin: Natural/Native occurrence

Site: 2002-07-18

Presence: Presumed Extant

Record Last Updated: 2006-05-16

Trend: Unknown

Quad Summary: Manteca (3712172/461C)

County Summary: San Joaquin

Lat/Long: 37.85564° / -121.18569°

Township: 01S

UTM: Zone-10 N4191350 E659609

Range: 07E

Mapping Precision: SPECIFIC

Section: 10 **Qtr:** SE

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 40 ft

Location: ALONG AUSTIN ROAD, ON THE SOUTH SIDE OF THE AUSTIN CREEK CROSSING, ~8 MILES SE OF

Location Detail:

Ecological: NEST TREE WAS A VALLEY OAK; SURROUNDED BY ROW CROPS TO THE NE AND SE, ORCHARD/VINEYARD TO THE NW, AND FALLOW LAND TO THE SW.

Threat:

General: NEST SITE ACTIVE ON 6 JUN 2002, WHEN 1 ADULT WAS INCUBATING, AND 18 JUL 2002, WHEN 2 FEATHERED JUVENILES WERE OBSERVED IN THE NEST.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1647

Map Index: 65497

EO Index: 65576

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2002-07-23

Origin: Natural/Native occurrence

Site: 2002-07-23

Presence: Presumed Extant

Record Last Updated: 2006-07-31

Trend: Unknown

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.72869° / -121.35522°

Township: 02S

UTM: Zone-10 N4176986 E644941

Range: 06E

Mapping Precision: SPECIFIC

Section: 30 **Qtr:** SW

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 50 ft

Location: 1.5 MILES SSW OF THE INTERSECTION OF I-5 AND KASSON ROAD, 2 MILES SSE OF BANTA.

Location Detail:

Ecological: NEST TREE WAS A VALLEY OAK.; SURROUNDED BY ROW CROPS IN ALL DIRECTIONS.

Threat:

General: SUSPECT NEST FIRST DETECTED ON 20 APR; NESTING ACTIVITY PRESENT ON 3 JUN, 27 JUN, AND 17 JUL 2002, BUT NO CHICKS EVER SEEN.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1655

Map Index: 65612

EO Index: 65691

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2003-06-13

Origin: Natural/Native occurrence

Site: 2003-06-13

Presence: Presumed Extant

Record Last Updated: 2006-08-03

Trend: Unknown

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.79900° / -121.27834°

Township: 01S

UTM: Zone-10 N4184910 E651574

Range: 06E

Mapping Precision: SPECIFIC

Section: 35 **Qtr:** SE

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 20 ft

Location: ALONG HOWLAND ROAD, 0.5 MILE WNW OF THE INTERSECTION OF MCKINLEY AVENUE AND YOSEMITE AVENUE, SOUTH LATHROP.

Location Detail:

Ecological: NEST TREE WAS A COTTONWOOD; SURROUNDED BY FALLOW AG FIELDS TO THE NW AND ROW CROPS TO THE NE, SE, AND SW.

Threat:

General: ADULTS OBSERVED BRINGING PREY ITEMS TO THE NEST ON 3 OCCASIONS ON 12-13 JUN 2003, BUT NO CHICKS WERE SEEN; NEST IS NOT VISIBLE.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1666

Map Index: 67094

EO Index: 67243

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2003-06-30

Origin: Natural/Native occurrence

Site: 2003-06-30

Presence: Presumed Extant

Record Last Updated: 2006-11-16

Trend: Unknown

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.63747° / -121.31530°

Township: 03S

UTM: Zone-10 N4166928 E648642

Range: 06E

Mapping Precision: SPECIFIC

Section: 33 **Qtr:** NW

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 135 ft

Location: SOUTH SIDE OF HIGHWAY 132, 0.5 MILE EAST OF KOSTER ROAD, 9 MILES SE OF TRACY.

Location Detail:

Ecological: NEST TREE WAS AN EXOTIC (POPLAR?); SURROUNDED BY ORCHARDS/VINEYARDS TO THE SE AND SW, AND ROW CROPS TO THE NE AND NW.

Threat:

General: NEST DISCOVERED ON 20 JUN 2003; ADULTS OBSERVED COMING AND GOING FROM THE NEST TREE ON 30 JUN 2003.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1667

Map Index: 67095

EO Index: 67244

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2003-07-30

Origin: Natural/Native occurrence

Site: 2003-07-30

Presence: Presumed Extant

Record Last Updated: 2006-11-16

Trend: Unknown

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.64265° / -121.22765°

Township: 03S

UTM: Zone-10 N4167645 E656365

Range: 07E

Mapping Precision: SPECIFIC

Section: 29 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 23 ft

Location: EAST BANK OF THE SAN JOAQUIN RIVER, 0.1 MILE NORTH OF HIGHWAY 132, 12 MILES WEST OF MODESTO.

Location Detail:

Ecological: NEST TREE WAS A WILLOW; SURROUNDED BY RIPARIAN TO THE NE AND SE, AND ROW CROPS TO THE NW AND SW.

Threat:

General: THIS PAIR WAS OBSERVED ON MANY PREVIOUS OCCASIONS, BUT NO NEST WAS VISIBLE; FLEDGLING AND 1 ADULT OBSERVED ON 30 JUL 2003.

Owner/Manager: USFWS-SAN JOAQUIN NWR

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1668

Map Index: 67096

EO Index: 67246

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2003-05-01

Origin: Natural/Native occurrence

Site: 2003-05-01

Presence: Presumed Extant

Record Last Updated: 2006-11-16

Trend: Unknown

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.76768° / -121.29212°

Township: 02S

UTM: Zone-10 N4181412 E650424

Range: 06E

Mapping Precision: SPECIFIC

Section: 15 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 12 ft

Location: EAST BANK OF WALTHALL SLOUGH, 4.5 MILES SW OF MANTECA.

Location Detail:

Ecological: NEST TREE WAS A WILLOW; SURROUNDED RIPARIAN TO THE NW AND SW, ROW CROPS TO THE SE, AND RESIDENTIAL TO THE NE.

Threat:

General: 2 ADULTS OBSERVED DIVING ON ONE ANOTHER, WHILE A THIRD ADULT WAS SITTING IN THE NEST ON 1 MAY 2003.

Owner/Manager: UNKNOWN

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1675

Map Index: 67155

EO Index: 67308

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2003-07-11

Origin: Natural/Native occurrence

Site: 2003-07-11

Presence: Presumed Extant

Record Last Updated: 2006-12-04

Trend: Unknown

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.63931° / -121.22137°

Township: 03S

UTM: Zone-10 N4167285 E656926

Range: 07E

Mapping Precision: SPECIFIC

Section: 29 **Qtr:** SE

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 30 ft

Location: NORTH OF SAN JOAQUIN RIVER, 0.4 MILE EAST OF THE HIGHWAY 132 BRIDGE OVER THE SAN JOAQUIN RIVER, 8.5 MILES SW OF SALIDA.

Location Detail:

Ecological: NEST TREE WAS A 40' VALLEY OAK; SURROUNDED BY RIPARIAN IN ALL DIRECTIONS.

Threat:

General: ACTIVE SWHA NEST SITE, WITH 2 ADULTS DEFENDING, OBSERVED ON 11 APR; 2 ADULTS OBSERVED COPULATING IN NEST TREE; NO CHICKS EVER OBSERVED, BUT THE SAME PAIR WAS PRESENT DURING SEVERAL VISITS DURING 2003.

Owner/Manager: USFWS-SAN JOAQUIN NWR

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G5	CDFG Status:
State: Threatened	State: S2	

Habitat Associations
General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH
Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1682	Map Index: 69179	EO Index: 69957	— Dates Last Seen —
Occ Rank: Good			Element: 2004-05-11
Origin: Natural/Native occurrence			Site: 2004-05-11
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 2007-05-07

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.82749° / -121.31093°	Township: 01S
UTM: Zone-10 N4188018 E648647	Range: 06E
Mapping Precision: SPECIFIC	Section: 21 Qtr: XX
Symbol Type: POINT	Meridian: M
Radius: 80 meters	Elevation: 12 ft

Location: 0.2 MILE SOUTH OF THE END OF DOS REIS ROAD, ON THE WEST SIDE OF THE SAN JOAQUIN RIVER, WEST OF LATHROP.

Location Detail: A SECOND ACTIVE NEST WAS LOCATED ~0.2 MILE NORTH OF THIS NEST SITE.

Ecological: NEST TREE IS A LARGE VALLEY OAK; SURROUNDING HABITAT CONSISTS OF A NARROW RIPARIAN CORRIDOR ALONG THE WEST SIDE OF THE SAN JOAQUIN RIVER. SITE IS SURROUNDED BY AGRICULTURAL LANDS ON THE WEST SIDE AND RESIDENTIAL DEVELOPMENT TO THE EAST.

Threat:

General: 2 ADULTS OBSERVED NESTING ON 11 MAY 2004.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1683

Map Index: 69184

EO Index: 69962

_____ **Dates Last Seen** _____

Occ Rank: Good

Element: 2004-05-11

Origin: Natural/Native occurrence

Site: 2004-05-11

Presence: Presumed Extant

Record Last Updated: 2007-05-07

Trend: Unknown

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.82946° / -121.31177°

Township: 01S

UTM: Zone-10 N4188237 E648569

Range: 06E

Mapping Precision: SPECIFIC

Section: 21 **Qtr:** SE

Symbol Type: POINT

Meridian: M

Radius: 80 meters

Elevation: 9 ft

Location: JUST SW OF THE END OF DOS REIS ROAD, WEST SIDE OF THE SAN JOAQUIN RIVER, WEST OF LATHROP

Location Detail: A SECOND ACTIVE NEST WAS LOCATED ~0.2 MILE SOUTH OF THIS NEST SITE.

Ecological: NEST TREE IS A LARGE VALLEY OAK; SURROUNDING HABITAT CONSISTS OF A NARROW RIPARIAN CORRIDOR ALONG THE WEST SIDE OF THE SAN JOAQUIN RIVER. SITE IS SURROUNDED BY AGRICULTURAL LANDS ON THE WEST SIDE AND RESIDENTIAL DEVELOPMENT TO THE EAST.

Threat:

General: 2 ADULTS OBSERVED NESTING ON 11 MAY 2004.

Owner/Manager: PVT

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: Threatened

State: S2

_____ **Habitat Associations** _____

General: BREEDS IN GRASSLANDS WITH WITH SCATTERED TREES, JUNIPER-SAGE FLATS, RIPARIAN AREAS, SAVANNAHS, & AGRICULTURAL OR RANCH

Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 1694

Map Index: 69988

EO Index: 70828

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2006-04-14

Origin: Natural/Native occurrence

Site: 2006-04-14

Presence: Presumed Extant

Record Last Updated: 2007-09-20

Trend: Unknown

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.63833° / -121.32527°

Township: 03S

UTM: Zone-10 N4167007 E647761

Range: 06E

Mapping Precision: NON-SPECIFIC

Section: 29 **Qtr:** SE

Symbol Type: POINT

Meridian: M

Radius: 1/10 mile

Elevation: 152 ft

Location: NORTH OF HIGHWAY 132, NEAR THE INTERSECTION OF VERNALIS ROAD AND KOSTER ROAD, ~9 MILES SE OF TRACY.

Location Detail:

Ecological: NEST TREE IS AN OLD WALNUT.

Threat:

General: 2 ADULTS OBSERVED NESTING.

Owner/Manager: UNKNOWN

Cirsium crassicaule

slough thistle

Element Code: PDAST2E0U0

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G2

CNPS List: 1B.1

State: None

State: S2.2

_____ **Habitat Associations** _____

General: CHENOPOD SCRUB, MARSHES AND SWAMPS, RIPARIAN SCRUB.

Micro: SLOUGHS, RIVERBANKS, AND MARSHY AREAS. 3-100M.

Occurrence No. 1

Map Index: 11657

EO Index: 17117

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 1974-07-26

Origin: Natural/Native occurrence

Site: 1974-07-26

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 1989-08-11

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.69631° / -121.27050°

Township: 03S

UTM: Zone-10 N4173528 E652475

Range: 06E

Mapping Precision: NON-SPECIFIC

Section: 2 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 1/5 mile

Elevation: 35 ft

Location: APPROX 1 MI N OF SAN JOAQUIN RIVER CLUB ON SAN JOAQUIN RIV.

Location Detail:

Ecological:

Threat: IN AREAS OF INTENSIVE AGRICULTURE. SITE IS ON PUBLIC LAND AND IS THREATENED.

General:

Owner/Manager: UNKNOWN

Cirsium crassicaule

slough thistle

Element Code: PDAST2E0U0

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G2

CNPS List: 1B.1

State: None

State: S2.2

_____ **Habitat Associations** _____

General: CHENOPOD SCRUB, MARSHES AND SWAMPS, RIPARIAN SCRUB.

Micro: SLOUGHS, RIVERBANKS, AND MARSHY AREAS. 3-100M.

Occurrence No. 2

Map Index: 24860

EO Index: 6754

_____ **Dates Last Seen** _____

Occ Rank: None

Element: 1933-07-20

Origin: Natural/Native occurrence

Site: 1974-07-18

Presence: Possibly Extirpated

Trend: Unknown

Record Last Updated: 1996-09-30

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.81005° / -121.31942°

Township: 01S

UTM: Zone-10 N4186070 E647935

Range: 06E

Mapping Precision: NON-SPECIFIC

Section: 33

Qtr: XX

Symbol Type: POINT

Meridian: M

Radius: 1 mile

Elevation: 10 ft

Location: 2 MILES NORTHEAST OF LATHROP BRIDGE ALONG SAN JOAQUIN RIVER.

Location Detail: MAPPED NEAR SAN JOAQUIN RIVER-OLD RIVER CONFLUENCE.

Ecological: IN SHALLOW WATER OF CANAL.

Threat: AREA OF INTENSIVE AGRICULTURE WITH MODIFIED CANALS.

General: SPECIES LAST SEEN IN THIS AREA IN 1933. SEARCHED FOR IN 1974 BUT NOT FOUND.

Owner/Manager: UNKNOWN

Coccyzus americanus occidentalis

western yellow-billed cuckoo

Element Code: ABNRB02022

Status	NDDB Element Ranks	Other Lists
Federal: Candidate State: Endangered	Global: G5T3Q State: S1	CDFG Status:

Habitat Associations

General: RIPARIAN FOREST NESTER, ALONG THE BROAD, LOWER FLOOD-BOTTOMS OF LARGER RIVER SYSTEMS.
Micro: NESTS IN RIPARIAN JUNGLES OF WILLOW, OFTEN MIXED WITH COTTONWOODS, W/ LOWER STORY OF BLACKBERRY, NETTLES, OR WILD GRAPE.

Occurrence No. 141	Map Index: 11753	EO Index: 25566	Dates Last Seen
Occ Rank: None			Element: 1973-06-24
Origin: Natural/Native occurrence			Site: 1977-06-30
Presence: Possibly Extirpated			
Trend: Unknown			Record Last Updated: 1989-08-10

Quad Summary: Ripon (3712162/443B), Vernalis (3712163/444A)

County Summary: San Joaquin, Stanislaus

Lat/Long: 37.66538° / -121.23596°	Township: 03S
UTM: Zone-10 N4170153 E655585	Range: 07E
Mapping Precision: NON-SPECIFIC	Section: 19 Qtr: XX
Symbol Type: POINT	Meridian: M
Radius: 1 mile	Elevation: 25 ft

Location: MOUTH OF STANISLAUS RIVER.

Location Detail:

Ecological:

Threat:

General: NUMEROUS CUCKOO OBSERVATIONS FROM 1962-73, REPORTED IN AFN AND AB; 5 INDIVIDUALS OBSERVED IN 1962; ONLY ONE OBSERVED IN 1973.

Owner/Manager: PVT

Desmocerus californicus dimorphus

valley elderberry longhorn beetle

Element Code: IICOL48011

Status	NDDB Element Ranks	Other Lists
Federal: Threatened State: None	Global: G3T2 State: S2	CDFG Status:

Habitat Associations
General: OCCURS ONLY IN THE CENTRAL VALLEY OF CALIFORNIA, IN ASSOCIATION WITH BLUE ELDERBERRY (SAMBUCUS MEXICANA). Micro: PREFERS TO LAY EGGS IN ELDERBERRIES 2-8 INCHES IN DIAMETER; SOME PREFERENCE SHOWN FOR "STRESSED" ELDERBERRIES.

Occurrence No. 45	Map Index: 25495	EO Index: 5621	Dates Last Seen
Occ Rank: Unknown			Element: 1985-10-28
Origin: Natural/Native occurrence			Site: 1985-10-28
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 1994-03-10

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus, San Joaquin

Lat/Long: 37.69475° / -121.19532°	Township: 03S
UTM: Zone-10 N4173480 E659107	Range: 07E
Mapping Precision: SPECIFIC	Section: 10 Qtr: XX
Symbol Type: POLYGON	Meridian: M
Area: 310.6 acres	Elevation: 40 ft

Location: CASWELL MEMORIAL STATE PARK, APPROX. 4 MILES SW OF RIPON.

Location Detail: TWO HOST PLANTS (ELDERBERRY) CONTAINING EMERGENCE HOLES FOUND: ONE LOCATED ADJACENT TO A PARKING LOT NEAR THE PARK ENTRANCE, THE OTHER LOCATED ONE MI DOWNSTREAM.

Ecological:

Threat:

General:

Owner/Manager: DPR-CASWELL MEMORIAL SP

Desmocerus californicus dimorphus

valley elderberry longhorn beetle

Element Code: IICOL48011

_____ Status _____	_____ NDDB Element Ranks _____	_____ Other Lists _____
Federal: Threatened	Global: G3T2	CDFG Status:
State: None	State: S2	

_____ Habitat Associations _____

General: OCCURS ONLY IN THE CENTRAL VALLEY OF CALIFORNIA, IN ASSOCIATION WITH BLUE ELDERBERRY (SAMBUCUS MEXICANA).

Micro: PREFERS TO LAY EGGS IN ELDERBERRRIES 2-8 INCHES IN DIAMETER; SOME PREFERENCE SHOWN FOR "STRESSED" ELDERBERRIES.

Occurrence No. 157

Map Index: 11821

EO Index: 34488

_____ Dates Last Seen _____

Occ Rank: Unknown

Element: 1984-XX-XX

Origin: Natural/Native occurrence

Site: 1984-XX-XX

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 1998-08-20

Quad Summary: Westley (3712152/443C), Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.62631° / -121.19660°

Township: 03S

UTM: Zone-10 N4165883 E659140

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 33 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 1 mile

Elevation: 30 ft

Location: ALONG THE SAN JOAQUIN RIVER, WEST OF MODESTO.

Location Detail:

Ecological:

Threat:

General: EXIT HOLES OBSERVED DURING MAY AND JUNE SURVEYS, NO ADULTS SEEN.

Owner/Manager: USFWS-SAN JOAQUIN NWR

Elderberry Savanna

Element Code: CTT63440CA

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2	
State: None	State: S2.1	
Habitat Associations		
General:		
Micro:		

Occurrence No. 1

Map Index: 11836

EO Index: 28798

— Dates Last Seen —

Occ Rank: Fair

Element: 1985-10-28

Origin: Natural/Native occurrence

Site: 1985-10-28

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 1998-07-23

Quad Summary: Ripon (3712162/443B)

County Summary: San Joaquin, Stanislaus

Lat/Long: 37.69325° / -121.19078°

Township: 03S

UTM: Zone-10 N4173321 E659510

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 10 Qtr: NW

Symbol Type: POINT

Meridian: M

Radius: 1/5 mile

Elevation: 35 ft

Location: CASWELL MEMORIAL STATE PARK.

Location Detail:

Ecological: 15-25 FT TALL SAMBUCUS SHRUBS SPACED 30-50 FT APART, OVER GRASSLAND DOMINATED BY ELYMUS TRITICOIDES AND CAREX ?BARBARAE. ON COLUMBIA CHanneled LOAMS.

Threat: BEING OVERTAKEN BY AILANTHUS ALTISSIMUS.

General: LONGHORN ELDERBERRY EMERGENCE HOLES ON MANY SAMBUCUS SHRUBS. SITE IN FAIR CONDITION, 1985. THIS WAS OCC #001 OF CTT63440CA.

Owner/Manager: DPR-CASWELL MEMORIAL SP

Eremophila alpestris actia

California horned lark

Element Code: ABPAT02011

Status	NDDB Element Ranks	Other Lists
Federal: None State: None	Global: G5T3Q State: S3	CDFG Status:

Habitat Associations
General: COASTAL REGIONS, CHIEFLY FROM SONOMA CO. TO SAN DIEGO CO. ALSO MAIN PART OF SAN JOAQUIN VALLEY & EAST TO FOOTHILLS.
Micro: SHORT-GRASS PRAIRIE, "BALD" HILLS, MOUNTAIN MEADOWS, OPEN COASTAL PLAINS, FALLOW GRAIN FIELDS, ALKALI FLATS.

Occurrence No. 25	Map Index: 34881	EO Index: 18731	— Dates Last Seen —
Occ Rank: Unknown			Element: 1993-04-20
Origin: Natural/Native occurrence			Site: 1993-04-20
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 1996-08-01

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.62789° / -121.37293°	Township: 03S
UTM: Zone-10 N4165775 E643575	Range: 05E
Mapping Precision: SPECIFIC	Section: 36 Qtr: SW
Symbol Type: POINT	Meridian: M
Radius: 80 meters	Elevation: 265 ft

Location: WEST OF VERNALIS; 2.9 KM WSW OF I-5 X HWY 132; BETWEEN CA AQUEDUCT AND HETCH HETCHY AQUEDUCT.

Location Detail: LOCATED APPROX. 400 FEET FROM EXISTING GAS PIPELINE AT MILEPOST 334.25.

Ecological: GRAZED, NON-NATIVE GRASSLAND.

Threat: POSSIBLE THREAT: AGRICULTURAL ACTIVITIES.

General: 5 ADULTS OBSERVED WHEN ONE NEST AND SEVERAL INDIVIDUALS WERE FLUSHED WITHIN 500 FEET EAST AND WEST OF PIPELINE.

Owner/Manager: UNKNOWN

Eryngium racemosum

Delta button-celery

Element Code: PDAPI0Z0S0

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G2Q

CNPS List: 1B.1

State: Endangered

State: S2.1

_____ **Habitat Associations** _____

General: RIPARIAN SCRUB.

Micro: SEASONALLY INUNDATED FLOODPLAIN ON CLAY. 3-75M.

Occurrence No. 3

Map Index: 11611

EO Index: 20069

_____ **Dates Last Seen** _____

Occ Rank: None

Element: XXXX-XX-XX

Origin: Natural/Native occurrence

Site: 1984-08-28

Presence: Possibly Extirpated

Trend: Unknown

Record Last Updated: 2006-08-15

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.78839° / -121.30334°

Township: 02S

UTM: Zone-10 N4183692 E649395

Range: 06E

Mapping Precision: NON-SPECIFIC

Section: 3 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 1 mile

Elevation: 15 ft

Location: NEAR HISTORICAL MONUMENT ON HWY 120, ABOUT 3 MILES SOUTH OF LATHROP.

Location Detail:

Ecological:

Threat: AREA NOW FLOODS YEARLY AND WALNUT ORCHARD EXISTS TO EDGE OF RIVER.

General: HABITAT GONE IN 1984. 1913 COLLECTION BY SUKSDORF FROM THE PLAIN NEAR LATHROP AND 1892 COLLECTION BY BIOLETTI FROM LATHROP BOTH ATTRIBUTED HERE. INCLUDES FORMER OCCURRENCE

Owner/Manager: PVT

Eryngium racemosum

Delta button-celery

Element Code: PDAPI0Z0S0

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G2Q

CNPS List: 1B.1

State: Endangered

State: S2.1

_____ **Habitat Associations** _____

General: RIPARIAN SCRUB.

Micro: SEASONALLY INUNDATED FLOODPLAIN ON CLAY. 3-75M.

Occurrence No. 6

Map Index: 11843

EO Index: 20071

_____ **Dates Last Seen** _____

Occ Rank: None

Element: 1935-XX-XX

Origin: Natural/Native occurrence

Site: 1985-07-11

Presence: Possibly Extirpated

Trend: Unknown

Record Last Updated: 2006-08-15

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus, San Joaquin

Lat/Long: 37.70010° / -121.17913°

Township: 03S

UTM: Zone-10 N4174101 E660522

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 03

Qtr: XX

Symbol Type: POINT

Meridian: M

Radius: 2/5 mile

Elevation: 40 ft

Location: NE END OF CASWELL MEMORIAL STATE PARK.

Location Detail:

Ecological:

Threat:

General: NO SUITABLE HABITAT EXISTS AS OF 1984. INCLUDES FORMER OCCURRENCE #7. INCLUDES COLLECTIONS FROM "5 MI SW OF RIPON."

Owner/Manager: DPR-CASWELL MEMORIAL SP

Eryngium racemosum

Delta button-celery

Element Code: PDAPI0Z0S0

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G2Q

CNPS List: 1B.1

State: Endangered

State: S2.1

_____ **Habitat Associations** _____

General: RIPARIAN SCRUB.

Micro: SEASONALLY INUNDATED FLOODPLAIN ON CLAY. 3-75M.

Occurrence No. 8

Map Index: 11665

EO Index: 20067

_____ **Dates Last Seen** _____

Occ Rank: None

Element: 1923-10-22

Origin: Natural/Native occurrence

Site: 1985-XX-XX

Presence: Possibly Extirpated

Trend: Unknown

Record Last Updated: 2003-06-09

Quad Summary: Vernalis (3712163/444A)

County Summary: San Joaquin

Lat/Long: 37.66992° / -121.26660°

Township: 03S

UTM: Zone-10 N4170606 E652873

Range: 06E

Mapping Precision: NON-SPECIFIC

Section: 13 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 1/5 mile

Elevation: 50 ft

Location: SITE OF OLD SAN JOAQUIN CITY, ABOUT 2.5 MI NE OF VERNALIS, SE OF SAN JOAQUIN RIV CLUB.

Location Detail:

Ecological:

Threat: AREA WEEDY & DISTURBED BY VEHICLES & GRAZING.

General: 1923 COLLECTION BY JEPSON (#10287 JEPS) FROM SAN JOAQUIN CITY ATTRIBUTED TO THIS SITE. AREA DISTURBED; LIKELY EXTIRPATED.

Owner/Manager: PVT

Falco columbarius

merlin

Element Code: ABNKD06030

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G5

CDFG Status:

State: None

State: S3

_____ **Habitat Associations** _____

General: SEACOAST, TIDAL ESTUARIES, OPEN WOODLANDS, SAVANNAHS, EDGES OF GRASSLANDS & DESERTS, FARMS & RANCHES.

Micro: CLUMPS OF TREES OR WINDBREAKS ARE REQUIRED FOR ROOSTING IN OPEN COUNTRY.

Occurrence No. 18

Map Index: 11753

EO Index: 72735

_____ **Dates Last Seen** _____

Occ Rank: Excellent

Element: 1991-12-29

Origin: Natural/Native occurrence

Site: 1991-12-29

Presence: Presumed Extant

Record Last Updated: 2008-07-31

Trend: Unknown

Quad Summary: Ripon (3712162/443B), Vernalis (3712163/444A)

County Summary: San Joaquin, Stanislaus

Lat/Long: 37.66538° / -121.23596°

Township: 03S

UTM: Zone-10 N4170153 E655585

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 19 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 1 mile

Elevation: 25 ft

Location: NEAR THE CONFLUENCE OF THE SAN JOAQUIN & STANISLAUS RIVERS.

Location Detail: LOCATION GIVEN AS "FAITH RANCH OWNED BY ROBERT GALLO" (OF E & J GALLO). ADDITIONAL INFORMATION GIVES FAITH RANCH AS "12 MI EAST OF MODESTO" AND "THE SOUTH BANK OF THE STANISLAUS RIVER FOR 2 MI UPSTREAM FROM THE SAN JOAQUIN RIVER."

Ecological:

Threat:

General: 1 ADULT MALE OVER-WINTERING ON 29 DEC 1991.

Owner/Manager: PVT

Great Valley Cottonwood Riparian Forest

Element Code: CTT61410CA

_____ Status _____	_____ NDDDB Element Ranks _____	_____ Other Lists _____
Federal: None	Global: G2	
State: None	State: S2.1	
_____ Habitat Associations _____		
General:		
Micro:		

Occurrence No. 18

Map Index: 11745

EO Index: 15677

— Dates Last Seen —

Occ Rank: Fair

Element: 1985-10-28

Origin: Natural/Native occurrence

Site: 1985-10-28

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 1998-09-02

Quad Summary: Ripon (3712162/443B)

County Summary: San Joaquin, Stanislaus

Lat/Long: 37.66370° / -121.22996°

Township: 03S

UTM: Zone-10 N4169976 E656118

Range: 07E

Mapping Precision: SPECIFIC

Section: 20 Qtr: NW

Symbol Type: POLYGON

Meridian: M

Area: 123.1 acres

Elevation: 40 ft

Location: BOTH SIDES OF STANISLAUS RIVER FROM ABOUT 0.3 TO 2.6 MI U/S OF CONFL W/SAN JOAQUIN RIV.

Location Detail:

Ecological: PARTIALLY CLOSED POPULUS FREMONTII CANOPY OVER WILLOW SCRUB & YOUNG ACER NEGUNDO.

Threat:

General: FAIR CONDITION, 1985. THIS WAS OCC #018 OF CTT61410CA.

Owner/Manager: PVT

Great Valley Cottonwood Riparian Forest

Element Code: CTT61410CA

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2	
State: None	State: S2.1	
Habitat Associations		
General:		
Micro:		

Occurrence No. 19

Map Index: 11669

EO Index: 15678

— Dates Last Seen —

Occ Rank: Fair

Element: 1985-10-28

Origin: Natural/Native occurrence

Site: 1985-10-28

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 1998-09-02

Quad Summary: Ripon (3712162/443B), Vernalis (3712163/444A)

County Summary: Stanislaus, San Joaquin

Lat/Long: 37.68747° / -121.25915°

Township: 03S

UTM: Zone-10 N4172565 E653494

Range: 06E

Mapping Precision: SPECIFIC

Section: 12 **Qtr:** XX

Symbol Type: POLYGON

Meridian: M

Area: 1,472.0 acres

Elevation: 25 ft

Location: SAN JOAQUIN RIVER UPSTREAM AND DOWNSTREAM OF DURHAM FERRY RIVER 3-4 MILES.

Location Detail:

Ecological: VERY OPEN POPULUS FREMONTII FOREST THROUGH THICKETS OF WILLOW SCRUB. SEVERAL OXBOWS AND RIVERINE GRASSLANDS WITHIN MAPPED AREA.

Threat: RECEIVES HEAVY RECREATIONAL USE.

General: AREA WITHIN DESIGNATED FLOODWAY IN FAIR CONDITION, 1985. THIS WAS OCC #019 OF CTT61410CA.

Owner/Manager: PVT

Great Valley Mixed Riparian Forest

Element Code: CTT61420CA

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2	
State: None	State: S2.2	
Habitat Associations		
General:		
Micro:		

Occurrence No. 30 Map Index: 11822 EO Index: 15643 — Dates Last Seen —
Occ Rank: Good Element: 1985-10-28
Origin: Natural/Native occurrence Site: 1985-10-28
Presence: Presumed Extant
Trend: Unknown Record Last Updated: 1998-07-21

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus, San Joaquin

Lat/Long: 37.69181° / -121.19763°	Township: 03S
UTM: Zone-10 N4173150 E658909	Range: 07E
Mapping Precision: SPECIFIC	Section: 09 Qtr: NE
Symbol Type: POLYGON	Meridian: M
Area: 731.8 acres	Elevation: 35 ft

Location: CASWELL MEMORIAL SP & VIC. STANISLAUS RIV RM 2- RM 9, EXCLU-DING VALLEY OAK AREA IN PARK.

Location Detail:

Ecological: HETEROGENEOUS FOREST. SEVERAL STANDS OF VARIED SUCCESSIONAL STAGE RANGING FROM OPEN SALIX HINDSIANA SCRUBS ON RECENT POINT BARS TO CLOSED CANOPY POPULUS FREMONTII, ACER NEGUNDO, FRAXINUS LATIFOLIA AND SENESCENT SAMBUCUS SAVANNA.

Threat:

General: ELDERBERRY BEETLE HABITAT, GREAT BLUE HERON ROOKERY. GOOD COND, 1985. THIS WAS OCC #030 OF CTT61420CA.

Owner/Manager: DPR-CASWELL MEMORIAL SP, PVT

Great Valley Valley Oak Riparian Forest

Element Code: CTT61430CA

_____ Status _____	_____ NDDB Element Ranks _____	_____ Other Lists _____
Federal: None	Global: G1	
State: None	State: S1.1	
_____ Habitat Associations _____		
General:		
Micro:		

Occurrence No. 6

Map Index: 11842

EO Index: 15621

_____ Dates Last Seen _____

Occ Rank: Good

Element: 1985-10-28

Origin: Natural/Native occurrence

Site: 1985-10-28

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 1998-07-23

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus, San Joaquin

Lat/Long: 37.69218° / -121.18902°

Township: 03S

UTM: Zone-10 N4173205 E659668

Range: 07E

Mapping Precision: SPECIFIC

Section: 10 Qtr: N

Symbol Type: POLYGON

Meridian: M

Area: 154.3 acres

Elevation: 40 ft

Location: CASWELL MEMORIAL STATE PARK.

Location Detail: ADJ TO MIXED RIP FOREST.

Ecological: QUERCUS LOBATA FOREST W/SPARSE SUBCANOPY OF ACER NEGUNDO & VITIS CALIFORNICA. CAREX BARBARAE & ELYMUS TRITICOIDES EXTENSIVE IN HERB LAYER. AMPLE Q. LOBATA REPROD-ALL SIZE CLASSES PRESENT, INCL GIANTS.

Threat: AG W/TRAILS. SOME AG DRAINAGES CROSSES PARK.

General: GOOD CONDITION 1985. THIS WAS OCC #006 OF CTT61430CA

Owner/Manager: DPR-CASWELL MEMORIAL SP

Great Valley Valley Oak Riparian Forest

Element Code: CTT61430CA

_____ Status _____	_____ NDDDB Element Ranks _____	_____ Other Lists _____
Federal: None	Global: G1	
State: None	State: S1.1	
_____ Habitat Associations _____		
General:		
Micro:		

Occurrence No. 27

Map Index: 11821

EO Index: 28899

— Dates Last Seen —

Occ Rank: Unknown

Element: 1980-09-04

Origin: Natural/Native occurrence

Site: 1980-09-04

Presence: Presumed Extant

Trend: Decreasing

Record Last Updated: 1998-07-31

Quad Summary: Westley (3712152/443C), Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.62631° / -121.19660°

Township: 03S

UTM: Zone-10 N4165883 E659140

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 33 Qtr: XX

Symbol Type: POINT

Meridian: M

Radius: 1 mile

Elevation: 30 ft

Location: S SIDE OF MAZE BLVD (HWY 132) E OF BRIDGE OVER SAN JOAQUIN RIVER. 11 MI W OF MODESTO.

Location Detail:

Ecological: OPEN WOODLAND OF QUERCUS LOBATA W/ANNUAL GRASS UNDERSTORY INSIDE RIVER MEANDER SURROUNDED BY IRRIGATED AG LAND. DENSE RIPARIAN FOREST W/POPULUS FREMONTII, QUERCUS LOBATA, SALIX SP SEEN ACROSS RIVER ON ISLAND FORMED BY FINNEGANS CUT & RIVER.

Threat: HISTORY OF GRAZING.

General: THIS WAS OCC #027 OF CTT61430CA.

Owner/Manager: USFWS-SAN JOAQUIN NWR

Linderiella occidentalis

California linderiella

Element Code: ICBRA06010

_____ Status _____ NDDB Element Ranks _____ Other Lists _____

Federal: None

Global: G3

CDFG Status:

State: None

State: S2S3

_____ Habitat Associations _____

General: SEASONAL POOLS IN UNPLOWED GRASSLANDS WITH OLD ALLUVIAL SOILS UNDERLAIN BY HARDPAN OR IN SANDSTONE DEPRESSIONS.

Micro: WATER IN THE POOLS HAS VERY LOW ALKALINITY, CONDUCTIVITY, AND TDS.

Occurrence No. 158

Map Index: 38253

EO Index: 33924

_____ Dates Last Seen _____

Occ Rank: Good

Element: 1998-01-27

Origin: Natural/Native occurrence

Site: 1998-01-27

Presence: Presumed Extant

Record Last Updated: 1998-06-10

Trend: Unknown

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus

Lat/Long: 37.64044° / -121.18315°

Township: 03S

UTM: Zone-10 N4167475 E660297

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 27 **Qtr:** SE

Symbol Type: POLYGON

Meridian: M

Area:

Elevation: 35 ft

Location: NNE OF THE INTERSECTION OF HWY 132 AND MAPES RANCH ROAD, ON THE SOUTH SIDE OF RILEY SLOUGH, 10 MILES WEST OF MODESTO.

Location Detail:

Ecological: HABITAT CONSISTS OF AN ALKALI SINK VERNAL POOL COMPLEX ON FRESNO SERIES SOIL; ASSOCIATED PLANT SPECIES INCLUDES SUAEDA, HEMIZONIA, ELEOCHARIS AND STELLARIA MEDIA. ADJACENT PARCELS HAVE BEEN LEVELED FOR IRRIGATED PASTURE.

Threat:

General: POOLS 1, 4, & 7 CONTAIN LINDERIELLA OCCIDENTALIS. POOLS 1, 4, 7, 9, AND 11 CONTAIN HUNDREDS OF BRANCHINECTA LYNCHI.

Owner/Manager: PVT

Lytta moesta

moestan blister beetle

Element Code: IICOL4C020

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2	CDFG Status:
State: None	State: S2	
Habitat Associations		
General: CENTRAL CALIFORNIA.		
Micro:		

Occurrence No. 7

Map Index: 11958

EO Index: 64445

Dates Last Seen

Occ Rank: Unknown

Element: 19XX-XX-XX

Origin: Natural/Native occurrence

Site: 19XX-XX-XX

Presence: Possibly Extirpated

Trend: Unknown

Record Last Updated: 2006-03-28

Quad Summary: Salida (3712161/443A), Ripon (3712162/443B)

County Summary: San Joaquin, Stanislaus

Lat/Long: 37.73520° / -121.12660°

Township: 02S

UTM: Zone-10 N4178087 E665076

Range: 08E

Mapping Precision: NON-SPECIFIC

Section: 30 **Qtr:** NE

Symbol Type: POINT

Meridian: M

Radius: 1 mile

Elevation: 65 ft

Location: RIPON.

Location Detail:

Ecological:

Threat:

General: LOCALITY FROM CALIFORNIA BEETLE PROJECT ONLINE DATABASE; COLLECTION INFORMATION NOT GIVEN. HISTORICAL RECORD; EXACT LOCATION UNKNOWN.

Owner/Manager: UNKNOWN

Lytta moesta

moestan blister beetle

Element Code: IICOL4C020

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: None

Global: G2

CDFG Status:

State: None

State: S2

_____ **Habitat Associations** _____

General: CENTRAL CALIFORNIA.

Micro:

Occurrence No. 9

Map Index: 64365

EO Index: 64444

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 19XX-XX-XX

Origin: Natural/Native occurrence

Site: 19XX-XX-XX

Presence: Possibly Extirpated

Trend: Unknown

Record Last Updated: 2006-03-28

Quad Summary: Manteca (3712172/461C)

County Summary: San Joaquin

Lat/Long: 37.79741° / -121.21887°

Township: 01S

UTM: Zone-10 N4184832 E656813

Range: 07E

Mapping Precision: NON-SPECIFIC

Section: 32 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 1 mile

Elevation: 40 ft

Location: MANTECA.

Location Detail:

Ecological:

Threat:

General: LOCALITY FROM CALIFORNIA BEETLE PROJECT ONLINE DATABASE; COLLECTION INFORMATION NOT GIVEN. HISTORICAL RECORD; EXACT LOCATION UNKNOWN.

Owner/Manager: UNKNOWN

Neotoma fuscipes riparia

riparian (=San Joaquin Valley) woodrat

Element Code: AMAFF08081

Status	NDDB Element Ranks	Other Lists
Federal: Endangered State: None	Global: G5T1Q State: S1	CDFG Status: SC

Habitat Associations
General: RIPARIAN AREAS ALONG THE SAN JOAQUIN, STANISLAUS & TUOLUMNE RIVERS. Micro: NEED AREAS WITH MIX OF BRUSH & TREES. NEED SUITABLE NESTING SITES IN TREES, SNAGS OR LOGS.

Occurrence No. 2	Map Index: 11683	EO Index: 23796	Dates Last Seen
Occ Rank: Unknown			Element: 1932-11-04
Origin: Natural/Native occurrence			Site: 1932-11-04
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 2005-09-26

Quad Summary: Ripon (3712162/443B), Vernalis (3712163/444A)

County Summary: San Joaquin, Stanislaus

Lat/Long: 37.64776° / -121.25945°	Township: 03S
UTM: Zone-10 N4168159 E653548	Range: 06E
Mapping Precision: NON-SPECIFIC	Section: 25 Qtr: XX
Symbol Type: POINT	Meridian: M
Radius: 1 mile	Elevation: 50 ft

Location: KINCAID'S RANCH, 2 MI NE VERNALIS.

Location Detail: LAT/LONG COORDINATES PROVIDED BY MANIS FALL IN THE SOUTHWESTERN PART OF THE OCCURRENCE AND HAVE AN UNCERTAINTY OF 0.5 MILES.

Ecological:

Threat:

General: 1 MALE, MVZ #55130 (HOLOTYPE) AND 1 FEMALE, MVZ #55131 COLLECTED 4 NOV 1932 BY ROBERT T. ORR.

Owner/Manager: UNKNOWN

Neotoma fuscipes riparia

riparian (=San Joaquin Valley) woodrat

Element Code: AMAFF08081

Status	NDDB Element Ranks	Other Lists
Federal: Endangered State: None	Global: G5T1Q State: S1	CDFG Status: SC

Habitat Associations
General: RIPARIAN AREAS ALONG THE SAN JOAQUIN, STANISLAUS & TUOLUMNE RIVERS. Micro: NEED AREAS WITH MIX OF BRUSH & TREES. NEED SUITABLE NESTING SITES IN TREES, SNAGS OR LOGS.

Occurrence No. 4	Map Index: 11692	EO Index: 23798	Dates Last Seen
Occ Rank: Unknown			Element: 1935-10-19
Origin: Natural/Native occurrence			Site: 1935-10-19
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 2005-01-31

Quad Summary: Ripon (3712162/443B), Vernalis (3712163/444A)

County Summary: San Joaquin, Stanislaus

Lat/Long: 37.66770° / -121.25521°	Township: 03S
UTM: Zone-10 N4170379 E653882	Range: 06E
Mapping Precision: NON-SPECIFIC	Section: 13 Qtr: XX
Symbol Type: POINT	Meridian: M
Radius: 1 mile	Elevation: 25 ft

Location: SAN JOAQUIN RIVER, 3 MI NE VERNALIS.

Location Detail: LAT/LONG COORDINATES PROVIDED BY MANIS FALL WITHIN THIS CIRCLE AND HAVE AN UNCERTAINTY OF 0.75 MILES.

Ecological:

Threat:

General: MVZ #68794-68798. 3 MALES AND 2 FEMALES COLLECTED 18-19 OCT 1935 BY EMMETT T. HOOPER & DAVID H. JOHNSON.

Owner/Manager: UNKNOWN

Neotoma fuscipes riparia

riparian (=San Joaquin Valley) woodrat

Element Code: AMAFF08081

Status	NDDB Element Ranks	Other Lists
Federal: Endangered State: None	Global: G5T1Q State: S1	CDFG Status: SC

Habitat Associations
General: RIPARIAN AREAS ALONG THE SAN JOAQUIN, STANISLAUS & TUOLUMNE RIVERS. Micro: NEED AREAS WITH MIX OF BRUSH & TREES. NEED SUITABLE NESTING SITES IN TREES, SNAGS OR LOGS.

Occurrence No. 5	Map Index: 25495	EO Index: 5674	Dates Last Seen
Occ Rank: Unknown			Element: 2002-01-13
Origin: Natural/Native occurrence			Site: 2002-01-13
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 2008-01-18

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus, San Joaquin

Lat/Long: 37.69475° / -121.19532°	Township: 03S
UTM: Zone-10 N4173480 E659107	Range: 07E
Mapping Precision: SPECIFIC	Section: 10 Qtr: XX
Symbol Type: POLYGON	Meridian: M
Area: 310.6 acres	Elevation: 40 ft

Location: CASWELL MEMORIAL STATE PARK, APPROXIMATELY 4 MILES SW OF RIPON.

Location Detail: MOST AREAS OF THE PARK ARE HABITAT FOR THE WOODRAT. ONLY A FEW HA OF OPEN AREAS & OPEN-CANOPY WOODLANDS WITHOUT SIGNIFICANT UNDERSTORY LACKED SIGN OF WOODRATS. HABITAT ESTIMATED AT 85-95 HA.

Ecological: PARK IS 104.4 HA IN SIZE & IS VEGETATED WITH SHRUBS & TREES CHARACTERISTIC OF VALLEY FLOOR RIPARIAN & FLOODPLAIN COMMUNITIES.

Threat: PARK SUBJECT TO PERIODIC FLOODING.

General: 1993 ESTIMATED POPULATION SIZE IS 437 WITH A MEAN DENSITY OF 4.8 WOODRATS/HA. 1 MALE (MVZ #199502) COLLECTED 8 JAN 2001 BY C. CONROY & C. LEE. 1 MALE (MVZ #199501) COLLECTED 13 JAN 2002 BY C. CONROY & B. VINCENT.

Owner/Manager: DPR-CASWELL MEMORIAL SP

Sylvilagus bachmani riparius

riparian brush rabbit

Element Code: AMAEB01021

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: Endangered

Global: G5T1

CDFG Status:

State: Endangered

State: S1

_____ **Habitat Associations** _____

General: RIPARIAN AREAS ON THE SAN JOAQUIN RIVER IN NORTHERN STANISLAUS COUNTY.

Micro: DENSE THICKETS OF WILD ROSE, WILLOWS, AND BLACKBERRIES.

Occurrence No. 1

Map Index: 11683

EO Index: 62743

_____ **Dates Last Seen** _____

Occ Rank: None

Element: 1932-11-04

Origin: Natural/Native occurrence

Site: 1932-11-04

Presence: Extirpated

Trend: Unknown

Record Last Updated: 2005-09-26

Quad Summary: Ripon (3712162/443B), Vernalis (3712163/444A)

County Summary: San Joaquin, Stanislaus

Lat/Long: 37.64776° / -121.25945°

Township: 03S

UTM: Zone-10 N4168159 E653548

Range: 06E

Mapping Precision: NON-SPECIFIC

Section: 25 **Qtr:** XX

Symbol Type: POINT

Meridian: M

Radius: 1 mile

Elevation: 50 ft

Location: KINCAID'S RANCH, 2 MI NE VERNALIS.

Location Detail: FROM: A-KINCAID'S RANCH, 2 MI NE OF VERNALIS; B-VERNALIS, 2MI NE OF [W SIDE SAN JOAQUIN RIVER]& C-VERNALIS, 2 MILES NE. MANIS LAT/LONG COORDINATES FALL IN SW PART WITH AN UNCERTAINTY OF 0.5 MI. C IS MAPPED HERE BASED ON WRITTEN DESCRIPTION

Ecological:

Threat:

General: A: 1 MALE & 1 FEMALE CAUGHT 3 & 4 NOV 1932 (MVZ #55133 & 55134). B: 1 FEMALE CAUGHT 11 NOV 1931 (MVZ #57348). C: 1 MALE & 1 FEMALE CAUGHT 5 MAR AND 3 SEPT 1931 (CAS #8004 & 8005).

Owner/Manager: UNKNOWN

Sylvilagus bachmani riparius

riparian brush rabbit

Element Code: AMAEB01021

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: Endangered

Global: G5T1

CDFG Status:

State: Endangered

State: S1

_____ **Habitat Associations** _____

General: RIPARIAN AREAS ON THE SAN JOAQUIN RIVER IN NORTHERN STANISLAUS COUNTY.

Micro: DENSE THICKETS OF WILD ROSE, WILLOWS, AND BLACKBERRIES.

Occurrence No. 2

Map Index: 25495

EO Index: 5675

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2001-01-XX

Origin: Natural/Native occurrence

Site: 2001-01-XX

Presence: Presumed Extant

Trend: Fluctuating

Record Last Updated: 2008-01-18

Quad Summary: Ripon (3712162/443B)

County Summary: Stanislaus, San Joaquin

Lat/Long: 37.69475° / -121.19532°

Township: 03S

UTM: Zone-10 N4173480 E659107

Range: 07E

Mapping Precision: SPECIFIC

Section: 10 **Qtr:** XX

Symbol Type: POLYGON

Meridian: M

Area: 310.6 acres

Elevation: 40 ft

Location: CASWELL MEMORIAL STATE PARK, ABOUT 4 MILES SW OF RIPON.

Location Detail: <100 ANIMALS EST. AT START IN NOV-DEC 1988. EST. POP SIZE IN 1993 IS 241 (95% CONFIDENCE LEVEL = 170 - 608 RABBITS). AFTER 1996-1997 FLOOD, POPULATION REMAINED VERY LOW. ONLY 3 INDIVIDUALS CAPTURED DURING CENSUS IN 2001.

Ecological: PARK IS 258 ACRES IN SIZE & IS VEGETATED WITH SHRUBS & TREES CHARACTERISTIC OF VALLEY FLOOR RIPARIAN & FLOODPLAIN COMMUNITIES. ESTIMATED HABITAT AREA IN 1993 IS 81 HA.

Threat: HABITAT REDUCED BY BRUSH CLEARING DURING WINTER 1984-85. SUBJECT TO FLOODING (1982-1983, 1985-1986, 1996-1997, 1997-1998)

General: DEPT. PARKS & RECREATION HAVE FUNDED PERIODIC STUDIES ON BRUSH RABBITS WITHIN THE PARK. WILLIAMS BELIEVES THE 1993 POPULATION ESTIMATES ARE NEAR THE CARRYING CAPACITY OF THE PARK.

Owner/Manager: DPR-CASWELL MEMORIAL SP

Sylvilagus bachmani riparius

riparian brush rabbit

Element Code: AMAEB01021

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: Endangered

Global: G5T1

CDFG Status:

State: Endangered

State: S1

_____ **Habitat Associations** _____

General: RIPARIAN AREAS ON THE SAN JOAQUIN RIVER IN NORTHERN STANISLAUS COUNTY.

Micro: DENSE THICKETS OF WILD ROSE, WILLOWS, AND BLACKBERRIES.

Occurrence No. 3

Map Index: 52111

EO Index: 52111

_____ **Dates Last Seen** _____

Occ Rank: Good

Element: 2003-02-03

Origin: Natural/Native occurrence

Site: 2003-02-03

Presence: Presumed Extant

Trend: Unknown

Record Last Updated: 2003-08-13

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.79532° / -121.31217°

Township: 02S

UTM: Zone-10 N4184448 E648602

Range: 06E

Mapping Precision: SPECIFIC

Section: 04 **Qtr:** NE

Symbol Type: POLYGON

Meridian: M

Area: 36.3 acres

Elevation: 9 ft

Location: OXBOW ON THE EAST SIDE OF THE SAN JOAQUIN RIVER, AT RIVER MILE 55, 2 MILES SW OF LATHROP

Location Detail: SITE ABUTS A PROPOSED DEVELOPMENT SITE (MOSSDALE LANDING).

Ecological: HABITAT CONSISTS OF COTTONWOOD RIPARIAN FOREST, DOMINATED BY FREMONT COTTONWOOD, WITH AN UNDERSTORY OF BLACKBERRY, WILD ROSE, STINGING NETTLE, BLESSED MILKTHIRSTLE, AND NON-NATIVE ANNUAL GRASSES. NON-NATIVE RATTUS RATTUS CAPTURED IN TRAPS.

Threat: EVIDENCE OF 6+ HOMELESS CAMPS, PAST WILDFIRES & AN UNAUTHORIZED GARDEN. CRISS-CROSSED WITH ROADS THAT ARE USED BY ORVS.

General: 2 CAPTURED EVENING OF 2 FEB 2003 AND 13 ADULTS CAPTURED MORNING OF 3 FEB 2003.

Owner/Manager: UNKNOWN

Sylvilagus bachmani riparius

riparian brush rabbit

Element Code: AMAEB01021

_____ **Status** _____ **NDDB Element Ranks** _____ **Other Lists** _____

Federal: Endangered

Global: G5T1

CDFG Status:

State: Endangered

State: S1

_____ **Habitat Associations** _____

General: RIPARIAN AREAS ON THE SAN JOAQUIN RIVER IN NORTHERN STANISLAUS COUNTY.

Micro: DENSE THICKETS OF WILD ROSE, WILLOWS, AND BLACKBERRIES.

Occurrence No. 4

Map Index: 57409

EO Index: 57425

_____ **Dates Last Seen** _____

Occ Rank: Unknown

Element: 2001-XX-XX

Origin: Natural/Native occurrence

Site: 2001-XX-XX

Presence: Presumed Extant

Record Last Updated: 2004-10-14

Trend: Unknown

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.76414° / -121.31826°

Township: 02S

UTM: Zone-10 N4180978 E648128

Range: 06E

Mapping Precision: SPECIFIC

Section: 16 **Qtr:** XX

Symbol Type: POLYGON

Meridian: M

Area: 103.8 acres

Elevation: 10 ft

Location: PARIDISE CUT, BORDERED TO THE NORTHWEST BY I-205 AND ABOUT 1.3 MI SOUTHWEST OF MOSSDALE AND 2.8 MILES NORTHEAST OF BANTA

Location Detail: INDIVIDUALS PRIMARILY CAUGHT IN AREA IMMEDIATELY WEST OF UNION PACIFIC RAILROAD TRACTS WEST OF INTERSTATE 5

Ecological: SUITABLE HABITAT IS PRESENT IN SOME CHANNELS AND ADJOINING SLOUGH THAT FLOODS DURING PERIODS OF HIGH WATER FLOW. THERE ARE APPROXIMATELY 135 ACRES OF POTENTIAL RIPARIAN BRUSH HABITAT AT THE SITE, MOSTLY NEAR PROPOSED I-205 WIDENING PROJECT

Threat: PROPOSED INTERSTATE-205 WIDENING PROJECT.

General: 21 INDIVIDUALS CAUGHT IN 2001.

Owner/Manager: UNKNOWN

Symphyotrichum lentum

Suisun Marsh aster

Element Code: PDASTE8470

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2	CNPS List: 1B.2
State: None	State: S2.2	

Habitat Associations

General: MARSHES AND SWAMPS (BRACKISH AND FRESHWATER).
Micro: MOST OFTEN SEEN ALONG SLOUGHS WITH PHRAGMITES, SCIRPUS, BLACKBERRY, TYPHA, ETC. 0-3M.

Occurrence No. 145	Map Index: 62567	EO Index: 62604	Dates Last Seen
Occ Rank: Unknown			Element: 1892-09-09
Origin: Natural/Native occurrence			Site: 1892-09-09
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 2005-09-13

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.82249° / -121.27687°	Township: 01S
UTM: Zone-10 N4187519 E651655	Range: 06E
Mapping Precision: NON-SPECIFIC	Section: 26 Qtr: XX
Symbol Type: POINT	Meridian: M
Radius: 1 mile	Elevation:

Location: LATHROP.

Location Detail: EXACT LOCATION UNKNOWN.

Ecological:

Threat:

General: ONLY SOURCE OF INFORMATION FOR THIS OCCURRENCE IS A 1892 COLLECTION BY MICHENER AND BIOLETTI.

Owner/Manager: UNKNOWN

Symphyotrichum lentum

Suisun Marsh aster

Element Code: PDASTE8470

_____ Status _____	_____ NDDB Element Ranks _____	_____ Other Lists _____
Federal: None	Global: G2	CNPS List: 1B.2
State: None	State: S2.2	

_____ **Habitat Associations** _____

General: MARSHES AND SWAMPS (BRACKISH AND FRESHWATER).
Micro: MOST OFTEN SEEN ALONG SLOUGHS WITH PHRAGMITES, SCIRPUS, BLACKBERRY, TYPHA, ETC. 0-3M.

Occurrence No. 146	Map Index: 62568	EO Index: 62605	_____ Dates Last Seen _____
Occ Rank: Unknown			Element: 1920-09-30
Origin: Natural/Native occurrence			Site: 1920-09-30
Presence: Presumed Extant			
Trend: Unknown		Record Last Updated: 2005-09-13	

Quad Summary: Vernalis (3712163/444A), Lathrop (3712173/462D), Union Island (3712174/462C), Tracy (3712164/444B)

County Summary: San Joaquin

Lat/Long: 37.75395° / -121.37281°	Township: 02S
UTM: Zone-10 N4179762 E643343	Range: 05E
Mapping Precision: NON-SPECIFIC	Section: 24 Qtr: XX
Symbol Type: POINT	Meridian: M
Radius: 1 mile	Elevation:

Location: NEAR BANTA.

Location Detail: EXACT LOCATION UNKNOWN.

Ecological:

Threat:

General: ONLY SOURCE OF INFORMATION FOR THIS OCCURRENCE IS A 1920 COLLECTION BY ABRAMS.

Owner/Manager: UNKNOWN

Trichocoronis wrightii var. wrightii

Wright's trichocoronis

Element Code: PDAST9F031

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T3	CNPS List: 2.1
State: None	State: S1.1	

Habitat Associations

General: MARSHES AND SWAMPS, RIPARIAN FOREST, MEADOWS AND SEEPS, VERNAL POOLS.
Micro: MUD FLATS OF VERNAL LAKES, DRYING RIVER BEDS, ALKALI MEADOWS. 5-435M.

Occurrence No. 6	Map Index: 24681	EO Index: 6904	Dates Last Seen
Occ Rank: Unknown			Element: 1914-09-27
Origin: Natural/Native occurrence			Site: 1914-09-27
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 1993-11-16

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.78548° / -121.30651°	Township: 02S
UTM: Zone-10 N4183364 E649121	Range: 06E
Mapping Precision: NON-SPECIFIC	Section: 3 Qtr: XX
Symbol Type: POINT	Meridian: M
Radius: 2/5 mile	Elevation: 20 ft

Location: BRIDGE ACROSS SAN JOAQUIN RIVER NEAR LATHROP.
Location Detail: MAPPED WHERE I-5 CROSSES SAN JOAQUIN RIVER.
Ecological:
Threat:
General: HERBARIUM LABELS ARE ONLY SOURCE OF INFORMATION FOR THIS SITE. COLECTED SEVERAL TIMES IN THIS AREA BETWEEN 1892 AND 1914. AREA SHOULD BE FIELD CHECKED FOR PRESENCE OF SUITABLE HABITAT.
Owner/Manager: UNKNOWN

Xanthocephalus xanthocephalus

yellow-headed blackbird

Element Code: ABPBXB3010

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G5	CDFG Status: SC
State: None	State: S3S4	

Habitat Associations
General: NESTS IN FRESHWATER EMERGENT WETLANDS WITH DENSE VEGETATION & DEEP WATER. OFTEN ALONG BORDERS OF LAKES OR PONDS.
Micro: NESTS ONLY WHERE LARGE INSECTS SUCH AS ODONATA ARE ABUNDANT, NESTING TIMED WITH MAXIMUM EMERGENCE OF AQUATIC INSECTS.

Occurrence No. 5	Map Index: 53639	EO Index: 53639	Dates Last Seen
Occ Rank: Unknown			Element: 1894-05-10
Origin: Natural/Native occurrence			Site: 1894-05-10
Presence: Presumed Extant			
Trend: Unknown			Record Last Updated: 2003-12-18

Quad Summary: Lathrop (3712173/462D)

County Summary: San Joaquin

Lat/Long: 37.81681° / -121.28368°	Township: 01S
UTM: Zone-10 N4186878 E651067	Range: 06E
Mapping Precision: NON-SPECIFIC	Section: 26 Qtr: XX
Symbol Type: POINT	Meridian: M
Radius: 1 mile	Elevation: 15 ft

Location: LATHROP

Location Detail:

Ecological:

Threat:

General: MVZ EGG SET #6846 COLLECTED 10 MAY 1894 BY A. WOLFE.

Owner/Manager: UNKNOWN

California Native Plant Society List Results

SCINAME	COM_NAME	FAMILY	LIFE_FORM	CNPS_LIST	CAENDEMIC	SRANK	GRANK	STATE_STAT	FED_STAT	COUNTIES
Atriplex minuscule	lesser saltscale	Chenopod iaceae	annual herb	List 1B.1	1		S1.1	G1		Butte (BUT), Fresno (FRE), Kern (KRN), Madera (MAD), Merced (MER), Stanislaus (STA)*, Tulare (TUL)
Cirsium crassicaule	slough thistle	Asteraceae	annual/perennial herb	List 1B.1	1		S2.2	G2		Kings (KNG), Kern (KRN), San Joaquin (SJQ)

Eryngium racemosum	Delta button- celery	Apiaceae	annual/perenni al herb	List 1B.1	1	S2.1	G2Q	Endangered	Calaveras (CAL), Contra Costa (CCA), Merced (MER), San Joaquin (SJQ)*, Stanislaus (STA)

Sagittaria sanfordii	Sanford's arrowhead	Alismataceae	perennial rhizomatous herb emergent	List 1B.2	1	S3.2	G3	Butte (BUT), Del Norte (DNT), El Dorado (ELD), Fresno (FRE), Merced (MER), Mariposa (MPA), Orange (ORA)*, Placer (PLA), Sacramento (SAC), Shasta (SHA), San Joaquin (SJQ), Tehama (TEH), Ventura (VEN)*

Symphyotric hum lentum	Suisun Marsh aster	Asteracea e	perennial rhizomatous herb	List 1B.2	1	S2.2	G2	Contra Costa (CCA), Marin (MRN), Napa (NAP), Sacramento (SAC), San Joaquin (SJQ), Solano (SOL), Sonoma (SON)
Trichocoroni s wrightii var. wrightii	Wright's trichocoronis	Asteracea e	annual herb	List 2.1	0	S1.1	G4T3	Colusa (COL)*, Merced (MER), Riverside (RIV), San Joaquin (SJQ)*, Sutter (SUT)*, Texas (TX), (++)

QUADS_123	NATCOMS	BLOOMING	blooming_orig	ELEV_LOW	ELEV_HIGH
Lost Hills NE (265A) 3511965, Delano East (287C)* 3511972, Cairns Corner (310B) 3611922, Woodville (310C) 3611912, Traver (334B) 3611944, Goshen (334C) 3611934, Visalia (334D) 3611933, Raisin (358C)* 3611958, Kerman (359A) 3612061, Jamesan (359B) 3612062, Helm (359D)* 3612051, Bonita Ranch (380B) 3612082, Gravelly Ford (380C) 3612072, Firebaugh NE (381A) 3612083, Poso Farm (381B) 3612084, Mendota Dam (381D) 3612073, Berenda (400C) 3712012, Plainsburg (401A) 3712023, El Nido (401B) 3712024, Bliss Ranch (401C) 3712014, Chowchilla (401D) 3712013, Sandy Mush (402A) 3712025, Arena (422C) 3712036, Hatch (423B)* 3712048, Crows Landing (424A) 3712141, Ripon (443B)* 3712162, Pennington (561D) 3912137	Chenopod scrub, Playas, Valley and foothill grassland/alkaline, sandy	May-Oct <SMALL></SMALL>	May-Oct	15	200
Tupman (241D) 3511933, Wasco SW (264C) 3511954, Lost Hills NE (265A) 3511965, Lost Hills NW (265B) 3511966, Semitropic (265D) 3511955, Lone Tree Well (289C) 3511976, Hacienda Ranch (289D)?* 3511975, Vernalis (444A) 3712163, Lathrop (462D) 3712173	Chenopod scrub, Marshes and swamps(sloughs), Riparian scrub	May-Aug <SMALL></SMALL>	May-Aug	3	100

Sandy Mush (402A) 3712025, Turner Ranch (402B) 3712026, Santa Rita Bridge (402D) 3712015, San Luis Ranch (403A) 3712027, Turlock (423A) 3712047, Gustine (423C) 3712038, Stevinson (423D) 3712037, Crows Landing (424A)* 3712141, Turlock Lake (441D) 3712055, Ripon (443B)* 3712162, Westley (443C)* 3712152, Vernalis (444A)* 3712163, Peters (461A)* 3712181, Lathrop (462D)* 3712173, Woodward Island (463A) 3712185, Salt Spring Valley (476C) 3812016, Jenny Lind (477D) 3812017	Riparian scrub(vernally Jun- mesic clay depressions) Sepandnbsp;andnbsp; <SMALL></SMALL>	Jun-Sep	3	30

Newport Beach (071B)* 3311768, Seal Beach Marshes and (072A) 3311861, Matilija (141A)* 3411943, swamps(assorted Jamesan (359B) 3612062, Clovis (378C) shallow freshwater) 3611976, Fresno North (379D) 3611977, Mendota Dam (381D) 3612073, Turner Ranch (402B) 3712026, Delta Ranch (402C) 3712016, Los Banos (403D) 3712017, Owens Reservoir (420C) 3712032, Merced (421C) 3712034, Gustine (423C) 3712038, Stevinson (423D) 3712037, Stockton West (462A) 3712183, Lathrop (462D) 3712173, Waterloo (478C) 3812112, Isleton (480A) 3812125, Carbondale (495A) 3812141, Sloughhouse (495B) 3812142, Elk Grove (496A) 3812143, Florin (496B) 3812144, Galt (496D) 3812133, Clarksville (511A) 3812161, Folsom SE (511D) 3812151, Citrus Heights (512A) 3812163, Sacramento East (512C) 3812154, Carmichael (512D) 3812153, Biggs (560B) 3912146, Gridley (560C) 3912136, Berry Creek (575B) 3912164, Richardson Springs NW (593B) 3912188, Tuscan Buttes NE (628A) 4012241, Dales (628D) 4012231, Whiskeytown (648A) 4012265, Crescent City (740C) 4112472	May- Octandnbsp;andnbsp; <SMALL></SMALL>	May-Oct	0	650

Vernalis (444A) 3712163, Tracy (444B) 3712164, Stockton East (461B) 3712182, Union Island (462C) 3712174, Lathrop (462D) 3712173, Woodward Island (463A) 3712185, San Quentin (466B) 3712284, San Rafael (467A) 3712285, Thornton (479B) 3812124, Terminous (479C) 3812114, Isleton (480A) 3812125, Rio Vista (480B) 3812126, Jersey Island (480C) 3812116, Bouldin Island (480D) 3812115, Denverton (481B) 3812128, Honker Bay (481C) 3812118, Antioch North (481D) 3812117, Fairfield South (482A) 3812221, Cordelia (482B) 3812222, Benicia (482C) 3812212, Vine Hill (482D) 3812211, Cuttings Wharf (483A) 3812223, Mare Island (483D) 3812213, Petaluma River (484A) 3812225, Petaluma (484B) 3812226, Point Reyes NE (485A)? 3812227, Dozier (498D) 3812137, Napa (500D) 3812233	Marshes and swamps(brackish and freshwater)	May-Nov	0	3

Beaumont (084B) 3311688, El Casco (085A) 3311781, Perris (085C) 3311772, Lakeview (085D) 3311771, Turner Ranch (402B) 3712026, Los Banos (403D)* 3712017, Lathrop (462D)* 3712173, Kirkville (530A)* 3812187, Gilsizer Slough (544C)* 3912116, Meridian (545B)* 3912128, Grimes (545C)* 3912118, Tisdale Weir (545D)* 3912117, Arbuckle (546D)* 3912211	Meadows and seeps, Marshes and swamps, Riparian forest, Vernal pools/alkaline	May-Sep	5	435

NOTES	FULL_NAME	CBRREASON	SCINAME	ELM_CODE	plants_code	Q123_count
			NEW			
Historical occurrences extirpated by agriculture. Closely related to <i>A. depressa</i> and <i>A. parishii</i> ; a synonym of the latter in <i>A California Flora</i> (1959) by P. Munz. See <i>North American Flora</i> 21:51 (1916) for original description.	<i>Atriplex</i> <i>minuscule</i> Standl.			PDCHE042M0	ATMI3	27
Threatened by agriculture and non-native plants. Population sizes fluctuate widely.	<i>Cirsium</i> <i>crassicaule</i> (Greene) Jeps.			PDAST2E0U0	CICR	9

Threatened by agriculture and flood control activities. See Flora of California 2(1):659 (1936) by W.L. Jepson for original description.

Eryngium
racemosum
Jeps.

PDAPI0Z0S0 ERRA5

17

Extirpated from southern California, and mostly extirpated from the Central Valley. Several SAC Co. occurrences not relocated during fieldwork in 2005. Threatened by grazing, development, recreational activities, non-native plants, road widening, and channel alteration. See Pittonia 2:158 (1890) for original description.

Sagittaria
sanfordii
Greene

PMALI040Q0 SASA2

36

Seriously threatened by marsh habitat alteration and loss. Intergrades into *A. chilensis*. USFWS uses the name *A. chilensis* var. *lentus*. See Manual of the Botany of the Region of San Francisco Bay, p. 180 (1894) by E. Greene for original description and Phytologia 77(3): 286 (1994) for revised nomenclature.

Symphyotrichum lentum (Greene) G.L. Nesom

PDAST0T540

28

Nearly extirpated in the Central Valley. Habitat lost to agriculture and urbanization. Confusion persists, but plant is probably native to CA. Rare in TX; perhaps more common in northern Mexico. Perhaps best treated as a full species distinct from TX plants.

Trichocoronis wrightii (T. and G.) Gray var. *wrightii*

PDAST9F031

13

APPENDIX F

Union Commercial Water Supply Assessment Memorandum
(October 18, 2006)

Memo

To: David Hanham
From: Keith Conarro
CC: Mike Brinton, Jim Podesta
Date: October 18, 2006
Re: Union Commercial Water Supply Assessment

Introduction

This memorandum presents the water supply assessment for the Union Commercial development. The planned floor space in the development is approximately 545,000 square feet. A water supply assessment is required for commercial developments with a floor space of more than 500,000 square feet. The projected acreage for the development is approximately 53.4 acres as shown in the Water Supply Assessment Request, Attachment 1.

The Union Commercial is a retail shopping center and office building. The development is not subject to a water supply verification, which is applicable only to residential development.

The water supply assessment evaluates the water demand of the proposed development and sufficiency of the water supply for the next 20 years to provide water for the project as well as the existing and future customers in normal, single and multiple dry year conditions.

Water Demand

The Union Commercial water demand consists of the potable and irrigation demand. The occupants of the development are unknown other than it will consist of general retail and a commercial office building. Based on similar developments in the City of

Manteca, an estimate of the average daily potable demand is 27 gallons per minute and the irrigation demand is 30 gallons per minute. Total average demand for the development is 57 gallons per minute or approximately 82,100 gallons per day.

The estimated peak potable demand is 115 gallons per minute and the peak irrigation demand is 200 gallons per minute. The peak potable demand and peak irrigation demand do not occur at the same time as the irrigation takes place at night when the development is unoccupied. The potable water and irrigation demand will be supplied by the City of Manteca water system. Potable water will be provided to the development through an extension of the 12-inch water main in Atherton Road.

The water supply for commercial development is included in the gross residential demand, which is assessed at 0.474 gallons per minute per dwelling unit. The gross residential demand is based on the City of Manteca's historical per capita water demand of 214 gallons per day. The actual water demand for residential use is 168 gallon per capita per day. The use of the gross demand in water supply planning allocates water for non-residential uses, such as commercial development. The demand by the Union Commercial development can be supported by the existing and planned water supply improvements.

Water Supply Sufficiency

The water supply assessment must include an evaluation of the water supply sufficiency for the next 20 years. The water supply assessment requires documentation on existing water sources and quantities used and future water supplies and quantities. The water supply assessment must evaluate the adequacy of these supplies to meet the demands for the development as well as existing and other future uses during the 20 year planning period. The assessment must include normal, single and multiple dry years. Where groundwater is used, a description of the aquifer must be provided and along with information regarding the overdraft of the basin aquifer.

The City of Manteca 2005 Urban Water Management Plan includes information required in the water supply sufficiency evaluation. Additional information is contained in the Water Master Plan. Both documents are used in the completion of this water supply assessment.

The water for potable use for the development will be from existing water sources and future water sources. Future water sources include surface water and future wells. Presently, the City of Manteca receives 11,500 acre-feet per year of surface water per its Water Supply Agreement with South San Joaquin Irrigation District, which includes provisions to increase the supply to 18,500 acre-feet per year. Groundwater water supply will be limited to the safe yield of the aquifer of 1 acre foot per acre per year. The groundwater supply is limited to extraction in the Primary Urban Service Area of 13,790 acres.

Water Supply Planning

The City Manteca water supply planning is documented in the 2002 Water Master Plan and the 2005 Urban Water Management Plan. The City limits the number of new residential sewer connections to 3.9 percent per year, which also limits the number of new water services. A 3.4 percent growth in water demand was used in both the Water Master Plan and the Urban Water Management Plan to project future water demand. Beginning in 2005, both the Water Master Plan and Urban Water Management Plan include groundwater and surface water from the South County Surface Water Supply Project as sources of water for the City of Manteca.

The 2005 Urban Water Management Plan was adopted in December of 2005. The Urban Water Management Plan includes water supply and demand comparisons through 2030 assuming a 3.4% growth in water demand. During the planning period water is supplied by groundwater from City wells and surface water from the South County Water Supply Project. The Urban Water Management Plan also contains the single and multiple dry year water demand-supply comparisons and the water supply shortage contingency planning. The water supply and demand comparisons from the Urban Water Management Plan are included in the Water Supply Sufficiency, Attachment 2. The comparisons show the water supply should exceed projected demand through year 2027. The water supply in the supply-demand comparison was assessed at 225 gallons per day per person. Conservation and the use of reclaimed water are not considered in the average year demand projection, which if implemented would extend the water supply beyond 2030. The dry year projections indicate that a five to ten percent reduction in per capita water use will be required to meet the single and multiple dry year water supply conditions. The increase in future water supplies is provided by the planned increase in surface water deliveries and drilling of new wells to meet peak water demands and supplement surface water in dry years.

Groundwater Supply. The City of Manteca draws groundwater from the Eastern San Joaquin County Groundwater Basin (ESJCGB), which is a subbasin of the San Joaquin Valley Groundwater Basin. The California Department of Water Resources identified the ESJCGB as a basin in a state of overdraft in DWR Bulletin 160-98. The basin is described in the 2005 Urban Water Management Plan.

The maximum groundwater extraction rate available to the City of Manteca is 13,790 acre feet per year. The groundwater extraction is limited to the safe aquifer yield of 1 acre foot per acre per year and development of the 13,790 acres in the Primary Urban Service Area (PUSA) identified in the City of Manteca 2003 General Plan.

The Water Master Plan included the construction of wells 26 and 27 to provide water for planned development. Well 27 has been drilled and developed and has a capacity of 2500 gpm. A test well drilled on the Well 26 site indicates there is an adequate quantity of water (estimated at 1500 to 1800 gpm) available for the planned

development. A 1-million gallon storage tank is planned for the Well 26 site to provide a peak water supply delivery of 3000 gpm from the Well 26 site.

Additional wells will be required for additional future development. The developers are required to fund construction of new wells and water distribution system improvements to provide water for their development. They are reimbursed through the Public Facilities Implementation Plan. The wells and water distribution system become part of the City water system.

Surface Water. The City of Manteca, along with the Cities of Escalon, Lathrop and Tracy contracted with the South San Joaquin Irrigation District in 1995 to develop the South County Water Supply Project for delivery of treated surface water. Surface water deliveries began in July of 2005. The Water Supply Development Agreement allocates 11,500 acre feet in Phase 1 of the project to Manteca. Phase II of the project will increase the Manteca allocation to 18,500 acre feet per year. A copy of the Water Supply Agreement is available in the City of Manteca Public Works Department.

The surface water deliveries for water supply planning purposes are scheduled to increase by about 4 percent per year until the full allotment of 18,500 acre feet per year is reached.

Reclaimed Water. The Urban Water Management Plan the Water Master Plan and the Wastewater Quality Control Facility Master Plan Update include reclaimed water in future planning. Reclaimed water requires construction of tertiary filters and disinfection facilities to meet Title 22 Reclamation Criteria. A reclaimed water distribution system is also required. Recent NPDES disposal and treatment requirements require the construction of tertiary filters and disinfection facilities. The required facilities can provide treated wastewater suitable for landscape irrigation.

Construction of the tertiary filters and disinfection facilities were started in 2005 and are scheduled for completion in 2007. A reclaimed water distribution system will be required to convey the reclaimed water to points of use.

Groundwater Management. The San Joaquin County Flood Control and Water Conservation District adopted a groundwater management plan for San Joaquin County, which encompasses most of the ESJCGB. The City of Manteca participated in the development of the groundwater management plan. The South County Water Supply Project was included as an element in the groundwater management plan to reduce extraction of groundwater from the basin.

The City of Manteca plans to manage its groundwater use to meet the area's estimated safe aquifer yield of 1 acre-ft/acre/year. Historically, Manteca has been extracting groundwater at a rate of 2.4 acre-ft/acre/year. Both the Water Master Plan and the Urban Water Management Plan recognize the overdraft of the basin. To

reduce Manteca's overdraft, the City began using surface water from the South County Water Supply Project in the 2005. The City will reduce its groundwater extraction to the safe aquifer yield of 1 acre-ft/acre/year.

Water Supply Reliability. Water supply reliability is addressed in the Urban Water Management Plan. In past droughts, the groundwater supply has been very reliable. Groundwater levels have dropped during severe droughts but recovered in subsequent years. However, there has been a long-term drop in groundwater levels (approximately 4 feet since 1964) in the Manteca area. The drop in groundwater is due to both the local groundwater pumping and the severe overdraft in the central and eastern portions of the groundwater basin. An objective of the groundwater management plan is to stabilize the groundwater level in the central and eastern portions of the basin. The combined effort of Manteca to reduce groundwater overdraft and the San Joaquin County Groundwater Management Plan should help maintain the historical reliability of Manteca's groundwater.

The South San Joaquin Irrigation District, which is supplying the surface water from the Stanislaus River, has pre-1914 water rights. With the construction of New Melones Reservoir, the SSJID entitlement was negotiated with the DWR at 300,000 acre-ft per year. The entitlement is subject to reductions when the New Melones inflow is less than 600,000 acre-feet. An examination of the inflows between 1922 and 2000 indicated that SSJID would have received its full allocation of 300,000 acre-ft in all but 16 years during this period. The severity of possible reductions was estimated by examining the three lowest inflow years of 1977, 1924 and 1988, which would have reduced SSJID's allocation by 37, 24 and 23 percent, respectively. Conservation and increased groundwater pumping can replace reductions of this order. Based on SSJID water rights and minimal reductions in past low flow years, the surface water supply is considered a reliable source. Manteca plans to construct additional groundwater wells to enable maintaining full water supply with a 50% reduction in surface water supply.

Long term overdraft of the basin groundwater poses a water supply reliability threat from the intrusion of saline water. Surface water supplies will enable groundwater pumping to be reduced the Manteca area and reduce the intrusion of saline water into the area.

Changes in water quality standards have the potential to reduce available groundwater available to the City. The Federal Maximum Contaminant Level (MCL) for arsenic was lowered from 50 ug/l to 10 ug/l in 2001. The State of California is also evaluating the arsenic MCL, which could be lower than the Federal MCL. The revised arsenic MCL becomes effective in 2006. Twelve of the City's wells exceed the revised Federal arsenic MCL, with concentrations ranging from 12 to 19 ug/l. Manteca is currently implementing arsenic treatment and water management alternatives to maintain Manteca's water supply capacity while meeting the new arsenic standard.

Reclaimed water is a reliable source of water but must meet the Title 22 water quality criteria. Reclaimed water not meeting the water quality criteria cannot be distributed. Treatment upset, improper filter operation or loss of disinfection can produce water that does not meet the reclaimed water quality criteria. The quantity of reclaimed water produced during the day varies. Minimum flows of 1 to 1.5 mgd occur at night when wastewater production is low.

Summary

The City of Manteca will have an adequate supply of water for the Union Commercial Development during the planning period. Surface water in combination with existing and planned groundwater supplies will supply potable and irrigation water for the development. Reclaimed water for irrigation water may be available in the future but is not included in the water supply assessment for the development.

The City is addressing issues that may affect the reliability of its potable water supply, which include overdraft of the basin groundwater and the revised arsenic MCL. Additional information on Manteca's water supply planning is available in the 2002 Water Master Plan and the 2005 Urban Water Management Plan.

RESOLUTION NO. R2006-481

**A RESOLUTION OF THE CITY COUNCIL OF THE
CITY OF MANTECA APPROVING THE
UNION COMMERCIAL WATER SUPPLY ASSESSMENT**

WHEREAS, in 2002 Senate Bill 610 amended the California Water Code to require water suppliers to complete water supply assessments for developments that meet certain water demand criteria; and

WHEREAS, the Union Commercial project is a proposed development of more than 500,000 square feet of floor space and falls under Senate Bill 610 requirements for a water supply assessment; and

WHEREAS, the 2005 Urban Water Management Plan (on file with the Office of the City Clerk) contains much of the required water supply information and was used in the water supply assessment; and

WHEREAS, the governing council must approve the prepared water supply assessment.

NOW, THEREFORE, BE IT RESOLVED AND ORDERED by the City Council of the City of Manteca that it does hereby approved the prepared water supply assessment for Union Commercial.

DATED: November 6, 2006

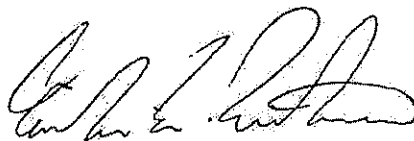
ROLL CALL:

AYES: Councilmembers DeBrum, Harris, Hernandez, Snyder and Weatherford

NOES: None

ABSENT: None

ABSTAIN: None



**WILLIE W. WEATHERFORD
MAYOR**

ATTEST:



**JOANN TILTON, MMC
CITY CLERK**

ATTACHMENT 1
WATER SUPPLY ASSESSMENT REQUEST

Memo

To: Mike Brinton, Public Works Director
Jim Podesta, Assistant Director of Public Works
Keith Conarroe, Associate Civil Engineer

From: David Hanham, Senior Planner

Date: October 3, 2006

Re: Water Analysis for Union Commercial

Please accept this memo to initiate a water analysis for the following project:

Date Submitted: Application Date: February 28, 2005

Subdivision: N/A # of units: N/A

Commercial Project: Union Commercial Size of project: 90.78 acres

Note: The acreage includes the Woodward Island that has a General Plan Land Use Low Density Residential which is 2 units to 8 units per acre. Based on most Low Density area within the City, the density range is from 3.5 to 4.5 units per acre. ,

Sent to Public Works: October 3, 2006

Subject to SB 610? Yes

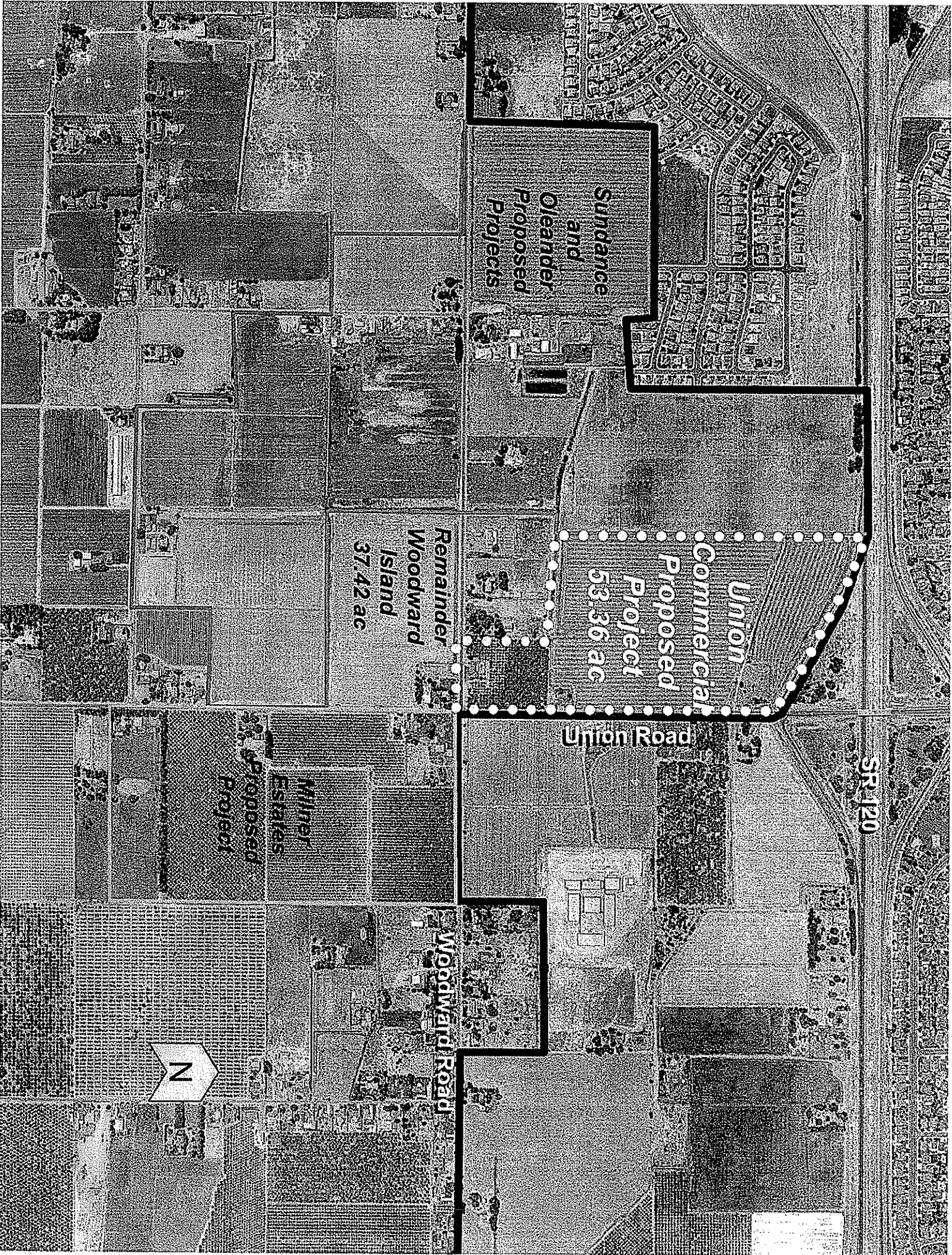
221? Yes

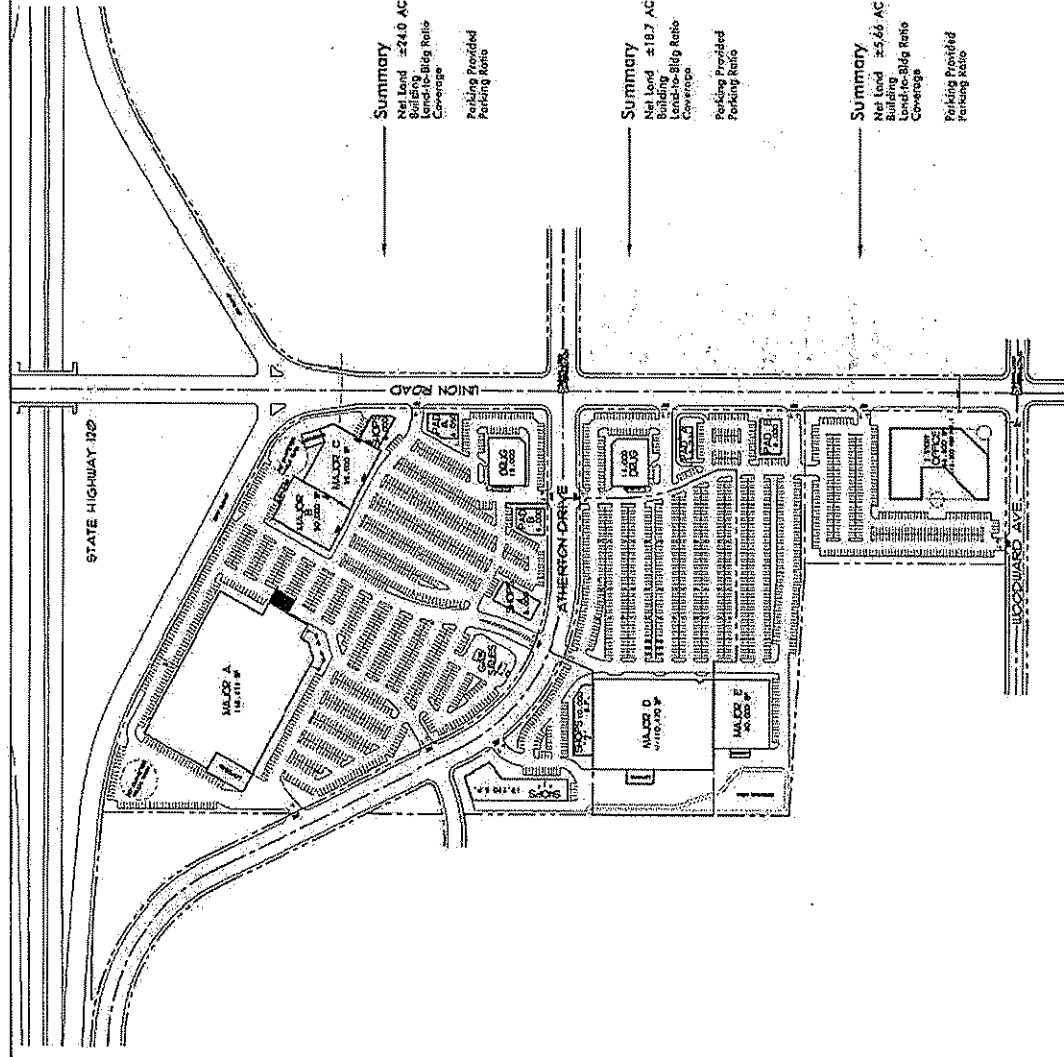
Needs City Council Action?

Went to Council: / /

Analysis Sent Back to Community Development: / /

Completed Date: / /





Summary
 Net Land ±24.0 AC ±1,043,974 SF
 Building ±25,600 SF
 Land-to-Bldg Ratio 24.4%
 Coverage 2.4%
 Parking Provided 1,408 stalls
 Parking Ratio 5.53/1000

Summary
 Net Land ±18.7 AC
 Building ±81,400 SF
 Land-to-Bldg Ratio 200,640 SF
 Coverage 2.99%
 Parking Provided 1,990 stalls
 Parking Ratio 5.36/1000

Summary
 Net Land ±24.6 AC
 Building ±24,600 SF
 Land-to-Bldg Ratio 1,847
 Coverage 35.11%
 Parking Provided 332 stalls
 Parking Ratio 4/1000

PRELIMINARY SITE PLAN - Scheme G1b

HIGHWAY 120 @ UNION RD
 MANTECA, CA.

DATE: 07/15/2019
 PROJECT: 2019-001

1000 S. BLANCKE BL. MANTECA, CA 95331
 510.841.2200 FAX 510.841.0113
 WWW.NATELARCH.COM



THIS PRELIMINARY SITE PLAN IS BASED ON THE INFORMATION PROVIDED BY THE CLIENT. THE CLIENT IS RESPONSIBLE FOR THE ACCURACY OF THE INFORMATION PROVIDED. THE ARCHITECT ASSUMES NO LIABILITY FOR THE ACCURACY OF THE INFORMATION PROVIDED. THE ARCHITECT ASSUMES NO LIABILITY FOR THE ACCURACY OF THE INFORMATION PROVIDED. THE ARCHITECT ASSUMES NO LIABILITY FOR THE ACCURACY OF THE INFORMATION PROVIDED.

ATTACHMENT 2

WATER SUPPLY SUFFICIENCY

APPENDIX C

Future Water Supply Scenarios for Normal and Dry Years

Year	Population	Average Year Water Production		Single Dry Year (5% Reduction)		Multiple Dry Year (10 Percent Reduction)	
		AF	per capita gpd	AF	per capita gpd	AF	per capita gpd
2000	49,258	12,609	229	11,974	217	11,312	205
2001	51,920	12,974	223	12,166	209	11,923	205
2002	54,975	13,516	219	13,117	213	12,440	202
2003	57,485	14,451	224	13,716	213	13,008	202
2004	59,439	14,933	224	14,183	213	13,450	202
2005	61,460	15,491	225	14,734	214	13,907	202
2006	63,550	16,018	225	15,235	214	14,380	202
2007	65,711	16,562	225	15,753	214	14,869	202
2008	67,945	17,125	225	16,288	214	15,375	202
2009	70,255	17,708	225	16,842	214	15,898	202
2010	72,644	18,310	225	17,415	214	16,438	202
2011	75,114	18,932	225	18,007	214	16,997	202
2012	77,668	19,576	225	18,619	214	17,575	202
2013	80,308	20,242	225	19,252	214	18,172	202
2014	83,039	20,930	225	19,907	214	18,790	202
2015	85,862	21,641	225	20,583	214	19,429	202
2016	88,781	22,377	225	21,283	214	20,090	202
2017	91,800	23,138	225	22,007	214	20,773	202
2018	94,921	23,925	225	22,755	214	21,478	202
2019	98,148	24,738	225	23,529	214	22,209	202
2020	101,485	25,579	225	24,329	214	22,964	202
2021	104,936	26,449	225	25,156	214	23,745	202
2022	108,504	27,348	225	26,011	214	24,553	202
2023	112,193	28,278	225	26,896	214	25,388	202
2024	116,007	29,240	225	27,810	214	26,251	202
2025	119,952	30,234	225	28,756	214	27,143	202
2026	124,030	31,262	225	29,733	214	28,066	202
2027	128,247	32,290	225	30,744	214	29,020	202
2028	132,607	32,290	217	31,789	214	30,007	202
2029	137,116	32,290	210	32,870	214	31,027	202
2030	141,778	32,290	203	33,988	214	32,082	202

New water supply added to maintain normal per capita demand at 225 gallons per day
Per Capita gpd

225 Average per capita demand from 2000 and 2004

214 5% Reduction in Per Capita Use in Single Dry Year

202 10% Reduction in Per Capita Use in Multiple Dry Year

3.40% Annual Population Increase

APPENDIX G

Detention Basin Design Calculations

Detention Basin Design Calculations

Per city of Manteca Storm Drain Design Criteria

Design Frequency = 10 Year

Runoff, R = 3.56 inches , 0.30 ft.

		C	I (ft)	A (ac)	V (ac-ft)	% of Total V
1	LDR OFF-SITE	0.3	0.3	12.28	1.11	5.52%
2	AKF Development	0.75	0.3	51.07	11.49	57.35%
3	AKF INFILTRATION AREA	0.1	0.3	0	0.00	0.00%
4	LDR RESIDENTIAL	0.3	0.3	40.88	3.68	18.36%
5	DETENTION BASIN	1	0.3	5.43	1.63	8.13%
6	MDR	0.45	0.3	7.76	1.05	5.23%
7	COMMERCIAL ON-SITE	0.75	0.3	4.82	1.08	5.41%
Total =				122.24	20.04	100%

Maximum Water Surface Elevation = **24 ft.**
 Basin Bottom Elevation = **20 ft.**
 Water Depth = **4 ft.**

Total Required Basin Storage Volume	20.04	ac-ft.	872779	cf.
Proposed Commercial Site Basin Volume =	4.62	ac-ft.	201247	cf.
Proposed Residential Site Basin Volume	15.42	ac-ft.	671532	cf.

Empty Basin in 48hrs **Qreq = 5.1 cfs.**
2267 gpm

Detention Basin Design Calculations

Per city of Manteca Storm Drain Design Criteria

AKF Development Overall

Design Frequency = 10 Year

Runoff, R = 3.56 inches , 0.30 ft.

AKF RETAIL DEVELOPMENT ONLY

AKF Development		C	I (ft)	A (ac)	V (ac-ft)	% of Total V
1	Roof Area	0.80	0.3	10.45	2.51	18.0%
2	Pavement	0.95	0.3	33.15	9.45	67.9%
3	Landscape	0.15	0.3	7.48	0.34	2.4%
5	DETENTION BASIN	1	0.3	5.43	1.63	11.7%
Total =				56.50	13.92	100%

Required Storage Volume = **13.92** ac-ft. **606351** cf.
 Maximum Water Surface Elevation = **26** ft.
 Basin Bottom Elevation = **22** ft.
 Water Depth = **4** ft.

Proposed Basin Volume = **20.04** ac-ft. **872942** cf.

Empty Basin in 48hrs **Qreq = 3.5** cfs.
1575 gpm

APPENDIX H

Traffic Modeling Data and
Fair-Share Calculations for Mitigation Recommended

APPENDIX H1

Traffic Modeling Data

Existing, No Project, AM

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Northbound
From/To: Jack Tone to Austin
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4555	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1265	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1805	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1805	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	28.3	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: SR-99 Northbound
 From/To: Austin to SR-120
 Jurisdiction:
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4351	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1209	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1724	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1724	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	26.8	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Northbound
From/To: SR-120 to Yosemite
Jurisdiction:
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3009	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	836	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1192	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1192	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	18.3	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: _____ Fax: _____
 E-mail: _____

 Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: SR-99 Northbound
 From/To: Yosemite to Louise
 Jurisdiction: City of Manteca
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

 Flow Inputs and Adjustments

Volume, V	2700	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	750	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1605	pc/h/ln

 Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

 LOS and Performance Measures

Flow rate, vp	1605	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	2	
Density, D	24.7	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: _____ Fax: _____
 E-mail: _____

 Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: SR-99 Southbound
 From/To: Louise to Yosemite
 Jurisdiction: City of Manteca
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

 Flow Inputs and Adjustments

Volume, V	2700	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	750	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1605	pc/h/ln

 Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

 LOS and Performance Measures

Flow rate, vp	1605	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	2	
Density, D	24.7	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: SR-99 Southbound
 From/To: Yosemite to SR-120
 Jurisdiction: City of Manteca
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3235	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	899	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1923	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1923	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.6	mi/h
Number of lanes, N	2	
Density, D	30.7	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: SR-120 to Austin
Jurisdiction:
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4119	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1144	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1632	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1632	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	25.2	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: Austin to Jack Tone
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4256	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1182	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1687	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1687	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	26.1	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: I-5 to Yosemite
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	1941	veh/h
Peak-hour factor, PHF	0.97	
Peak 15-min volume, v15	500	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1071	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

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	2	
Density, D	16.5	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Yosemite to Aiport
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	1904	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	517	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1087	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1087	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	16.7	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Airport to Union
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	1982	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	539	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1131	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1131	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	17.4	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Union to Main
Jurisdiction:
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2097	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	570	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1197	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1197	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.4	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Main to SR 99
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	1984	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	539	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1132	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1132	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	17.4	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: SR 99 to Main
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2442	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	664	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1394	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

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	2	
Density, D	21.4	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Yosemite to I-5
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2984	veh/h
Peak-hour factor, PHF	0.93	
Peak 15-min volume, v15	802	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1685	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1685	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.6	mi/h
Number of lanes, N	2	
Density, D	26.1	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Main to Union
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2652	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	721	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1513	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1513	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	23.3	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: SR 120 Westbound
 From/To: Union to Airport
 Jurisdiction: City of Manteca
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2777	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	755	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1585	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1585	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	2	
Density, D	24.4	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Airport to Yosemite
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2974	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	808	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1697	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1697	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.6	mi/h
Number of lanes, N	2	
Density, D	26.3	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: _____ Fax: _____
E-mail: _____

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1904	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	114	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
Volume, V (vph)	1904	114	vph
Peak-hour factor, PHF	0.92	0.80	
Peak 15-min volume, v15	517	36	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2173	146	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 1.000 Using Equation 0

$$v = v_R + (v_F - v_R) P = 2173 \text{ pc/h}$$

Capacity Checks

$v = v_F$	Actual 2173	Maximum 4700	LOS F? No
$v = v_F - v_{FO}$	2027	4700	No
v_R	146	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700 \text{ pc/h}$?		No	
Is $v_{3 \text{ or } av34} > 1.5 v_R / 2$	12	No	
If yes, $v_{12A} =$		(Equation 25-18)	

Flow Entering Diverge Influence Area

v_{12}	Actual 2173	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D = 21.6 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable, S_R	$D = 0.441$
Space mean speed in ramp influence area, S_R	$S = 54.9 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = \text{N/A} \text{ mph}$
Space mean speed for all vehicles, S_0	$S = 54.9 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/2008
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1790	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	192	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	1790	192	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	486	52	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2043	214	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 1.000 Using Equation 0

$$v = v_{FM} = \frac{P}{F} = \frac{2043}{12} = 170.25 \text{ pc/h}$$

Capacity Checks

Actual	Maximum	LOS F?
2257	4700	No
Is $v_{FO} > 2700$ pc/h? (Equation 25-4 or 25-5)		
No		
Is $v_{FO} > 1.5 v_{12} / 2$ (Equation 25-8)?		
No		

Flow Entering Merge Influence Area

Actual	Max Desirable	Violation?
2043	4400	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 19.8 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$M = 0.323$
Space mean speed in ramp influence area, S_R	$S_R = 57.6 \text{ mph}$
Space mean speed in outer lanes, S_0	$S_0 = N/A \text{ mph}$
Space mean speed for all vehicles, S	$S = 57.6 \text{ mph}$

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Phone: _____ Fax: _____
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Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1982	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	130	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
Volume, V (vph)	1982	130	vph
Peak-hour factor, PHF	0.92	0.80	
Peak 15-min volume, v15	539	41	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2262	167	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 1.000 Using Equation 0

$$v = v_R + (v_F - v_R) P = 2262 \text{ pc/h}$$

Capacity Checks

$v = v_F$	Actual 2262	Maximum 4700	LOS F? No
$v = v_F - v_{FO}$	2095	4700	No
v_R	167	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700 \text{ pc/h}$?		No	
Is $v_{3 \text{ or } av34} > 1.5 v_R / 2$		No	
If yes, $v_{12A} =$		(Equation 25-18)	

Flow Entering Diverge Influence Area

v_{12}	Actual 2262	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D = 22.4 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable, S_R	$D = 0.443$
Space mean speed in ramp influence area, S_R	$S = 54.8 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = \text{N/A} \text{ mph}$
Space mean speed for all vehicles, S_0	$S = 54.8 \text{ mph}$

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Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/2008
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1852	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	245	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	1852	245	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	503	67	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2114	273	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_{FM} (P_{FM}) = 2114 \text{ pc/h}$$

Capacity Checks

v_{FO}	Actual 2387	Maximum 4700	LOS F? No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34} > 2700 \text{ pc/h?}$		No	
Is $v_{3 \text{ or } av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} =$		(Equation 25-8)	

Flow Entering Merge Influence Area

v_{12}	Actual 2114	Max Desirable 4400	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 20.8 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S_R	$M = 0.328$
Space mean speed in ramp influence area, S_R	$S = 57.4 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = \text{N/A} \text{ mph}$
Space mean speed for all vehicles, S	$S = 57.4 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2777	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	207	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
Volume, V (vph)	2777	207	vph
Peak-hour factor, PHF	0.92	0.95	
Peak 15-min volume, v15	755	54	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3169	223	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 1.000 Using Equation 0

$$v = v + (v - v) P = 3169 \text{ pc/h}$$

$$12 \quad R \quad F \quad R \quad FD$$

Capacity Checks

$v = v$	Actual	Maximum	LOS F?
$F_i \quad F$	3169	4700	No
$v = v - v$	2946	4700	No
$FO \quad F \quad R$			
v	223	2000	No
R			
$v \quad v$	0 pc/h	(Equation 25-15 or 25-16)	
3 or av_{34}			
Is $v \quad v > 2700 \text{ pc/h?}$		No	
3 or av_{34}			
Is $v \quad v > 1.5 \quad v / 2$		No	
3 or av_{34}	12		
If yes, $v =$		(Equation 25-18)	
12A			

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v	3169	4600	No
12			!

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 \quad v - 0.009 \quad L = 30.2 \text{ pc/mi/ln}$

$$R \quad 12 \quad D$$

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

Speed Estimation

Intermediate speed variable,	$D = 0.448$
S	
Space mean speed in ramp influence area,	$S = 54.7 \text{ mph}$
R	
Space mean speed in outer lanes,	$S = \text{N/A} \text{ mph}$
0	
Space mean speed for all vehicles,	$S = 54.7 \text{ mph}$

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge
Number of lanes in freeway	2
Free-flow speed on freeway	65.0 mph
Volume on freeway	2570 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	404 vph
Length of first accel/decel lane	500 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)	2570	404	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	698	110	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2933	450	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_{FM} (P_{FM}) = 2933 \text{ pc/h}$$

Capacity Checks

v_{FO}	Actual 3383	Maximum 4700	LOS F? No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34} > 2700 \text{ pc/h?}$		No	
Is $v_{3 \text{ or } av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} =$		(Equation 25-8)	

Flow Entering Merge Influence Area

v_{12}	Actual 2933	Max Desirable 4400	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 28.5 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S_R	$M = 0.401$
Space mean speed in ramp influence area, S_R	$S = 55.8 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = \text{N/A} \text{ mph}$
Space mean speed for all vehicles, S	$S = 55.8 \text{ mph}$

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Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2382	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	395	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	2382	395	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	647	107	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2719	440	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_{FM} (P_{FM}) = 2719 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v	3159	4700	No
FO			
v v	0 pc/h	(Equation 25-4 or 25-5)	
3 or av34			
Is v v > 2700 pc/h?		No	
3 or av34			
Is v v > 1.5 v /2		No	
3 or av34 12			
If yes, v =		(Equation 25-8)	
12A			

Flow Entering Merge Influence Area

v_{12}	Actual 2719	Max Desirable 4400	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 26.8 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S_R	$M = 0.378$
Space mean speed in ramp influence area, S_R	$S = 56.3 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = \text{N/A} \text{ mph}$
Space mean speed for all vehicles, S_0	$S = 56.3 \text{ mph}$

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Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge
Number of lanes in freeway	2
Free-flow speed on freeway	65.0 mph
Volume on freeway	2452 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	270 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)	2452	270	vph
Peak-hour factor, PHF	0.92	0.95	
Peak 15-min volume, v15	666	71	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2798	291	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 1.000 Using Equation 0

$$v = v + (v - v) P = 2798 \text{ pc/h}$$

$$12 \quad R \quad F \quad R \quad FD$$

Capacity Checks

$v = v$	Actual	Maximum	LOS F?
$F_i \quad F$	2798	4700	No
$v = v - v$	2507	4700	No
$FO \quad F \quad R$			
v	291	2000	No
R			
$v \quad v$	0 pc/h	(Equation 25-15 or 25-16)	
3 or av_{34}			
Is $v \quad v > 2700 \text{ pc/h?}$		No	
3 or av_{34}			
Is $v \quad v > 1.5 \quad v / 2$		No	
3 or av_{34}	12		
If yes, $v =$		(Equation 25-18)	
12A			

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v	2798	4600	No
12			!

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 \quad v - 0.009 \quad L = 27.0 \text{ pc/mi/ln}$

$$R \quad 12 \quad D$$

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

Speed Estimation

Intermediate speed variable,	$D = 0.454$
S	
Space mean speed in ramp influence area,	$S = 54.6 \text{ mph}$
R	
Space mean speed in outer lanes,	$S = \text{N/A} \text{ mph}$
0	
Space mean speed for all vehicles,	$S = 54.6 \text{ mph}$

Leisch Method for Weaving Analysis

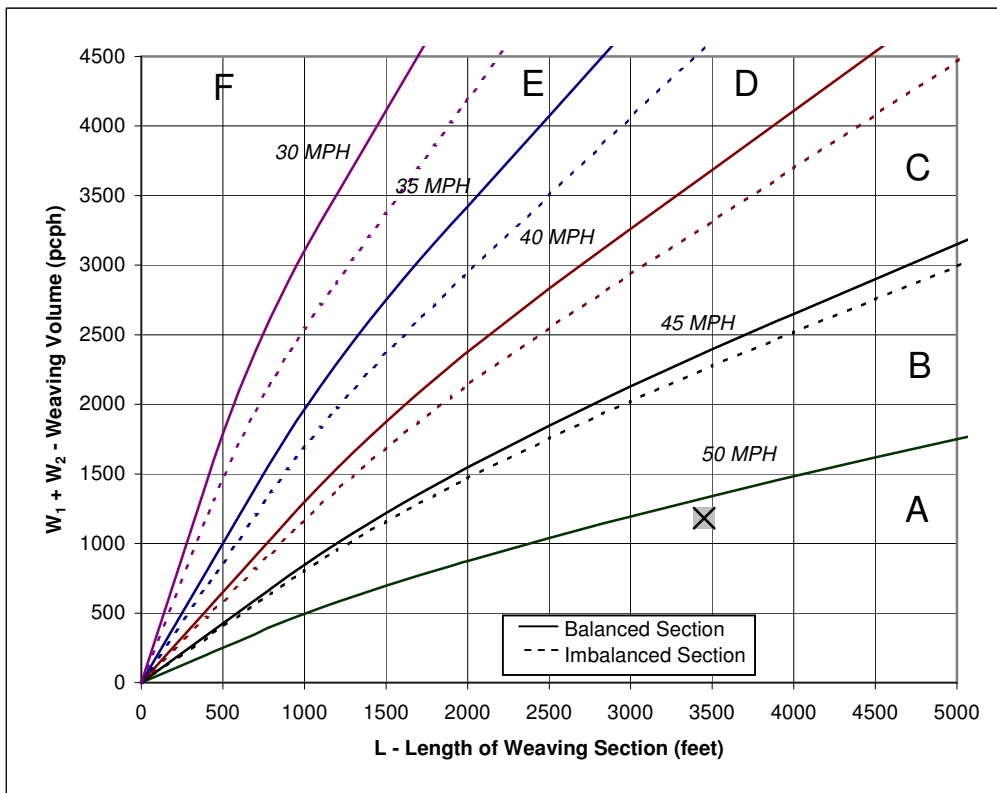
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,450

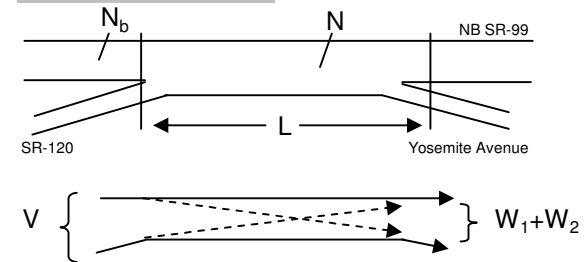
Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	3,009	Volume (vph)*	275	Volume (vph)*	357
Truck Percentage	14%	Truck Percentage	10%	Truck Percentage	6%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	3,220	Volume (pcph)	550	Volume (pcph)	632

Project Information

Project	Union Crossing
Scenario	EXISTING NO PROJECT - AM
Freeway	NB SR-99
On-ramp	SR-120
Off-ramp	Yosemite Avenue



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? **Y**
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

45 mph and **50 mph**

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

3. Interpolated Weaving Speed (S_w , mph)	50.7
4. Weaving Intensity Factor (k)	1.00
5. Service Volume (SV, pcph) $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	1,073
6. Level of Service (LOS)	C

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF)**. The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Leisch Method for Weaving Analysis

Data Input

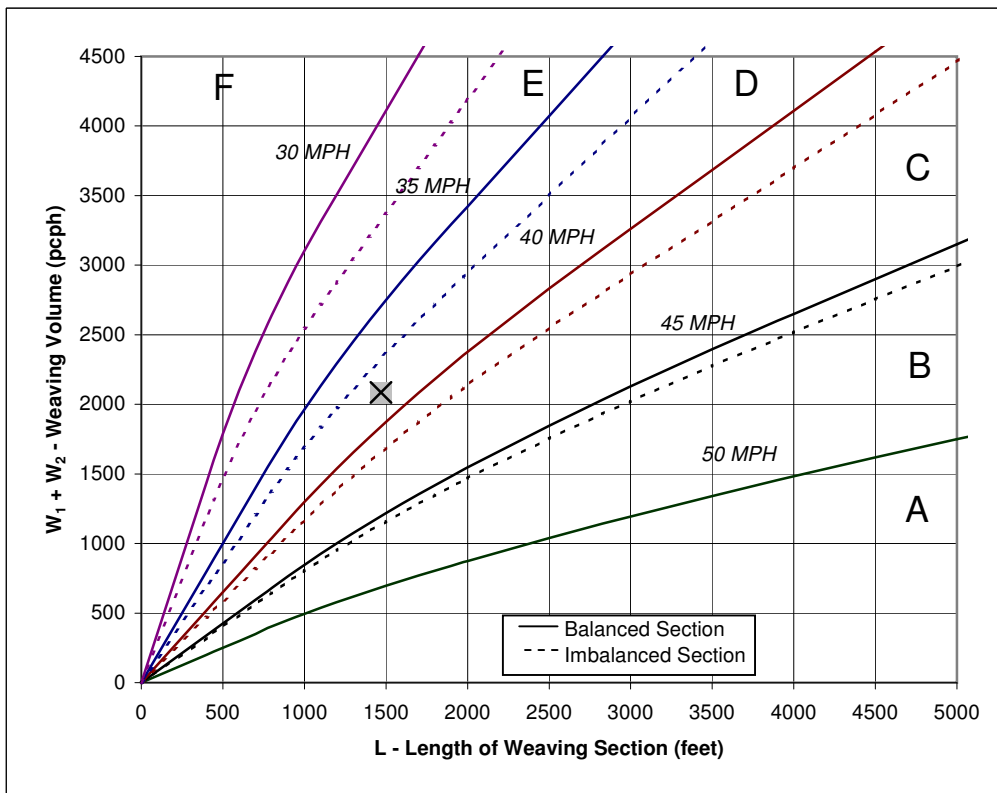
Number of Entering Mainline Lanes	N_b	3
Number of Lanes in Weaving Section	N	4
Length of Weaving Section (feet)	L	1,470

Project Information

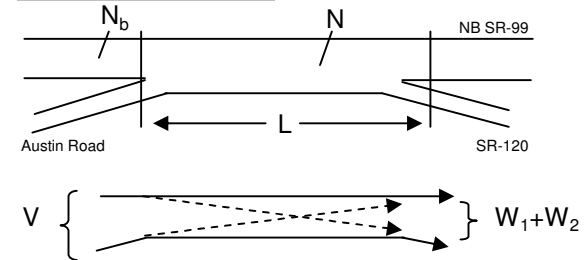
Project	Union Crossing
Scenario	EXISTING NO PROJECT - AM
Freeway	NB SR-99
On-ramp	Austin Road
Off-ramp	SR-120

Total Weaving Section (V)	On-ramp to Mainline (W_1)	Mainline to Off-ramp (W_2)
Volume (vph)*	4,351	96
Truck Percentage	14%	6%
PCE for Trucks	1.5	1.5
Volume (pcph)	4,656	99

Volume (vph)*	1,892
Truck Percentage	10%
PCE for Trucks	1.5
Volume (pcph)	1,987



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? **Y**
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

35 MPH and **40 MPH**

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

3. Interpolated Weaving Speed (S_w , mph)	38.6
4. Weaving Intensity Factor (k)	3.00
5. Service Volume (SV, pcph) $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	1,213
6. Level of Service (LOS)	C

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF)**. The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Leisch Method for Weaving Analysis

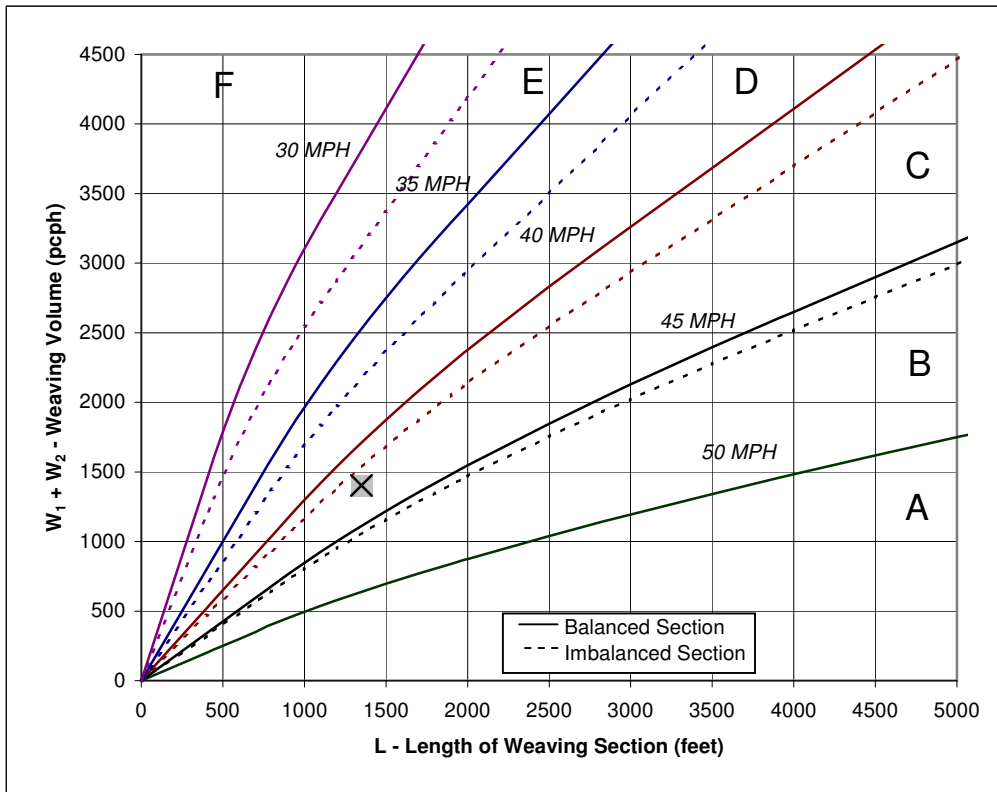
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	1,350

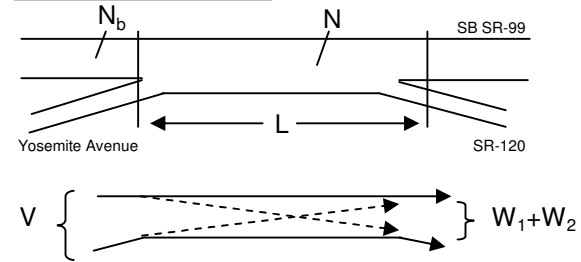
Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	3,235	Volume (vph)*	796	Volume (vph)*	550
Truck Percentage	14%	Truck Percentage	10%	Truck Percentage	6%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	3,461	Volume (pcph)	836	Volume (pcph)	567

Project Information

Project	Union Crossing
Scenario	EXISTING NO PROJECT - AM
Freeway	SB SR-99
On-ramp	Yosemite Avenue
Off-ramp	SR-120



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? n
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

40 mph and 45 mph

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

- Interpolated Weaving Speed (S_w , mph) 41.4
- Weaving Intensity Factor (k) 2.40
- Service Volume (SV, pcph)
 $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$ 1,418
- Level of Service (LOS) D

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Major Street Airport Way
 Minor Street SR 120 EB

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour AM

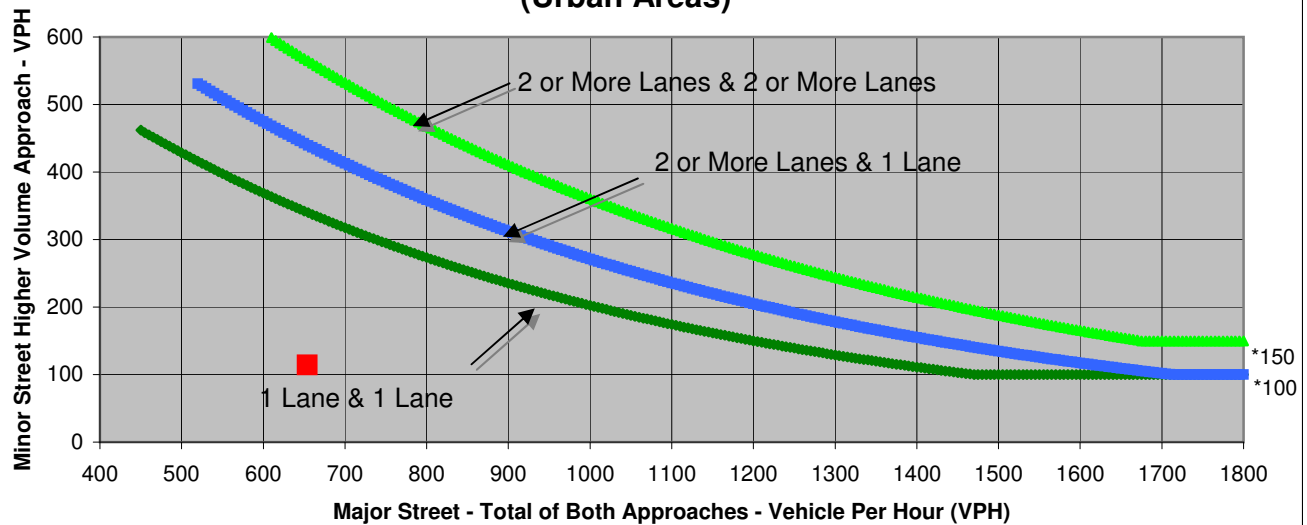
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	100	104	0
Through	323	139	0	0
Right	92	0	10	0
Total	415	239	114	0

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street SR 120 EB	<u>Warrant Met</u>
Number of Approach Lanes	2	1	<u>NO</u>
Traffic Volume (VPH) *	654	114	

* 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 Airport Way
 Minor Street SR 120 WB

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour AM

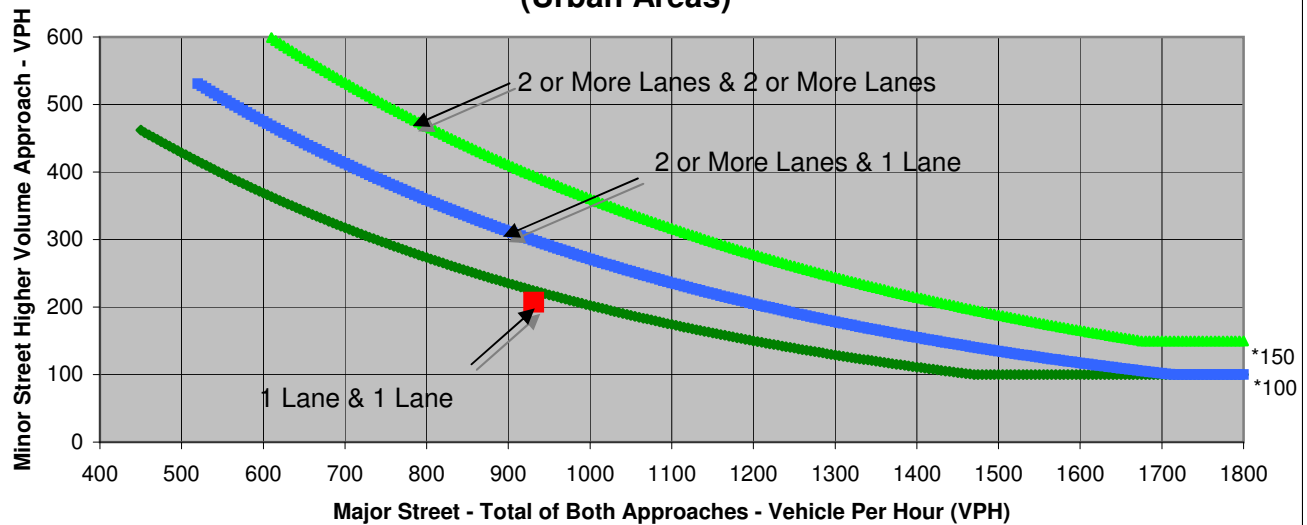
Turn Movement Volumes

	NB	SB	EB	WB
Left	109	0	0	30
Through	318	209	0	0
Right	0	295	0	177
Total	427	504	0	207

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street SR 120 WB	<u>Warrant Met</u>
Number of Approach Lanes	2	1	<u>NO</u>
Traffic Volume (VPH) *	931	207	

* 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 Airport Way
 Minor Street Wawona Street

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour AM

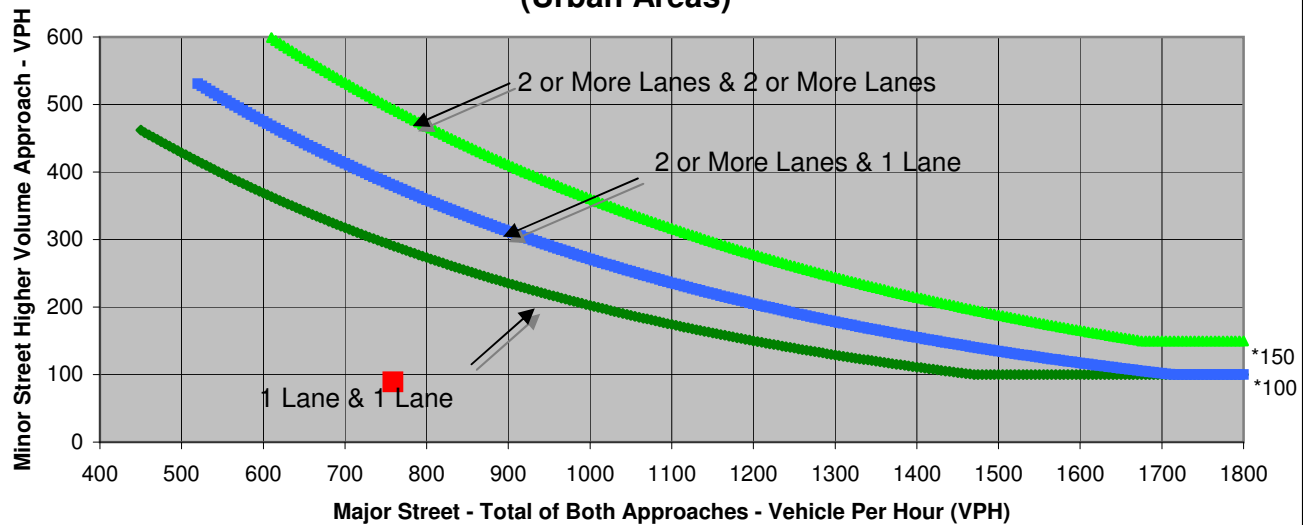
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	39	0	49
Through	320	320	0	0
Right	80	0	0	40
Total	400	359	0	89

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Wawona Street	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	759	89	

* 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 Airport Way
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour AM

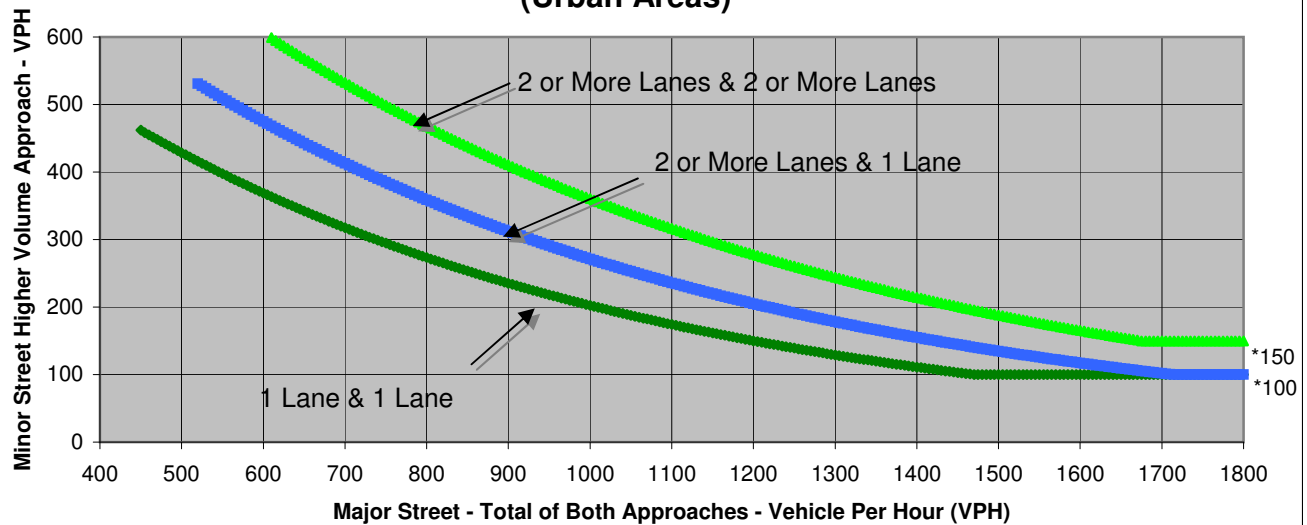
Turn Movement Volumes

	NB	SB	EB	WB
Left	13	30	45	1
Through	121	70	18	15
Right	3	38	19	22
Total	137	138	82	38

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Woodward Avenue	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	275	82	

* 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 Main Street
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour AM

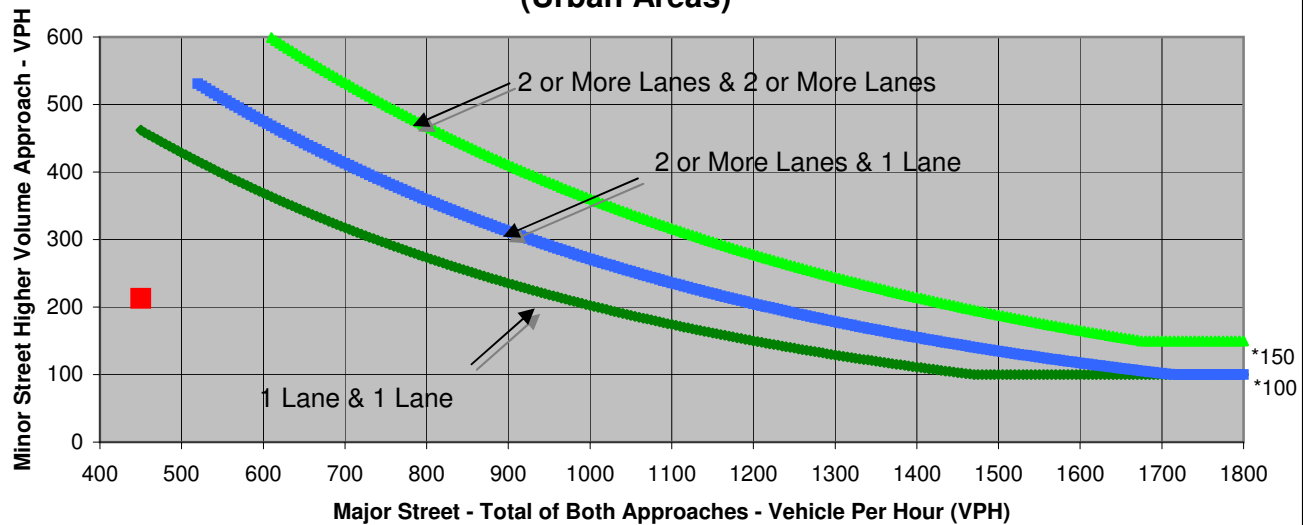
Turn Movement Volumes

	NB	SB	EB	WB
Left	34	53	18	7
Through	233	84	44	69
Right	12	34	27	137
Total	279	171	89	213

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Main Street	Woodward Avenue	
Number of Approach Lanes	2	2	<u>NO</u>
Traffic Volume (VPH) *	450	213	

* 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 Union Road
 Minor Street Atherton Drive

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour AM

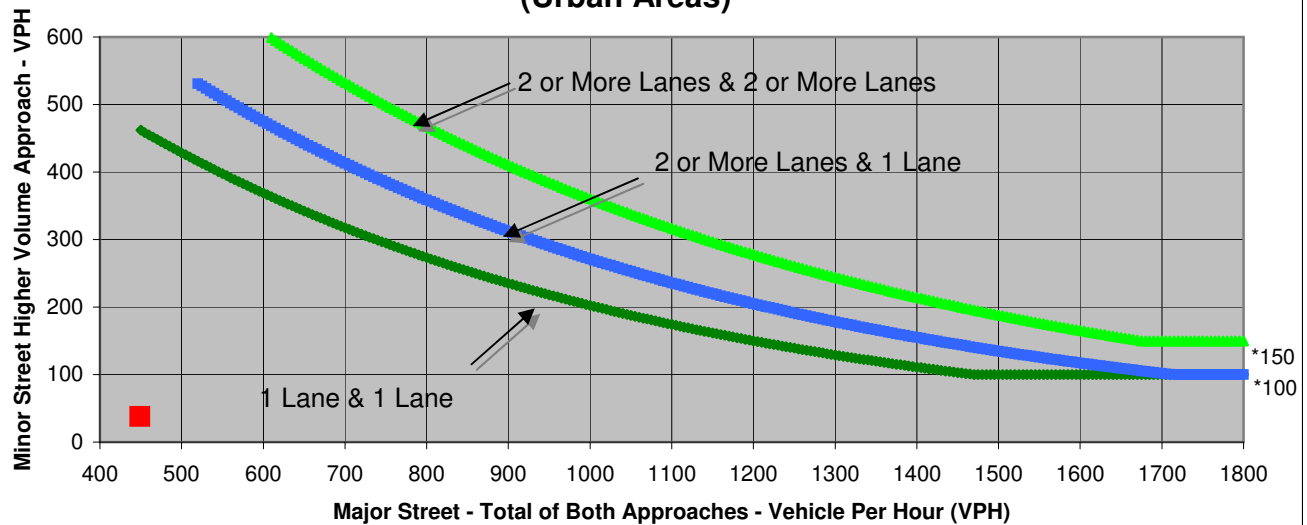
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	38	0	0
Through	227	182	0	0
Right	2	0	0	38
Total	229	220	0	38

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Union Road	Minor Street Atherton Drive	<u>Warrant Met</u>
Number of Approach Lanes	3	3	<u>NO</u>
Traffic Volume (VPH) *	449	38	

* 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 Union Road
 Minor Street Daniels Street

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour AM

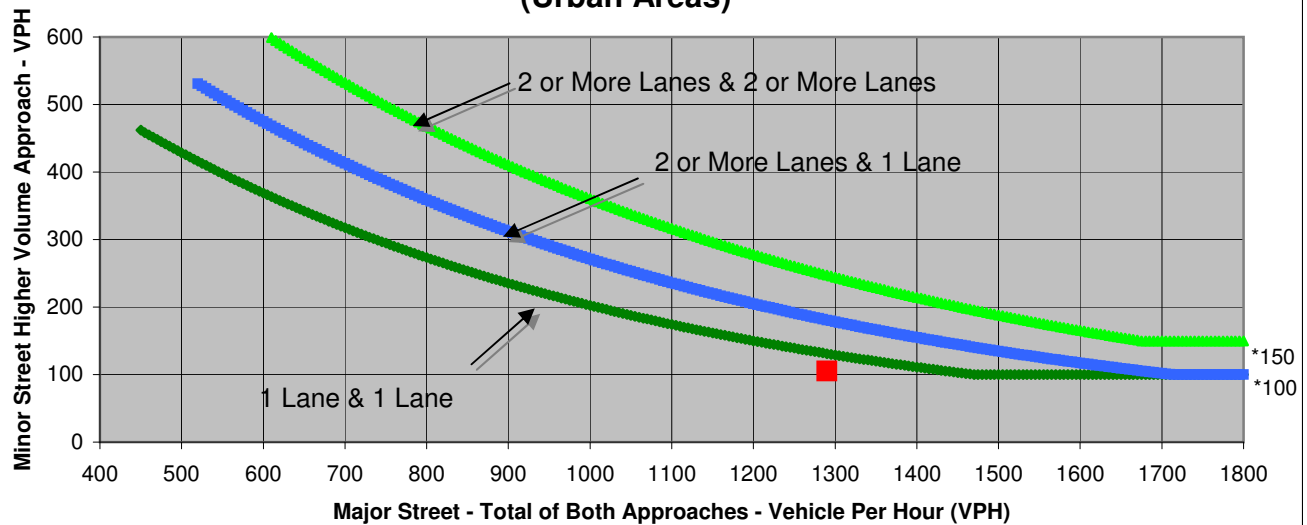
Turn Movement Volumes

	NB	SB	EB	WB
Left	45	0	35	0
Through	525	695	0	0
Right	0	25	70	0
Total	570	720	105	0

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Union Road	Minor Street Daniels Street	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	1,290	105	

* 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 Union Road
 Minor Street SR 120 EB

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour AM

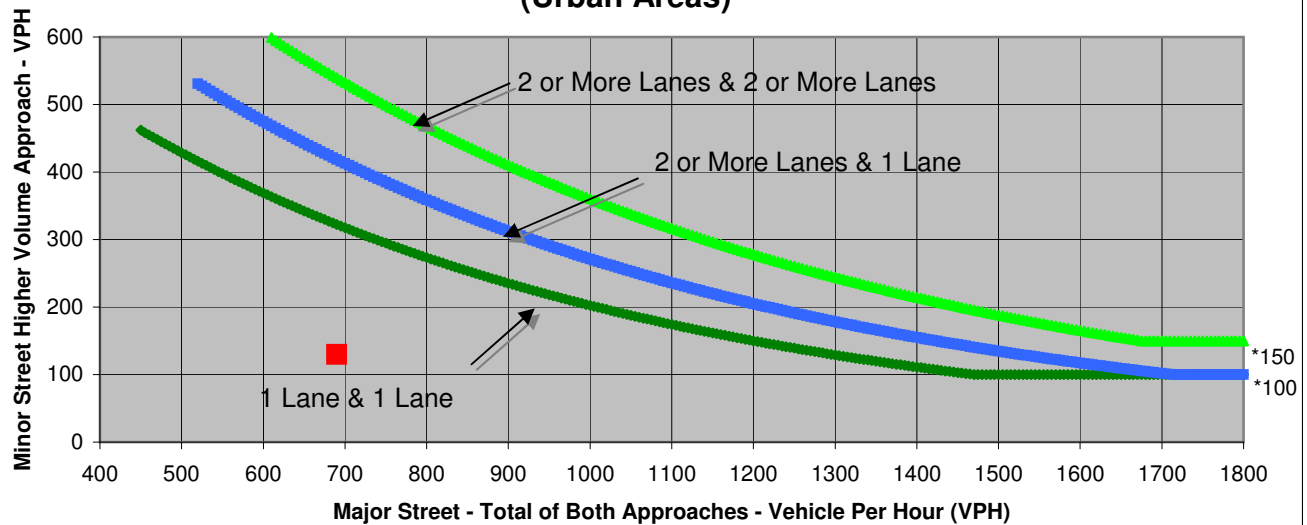
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	215	120	0
Through	235	210	0	0
Right	30	0	10	0
Total	265	425	130	0

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Union Road	SR 120 EB	
Number of Approach Lanes	2	1	<u>NO</u>
Traffic Volume (VPH) *	690	130	

* 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 Union Road
 Minor Street SR 120 WB

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour AM

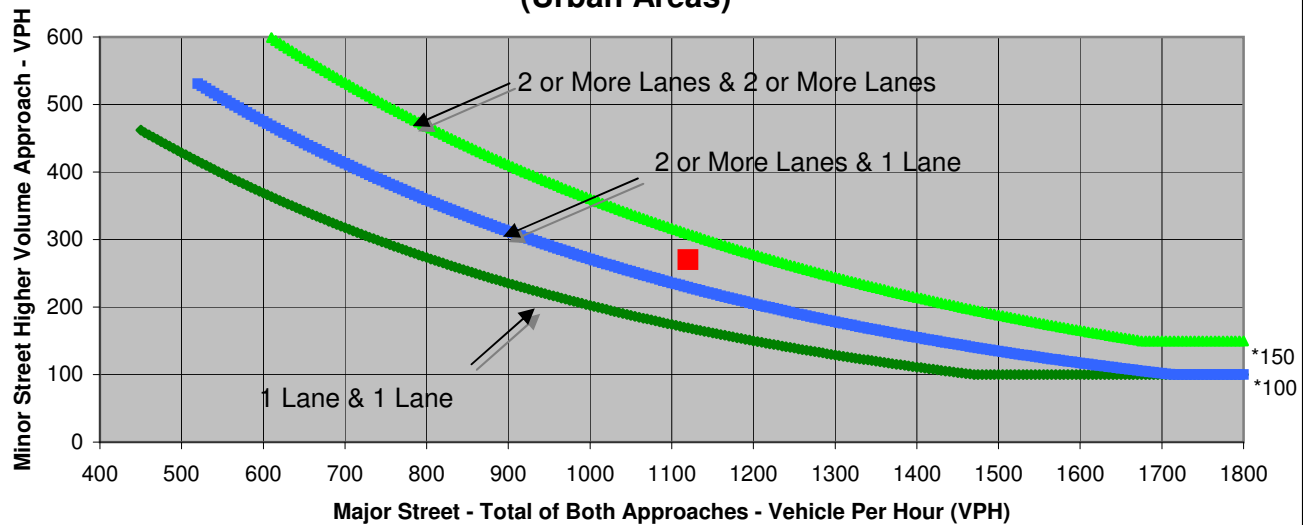
Turn Movement Volumes

	NB	SB	EB	WB
Left	30	0	0	25
Through	325	400	0	0
Right	0	365	0	245
Total	355	765	0	270

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Union Road	SR 120 WB	
Number of Approach Lanes	2	2	<u>NO</u>
Traffic Volume (VPH) *	1,120	270	

* 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 Union Road
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour AM

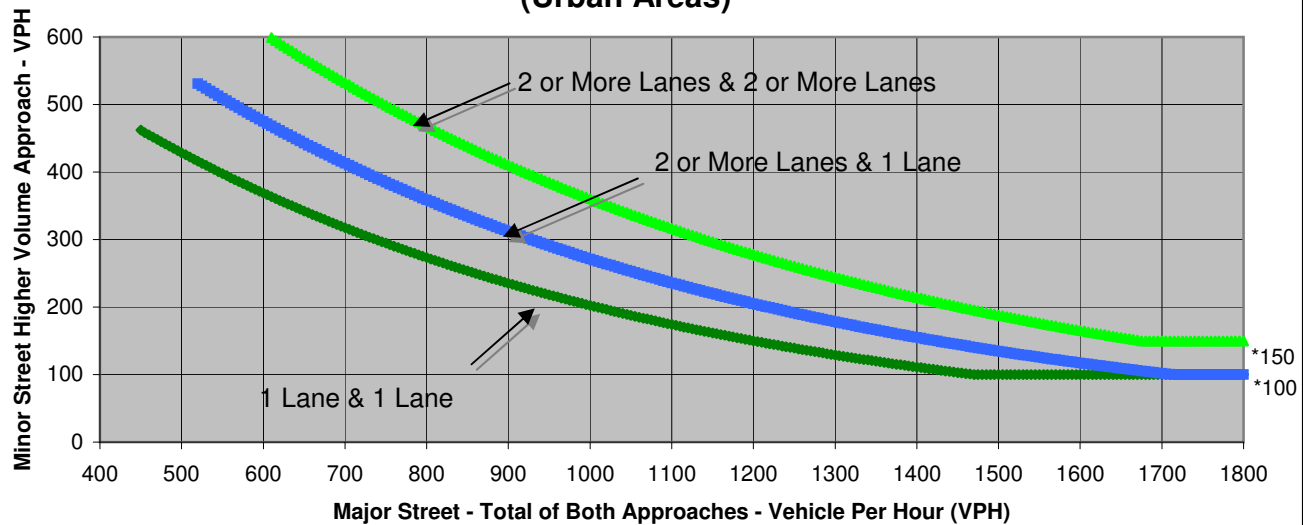
Turn Movement Volumes

	NB	SB	EB	WB
Left	2	28	7	36
Through	169	150	41	35
Right	28	4	4	53
Total	199	182	52	124

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Union Road	Woodward Avenue	
Number of Approach Lanes	2	2	<u>NO</u>
Traffic Volume (VPH) *	381	124	

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

HCM Signalized Intersection Capacity Analysis

1: Yosemite Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.99		1.00	0.93		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3494		1770	3283		1770	1827	1583	1770	1788	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3494		1770	3283		1770	1827	1583	1770	1788	
Volume (vph)	37	219	20	101	157	147	69	197	94	205	238	47
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	40	238	22	110	171	160	77	219	104	216	251	49
RTOR Reduction (vph)	0	7	0	0	129	0	0	0	64	0	5	0
Lane Group Flow (vph)	40	253	0	110	202	0	77	219	40	216	295	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	4.6	12.3		8.7	16.4		7.4	33.2	33.2	15.1	40.9	
Effective Green, g (s)	4.6	12.3		8.7	16.4		7.4	33.2	33.2	15.1	40.9	
Actuated g/C Ratio	0.05	0.14		0.10	0.19		0.09	0.39	0.39	0.18	0.48	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	95	504		181	631		154	711	616	313	857	
v/s Ratio Prot	0.02	c0.07		c0.06	0.06		0.04	0.12		c0.12	c0.16	
v/s Ratio Perm									0.03			
v/c Ratio	0.42	0.50		0.61	0.32		0.50	0.31	0.07	0.69	0.34	
Uniform Delay, d1	39.1	33.7		36.7	29.6		37.2	18.1	16.3	32.9	13.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.0	0.8		5.7	0.3		2.5	1.1	0.2	6.4	1.1	
Delay (s)	42.1	34.5		42.3	29.9		39.7	19.2	16.5	39.3	14.9	
Level of Service	D	C		D	C		D	B	B	D	B	
Approach Delay (s)		35.5			33.0			22.5			25.1	
Approach LOS		D			C			C			C	
Intersection Summary												
HCM Average Control Delay			28.5			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			85.3			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			47.5%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Wawona St. & Airport Way

1/5/2009

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Volume (veh/h)	49	40	320	80	39	320			
Peak Hour Factor	0.85	0.85	0.90	0.90	0.95	0.95			
Hourly flow rate (vph)	58	47	356	89	41	337			
Pedestrians	2					2			
Lane Width (ft)	12.0					12.0			
Walking Speed (ft/s)	4.0					4.0			
Percent Blockage	0					0			
Right turn flare (veh)									
Median type	None								
Median storage veh									
Upstream signal (ft)	1313								
pX, platoon unblocked	0.88	0.88			0.88				
vC, conflicting volume	821	404			446				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	797	323			372				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	81	93			96				
cM capacity (veh/h)	300	630			1044				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	105	444	378						
Volume Left	58	0	41						
Volume Right	47	89	0						
cSH	393	1700	1044						
Volume to Capacity	0.27	0.26	0.04						
Queue Length 95th (ft)	26	0	3						
Control Delay (s)	17.5	0.0	1.3						
Lane LOS	C		A						
Approach Delay (s)	17.5	0.0	1.3						
Approach LOS	C								
Intersection Summary									
Average Delay	2.5								
Intersection Capacity Utilization	56.5%		ICU Level of Service		B				
Analysis Period (min)	15								

HCM Signalized Intersection Capacity Analysis

3: Daniels Street & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1561	1770	1863	1562	1770	3471	1548	1770	1827	1548
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1561	1770	1863	1562	1770	3471	1548	1770	1827	1548
Volume (vph)	27	9	67	141	25	16	68	357	70	9	296	64
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	32	11	79	166	29	19	76	397	78	9	312	67
RTOR Reduction (vph)	0	0	58	0	0	14	0	0	48	0	0	47
Lane Group Flow (vph)	32	11	21	166	29	5	76	397	30	9	312	20
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	pm+ov		Prot	Perm		Prot	Perm		Prot	Perm	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	6.8	10.6	16.5	11.1	14.9	14.9	5.9	23.6	23.6	0.7	18.4	18.4
Effective Green, g (s)	6.8	10.6	16.5	11.1	14.9	14.9	5.9	23.6	23.6	0.7	18.4	18.4
Actuated g/C Ratio	0.11	0.17	0.27	0.18	0.24	0.24	0.10	0.38	0.38	0.01	0.30	0.30
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	377	319	516	317	448	375	168	1321	589	20	542	459
v/s Ratio Prot	0.01	0.01	0.00	c0.09	c0.02		c0.04	0.11		0.01	c0.17	
v/s Ratio Perm			0.01			0.00			0.02			0.01
v/c Ratio	0.08	0.03	0.04	0.52	0.06	0.01	0.45	0.30	0.05	0.45	0.58	0.04
Uniform Delay, d1	24.8	21.4	16.9	23.1	18.2	17.9	26.5	13.4	12.1	30.5	18.5	15.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.01	0.99	0.93	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.0	0.0	1.6	0.1	0.0	1.9	0.1	0.0	15.3	1.5	0.0
Delay (s)	24.9	21.5	16.9	24.6	18.2	18.0	28.7	13.4	11.3	45.7	20.0	15.6
Level of Service	C	C	B	C	B	B	C	B	B	D	B	B
Approach Delay (s)		19.4			23.2			15.2			19.8	
Approach LOS		B			C			B			B	
Intersection Summary												
HCM Average Control Delay			18.4				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.40									
Actuated Cycle Length (s)			62.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			45.1%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

4: SR 120 WB & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	0	0	0	30	0	177	109	318	0	0	209	295
Peak Hour Factor	0.25	0.25	0.25	0.65	0.65	0.65	0.80	0.80	0.80	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	0	46	0	272	136	398	0	0	232	328
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)											494	
pX, platoon unblocked	0.86	0.86	0.86	0.86	0.86		0.86					
vC, conflicting volume	1338	1066	396	1066	1230	398	560				398	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1393	1077	298	1077	1267	398	489				398	
tC, single (s)	7.1	6.5	6.2	*6.4	6.5	6.3	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2				2.2	
p0 queue free %	100	100	100	75	100	57	85				100	
cM capacity (veh/h)	53	161	638	186	124	639	925				1161	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1								
Volume Total	318	136	398	560								
Volume Left	46	136	0	0								
Volume Right	272	0	0	328								
cSH	473	925	1700	1700								
Volume to Capacity	0.67	0.15	0.23	0.33								
Queue Length 95th (ft)	123	13	0	0								
Control Delay (s)	27.0	9.6	0.0	0.0								
Lane LOS	D	A										
Approach Delay (s)	27.0	2.4		0.0								
Approach LOS	D											
Intersection Summary												
Average Delay	7.0											
Intersection Capacity Utilization	57.7%			ICU Level of Service			B					
Analysis Period (min)	15											

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

5: SR 120 EB & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	104	0	10	0	0	0	0	323	92	100	139	0
Peak Hour Factor	0.90	0.90	0.90	0.25	0.25	0.25	0.90	0.90	0.90	0.80	0.80	0.80
Hourly flow rate (vph)	116	0	11	0	0	0	0	359	102	125	174	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	834	885	174	845	834	410	174			461		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	834	885	174	845	834	410	174			461		
tC, single (s)	*6.5	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	61	100	99	100	100	100	100			88		
cM capacity (veh/h)	299	251	870	254	269	642	1403			1069		
Direction, Lane #	EB 1	NB 1	SB 1	SB 2								
Volume Total	127	461	125	174								
Volume Left	116	0	125	0								
Volume Right	11	102	0	0								
cSH	318	1700	1069	1700								
Volume to Capacity	0.40	0.27	0.12	0.10								
Queue Length 95th (ft)	46	0	10	0								
Control Delay (s)	23.7	0.0	8.8	0.0								
Lane LOS	C		A									
Approach Delay (s)	23.7	0.0	3.7									
Approach LOS	C											
Intersection Summary												
Average Delay			4.6									
Intersection Capacity Utilization			57.7%	ICU Level of Service	B							
Analysis Period (min)			15									

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

6: Atherton Dr & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	147	2	3	3	1	87	5	181	2	22	101	26
Peak Hour Factor	0.85	0.85	0.85	0.75	0.75	0.75	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	173	2	4	4	1	116	6	226	2	28	126	32
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			14				14					
Median type	None						None					
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	479	422	126	423	452	226	159			229		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	479	422	126	423	452	226	159			229		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	59	100	100	99	100	86	100			98		
cM capacity (veh/h)	417	510	924	527	490	813	1421			1339		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3			
Volume Total	179	4	117	6	226	2	28	126	32			
Volume Left	173	4	0	6	0	0	28	0	0			
Volume Right	4	0	116	0	0	2	0	0	32			
cSH	427	527	822	1421	1700	1700	1339	1700	1700			
Volume to Capacity	0.42	0.01	0.14	0.00	0.13	0.00	0.02	0.07	0.02			
Queue Length 95th (ft)	51	1	12	0	0	0	2	0	0			
Control Delay (s)	19.4	11.9	10.2	7.5	0.0	0.0	7.7	0.0	0.0			
Lane LOS	C	B	B	A			A					
Approach Delay (s)	19.4	10.2		0.2			1.1					
Approach LOS	C	B										
Intersection Summary												
Average Delay			6.9									
Intersection Capacity Utilization			37.8%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

7: Woodward Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Stop			Stop		
Volume (vph)	45	18	19	1	15	22	13	121	3	30	70	38
Peak Hour Factor	0.60	0.60	0.60	0.65	0.65	0.65	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	75	30	32	2	23	34	15	142	4	35	82	45
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	137	58	161	162								
Volume Left (vph)	75	2	15	35								
Volume Right (vph)	32	34	4	45								
Hadj (s)	0.00	-0.31	0.04	-0.09								
Departure Headway (s)	4.7	4.5	4.6	4.5								
Degree Utilization, x	0.18	0.07	0.21	0.20								
Capacity (veh/h)	704	723	741	757								
Control Delay (s)	8.8	7.9	8.8	8.6								
Approach Delay (s)	8.8	7.9	8.8	8.6								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.6									
HCM Level of Service			A									
Intersection Capacity Utilization			32.0%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

8: Yosemite Avenue & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.98		1.00	0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	3391		1770	3296		1770	3323	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	1770	3391		1770	3296		1770	3323	
Volume (vph)	121	163	112	53	169	65	154	293	50	67	303	209
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.85	0.85	0.85	0.90	0.90	0.90
Adj. Flow (vph)	132	177	122	58	184	71	181	345	59	74	337	232
RTOR Reduction (vph)	0	0	96	0	57	0	0	14	0	0	131	0
Lane Group Flow (vph)	132	177	26	58	198	0	181	390	0	74	438	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	7.3	15.2	15.2	3.3	11.2		9.0	31.1		4.4	26.5	
Effective Green, g (s)	7.3	15.2	15.2	3.3	11.2		9.0	31.1		4.4	26.5	
Actuated g/C Ratio	0.10	0.22	0.22	0.05	0.16		0.13	0.44		0.06	0.38	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	185	405	344	83	543		228	1464		111	1258	
v/s Ratio Prot	c0.07	c0.10		0.03	0.06		c0.10	0.12		0.04	c0.13	
v/s Ratio Perm			0.02									
v/c Ratio	0.71	0.44	0.08	0.70	0.36		0.79	0.27		0.67	0.35	
Uniform Delay, d1	30.3	23.7	21.8	32.9	26.2		29.6	12.3		32.1	15.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	12.3	0.8	0.1	22.6	0.4		17.1	0.4		14.1	0.8	
Delay (s)	42.6	24.5	21.9	55.5	26.6		46.7	12.7		46.2	16.3	
Level of Service	D	C	C	E	C		D	B		D	B	
Approach Delay (s)		29.3			32.0			23.2			19.8	
Approach LOS		C			C			C			B	
Intersection Summary												
HCM Average Control Delay			24.8			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.49									
Actuated Cycle Length (s)			70.0			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			50.4%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: Wawona St. & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.91		1.00	0.93		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1691		1770	1737		1770	3308		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1691		1770	1737		1770	3308		1770	1863	1583
Volume (vph)	55	75	120	145	85	70	80	412	50	75	442	10
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.90	0.90	0.90
Adj. Flow (vph)	65	88	141	171	100	82	94	485	59	83	491	11
RTOR Reduction (vph)	0	97	0	0	47	0	0	11	0	0	0	10
Lane Group Flow (vph)	65	132	0	171	135	0	94	533	0	83	491	1
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot			Prot			Prot			Prot		Over
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												
Actuated Green, G (s)	3.4	10.0		7.1	13.7		4.7	25.8		4.5	25.6	3.4
Effective Green, g (s)	3.4	10.0		7.1	13.7		4.7	25.8		4.5	25.6	3.4
Actuated g/C Ratio	0.05	0.16		0.11	0.22		0.07	0.41		0.07	0.40	0.05
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	95	267		198	375		131	1346		126	752	85
v/s Ratio Prot	0.04	c0.08		c0.10	c0.08		c0.05	0.16		0.05	c0.26	0.00
v/s Ratio Perm												
v/c Ratio	0.68	0.49		0.86	0.36		0.72	0.40		0.66	0.65	0.01
Uniform Delay, d1	29.5	24.4		27.7	21.1		28.7	13.3		28.7	15.3	28.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	1.00
Incremental Delay, d2	18.5	1.4		30.0	0.6		17.1	0.9		11.8	4.4	0.0
Delay (s)	47.9	25.8		57.7	21.7		45.8	14.1		40.5	19.7	28.4
Level of Service	D	C		E	C		D	B		D	B	C
Approach Delay (s)		30.7			39.1			18.7			22.8	
Approach LOS		C			D			B			C	
Intersection Summary												
HCM Average Control Delay			25.7			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.68									
Actuated Cycle Length (s)			63.4			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			60.4%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

10: Daniels Street & Union Road

1/5/2009



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	35	70	45	525	695	25
Peak Hour Factor	0.92	0.92	0.85	0.85	0.90	0.90
Hourly flow rate (vph)	38	76	53	618	772	28
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1510	786	800			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1510	786	800			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	69	81	94			
cM capacity (veh/h)	124	392	823			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	114	671	800			
Volume Left	38	53	0			
Volume Right	76	0	28			
cSH	228	823	1700			
Volume to Capacity	0.50	0.06	0.47			
Queue Length 95th (ft)	64	5	0			
Control Delay (s)	35.7	1.7	0.0			
Lane LOS	E	A				
Approach Delay (s)	35.7	1.7	0.0			
Approach LOS	E					
Intersection Summary						
Average Delay		3.3				
Intersection Capacity Utilization		77.8%		ICU Level of Service		D
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

11: SR 120 WB Ramps & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop				Free	Free			
Grade	0%			0%				0%	0%			
Volume (veh/h)	0	0	0	25	0	245	30	325	0	0	400	365
Peak Hour Factor	0.25	0.25	0.25	0.90	0.90	0.90	0.85	0.85	0.85	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	0	28	0	272	35	382	0	0	444	406
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1372	1100	647	1100	1303	382	850			382		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1372	1100	647	1100	1303	382	850			382		
tC, single (s)	7.1	6.5	6.2	*6.5	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	87	100	59	96			100		
cM capacity (veh/h)	70	203	471	219	153	665	788			1176		
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1							
Volume Total	28	272	35	382	850							
Volume Left	28	0	35	0	0							
Volume Right	0	272	0	0	406							
cSH	219	665	788	1700	1700							
Volume to Capacity	0.13	0.41	0.04	0.22	0.50							
Queue Length 95th (ft)	11	50	4	0	0							
Control Delay (s)	23.8	14.1	9.8	0.0	0.0							
Lane LOS	C	B	A									
Approach Delay (s)	15.0		0.8		0.0							
Approach LOS	C											
Intersection Summary												
Average Delay	3.1											
Intersection Capacity Utilization	60.0%			ICU Level of Service				B				
Analysis Period (min)	15											

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

12: SR 120 EB Ramps & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	120	0	10	0	0	0	0	235	30	215	210	0
Peak Hour Factor	0.90	0.90	0.90	0.25	0.25	0.25	0.90	0.90	0.90	0.85	0.85	0.85
Hourly flow rate (vph)	133	0	11	0	0	0	0	261	33	253	247	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1031	1047	247	1042	1031	278	247			294		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1031	1047	247	1042	1031	278	247			294		
tC, single (s)	*6.4	6.5	6.3	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	39	100	99	100	100	100	100			80		
cM capacity (veh/h)	220	182	777	173	187	761	1319			1267		
Direction, Lane #	EB 1	NB 1	SB 1	SB 2								
Volume Total	144	294	253	247								
Volume Left	133	0	253	0								
Volume Right	11	33	0	0								
cSH	233	1700	1267	1700								
Volume to Capacity	0.62	0.17	0.20	0.15								
Queue Length 95th (ft)	92	0	19	0								
Control Delay (s)	42.8	0.0	8.5	0.0								
Lane LOS	E		A									
Approach Delay (s)	42.8	0.0	4.3									
Approach LOS	E											
Intersection Summary												
Average Delay		8.9										
Intersection Capacity Utilization		60.0%		ICU Level of Service						B		
Analysis Period (min)		15										

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

13: Atherton Dr. & Union Road

1/5/2009

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free		Free	Free
Grade	0%		0%			0%
Volume (veh/h)	0	38	227	2	38	182
Peak Hour Factor	0.80	0.80	0.70	0.70	0.80	0.80
Hourly flow rate (vph)	0	48	324	3	48	228
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh	1					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	648	326			327	
vC1, stage 1 conf vol	326					
vC2, stage 2 conf vol	322					
vCu, unblocked vol	648	326			327	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	93			96	
cM capacity (veh/h)	519	715			1232	
Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2	
Volume Total	0	48	327	48	228	
Volume Left	0	0	0	48	0	
Volume Right	0	48	3	0	0	
cSH	1700	715	1700	1232	1700	
Volume to Capacity	0.00	0.07	0.19	0.04	0.13	
Queue Length 95th (ft)	0	5	0	3	0	
Control Delay (s)	0.0	10.4	0.0	8.0	0.0	
Lane LOS	A	B		A		
Approach Delay (s)	10.4		0.0	1.4		
Approach LOS	B					
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			22.1%		ICU Level of Service	A
Analysis Period (min)			15			

Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

HCM Signalized Intersection Capacity Analysis

15: SR 120 WB Ramp & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00
Frpb, ped/bikes					1.00	0.98	1.00	1.00			1.00	0.98
Flpb, ped/bikes					1.00	1.00	1.00	1.00			1.00	1.00
Frt					1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1736	1492	1736	1792			1792	1491
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1736	1492	1736	1792			1792	1491
Volume (vph)	0	0	0	30	0	209	185	406	0	0	231	264
Peak-hour factor, PHF	0.25	0.25	0.25	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	33	0	232	206	451	0	0	257	293
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	146
Lane Group Flow (vph)	0	0	0	0	33	232	206	451	0	0	257	147
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	2%	2%	2%	4%	2%	6%	4%	6%	2%	2%	6%	6%
Turn Type				Split		Free	Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases						Free						6
Actuated Green, G (s)					1.1	47.3	10.4	38.2			23.8	23.8
Effective Green, g (s)					1.1	47.3	10.4	38.2			23.8	23.8
Actuated g/C Ratio					0.02	1.00	0.22	0.81			0.50	0.50
Clearance Time (s)					4.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)					3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					40	1492	382	1447			902	750
v/s Ratio Prot					c0.02		c0.12	c0.25			0.14	
v/s Ratio Perm						0.16						0.10
v/c Ratio					0.82	0.16	0.54	0.31			0.28	0.20
Uniform Delay, d1					23.0	0.0	16.3	1.2			6.8	6.5
Progression Factor					1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2					76.6	0.2	1.5	0.1			0.2	0.1
Delay (s)					99.6	0.2	17.8	1.3			7.0	6.6
Level of Service					F	A	B	A			A	A
Approach Delay (s)		0.0			12.6			6.5			6.8	
Approach LOS		A			B			A			A	
Intersection Summary												
HCM Average Control Delay			7.7									
HCM Volume to Capacity ratio			0.37									
Actuated Cycle Length (s)			47.3									
Intersection Capacity Utilization			51.9%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

16: SR 120 EB Ramps & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.98					1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00					1.00		1.00	1.00	
Frt		1.00	0.85					0.99		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1703	1515					1799		1703	1827	
Flt Permitted		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (perm)		1703	1515					1799		1703	1827	
Volume (vph)	240	0	52	0	0	0	0	351	37	142	119	0
Peak-hour factor, PHF	0.80	0.80	0.80	0.25	0.25	0.25	0.95	0.95	0.95	0.85	0.85	0.85
Adj. Flow (vph)	300	0	65	0	0	0	0	369	39	167	140	0
RTOR Reduction (vph)	0	0	51	0	0	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	300	14	0	0	0	0	405	0	167	140	0
Confl. Peds. (#/hr)			2				2		2			2
Heavy Vehicles (%)	6%	2%	4%	2%	2%	2%	2%	4%	4%	6%	4%	2%
Turn Type	Split	Perm								Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases			4									
Actuated Green, G (s)		13.0	13.0					25.4		9.2	38.6	
Effective Green, g (s)		13.0	13.0					25.4		9.2	38.6	
Actuated g/C Ratio		0.22	0.22					0.43		0.15	0.65	
Clearance Time (s)		4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)		371	330					767		263	1183	
v/s Ratio Prot		c0.18						c0.23		c0.10	0.08	
v/s Ratio Perm			0.01									
v/c Ratio		0.81	0.04					0.53		0.63	0.12	
Uniform Delay, d1		22.1	18.4					12.7		23.6	4.0	
Progression Factor		1.00	1.00					1.00		1.00	1.00	
Incremental Delay, d2		12.2	0.1					0.7		4.9	0.0	
Delay (s)		34.3	18.4					13.3		28.6	4.1	
Level of Service		C	B					B		C	A	
Approach Delay (s)		31.5			0.0			13.3			17.4	
Approach LOS		C			A			B			B	
Intersection Summary												
HCM Average Control Delay			20.6									
HCM Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			59.6							12.0		
Intersection Capacity Utilization			51.9%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

17: Atherton Drive & Main Street

1/5/2009

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Sign Control	Stop			Stop				Free		Free			
Grade	0%			0%				0%		0%			
Volume (veh/h)	0	0	0	0	0	0	0	388	0	0	171	0	
Peak Hour Factor	0.25	0.25	0.25	0.25	0.25	0.25	0.95	0.95	0.95	0.85	0.85	0.85	
Hourly flow rate (vph)	0	0	0	0	0	0	0	408	0	0	201	0	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type	None			None									
Median storage veh													
Upstream signal (ft)												640	
pX, platoon unblocked													
vC, conflicting volume	610	610	201	610	610	408	201						408
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	610	610	201	610	610	408	201						408
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1						4.1
tC, 2 stage (s)													
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2						2.2
p0 queue free %	100	100	100	100	100	100	100						100
cM capacity (veh/h)	407	409	840	407	409	643	1371						1150
Direction, Lane #	NB 1	SB 1											
Volume Total	408	201											
Volume Left	0	0											
Volume Right	0	0											
cSH	1371	1150											
Volume to Capacity	0.00	0.00											
Queue Length 95th (ft)	0	0											
Control Delay (s)	0.0	0.0											
Lane LOS													
Approach Delay (s)	0.0	0.0											
Approach LOS													
Intersection Summary													
Average Delay	0.0												
Intersection Capacity Utilization	23.8%			ICU Level of Service				A					
Analysis Period (min)	15												

Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

Level Of Service Computation Report

2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #14

Cycle (sec): 100 Critical Vol./Cap.(X): 0.265

Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 9.3

Optimal Cycle: 0 Level Of Service: A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0	1	0	1	0	1	0	1	0	1	0

Volume Module:

Base Vol:	2	169	28	28	150	4	7	41	4	36	35	53
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	2	169	28	28	150	4	7	41	4	36	35	53
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	2	169	28	28	150	4	7	41	4	36	35	53
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	2	169	28	28	150	4	7	41	4	36	35	53
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	2	169	28	28	150	4	7	41	4	36	35	53
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	2	169	28	28	150	4	7	41	4	36	35	53

Saturation Flow Module:

Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	583	638	725	580	634	719	530	573	643	548	592	671

Capacity Analysis Module:

Vol/Sat:	0.00	0.26	0.04	0.05	0.24	0.01	0.01	0.07	0.01	0.07	0.06	0.08
Crit Moves:	****			****			****			****		
Delay/Veh:	8.6	10.0	7.6	8.9	9.8	7.5	9.1	9.0	7.9	9.3	8.7	8.1
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	8.6	10.0	7.6	8.9	9.8	7.5	9.1	9.0	7.9	9.3	8.7	8.1
LOS by Move:	A	A	A	A	A	A	A	A	A	A	A	A
ApproachDel:	9.6			9.6			8.9			8.6		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	9.6			9.6			8.9			8.6		
LOS by Appr:	A			A			A			A		
AllWayAvgQ:	0.0	0.3	0.0	0.0	0.3	0.0	0.0	0.1	0.0	0.1	0.1	0.1

Note: Queue reported is the number of cars per lane.

Level Of Service Detailed Computation Report
2000 HCM 4-Way Stop Method
Future Volume Alternative

Intersection #14

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R	
----- ----- ----- ----- -----																
Time Period:	0.25 hour															
HevVeh:	0%				0%				0%				0%			
Alpha Value:	0.01															
----- ----- ----- ----- -----																
GroupType:	6				6				6				6			
P[C1]:	0.55				0.54				0.43				0.48			
P[C2]:	0.20				0.21				0.09				0.04			
P[C3]:	0.17				0.17				0.33				0.37			
P[C4]:	0.07				0.08				0.13				0.10			
P[C5]:	0.00				0.00				0.01				0.01			
Padj[C1]:	0.008				0.008				0.012				0.011			
Padj[C2]:	0.001				0.001				0.005				0.005			
Padj[C3]:	-0.004				-0.004				-0.008				-0.010			
Padj[C4]:	-0.004				-0.005				-0.008				-0.006			
Padj[C5]:	-0.000				-0.000				-0.001				-0.001			
----- ----- ----- ----- -----																
Lanes:	L1		L2		L1		L2		L1		L2		L1		L2	
LaneType:	LEFT		RITE		LEFT		RITE		LEFT		RITE		LEFT		RITE	
----- ----- ----- ----- -----																
HeadwayAdj:	0.500		-0.700		0.500		-0.700		0.500		-0.700		0.500		-0.700	
Volume:	2		28		28		4		7		4		36		53	
Capacity:	583		725		580		719		530		643		548		671	
DegOfUtil:	0.00		0.04		0.05		0.01		0.01		0.01		0.06		0.07	
DepHeadway:	5.93		4.73		5.95		4.75		6.35		5.15		6.21		5.01	
ServiceTime:	3.6		2.4		3.7		2.5		4.1		2.9		3.9		2.7	
Delay:	8.6		7.6		8.9		7.5		9.1		7.9		9.3		8.1	
Queue:	0.0		0.0		0.0		0.0		0.0		0.0		0.1		0.1	
----- ----- ----- ----- -----																
Lane:	L3				L3				L3				L3			
LaneType:	THRU				THRU				THRU				THRU			
----- ----- ----- ----- -----																
HeadwayAdj:	0.000				0.000				0.000				0.000			
Volume:	169				150				41				35			
Capacity:	638				634				573				592			
DegOfUtil:	0.25				0.23				0.07				0.06			
DepHeadway:	5.43				5.45				5.85				5.71			
ServiceTime:	3.1				3.2				3.6				3.4			
Delay:	10.0				9.8				9.0				8.7			
Queue:	0.3				0.3				0.1				0.1			
----- ----- ----- ----- -----																
Approach:	North Bound				South Bound				East Bound				West Bound			
----- ----- ----- ----- -----																
ApproachDel:	9.6				9.6				8.9				8.6			
Delay Adj:	1.00				1.00				1.00				1.00			
ApprAdjDel:	9.6				9.6				8.9				8.6			
LOS by Appr:	A				A				A				A			

OverallDel:	9.3
OverallLOS:	A

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #14

Future Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound	South Bound	East Bound	West Bound
Movement:	L - T - R	L - T - R	L - T - R	L - T - R
Control:	Stop Sign	Stop Sign	Stop Sign	Stop Sign
Lanes:	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1
Initial Vol:	2 169 28	28 150 4	7 41 4	36 35 53
Major Street Volume:	381			
Minor Approach Volume:	124			
Minor Approach Volume Threshold:	789			

SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

Level Of Service Computation Report

2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #18

Cycle (sec): 100 Critical Vol./Cap.(X): 0.391

Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 10.2

Optimal Cycle: 0 Level Of Service: B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0	1	0	1	0	1	0	1	0	1	0

Volume Module:	North Bound			South Bound			East Bound			West Bound		
Base Vol:	34	233	12	53	84	34	18	44	27	7	69	137
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	34	233	12	53	84	34	18	44	27	7	69	137
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	34	233	12	53	84	34	18	44	27	7	69	137
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	34	233	12	53	84	34	18	44	27	7	69	137
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	34	233	12	53	84	34	18	44	27	7	69	137
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	34	233	12	53	84	34	18	44	27	7	69	137

Saturation Flow Module:	North Bound			South Bound			East Bound			West Bound		
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	546	596	666	520	562	629	492	528	587	516	558	629

Capacity Analysis Module:	North Bound			South Bound			East Bound			West Bound		
Vol/Sat:	0.06	0.39	0.02	0.10	0.15	0.05	0.04	0.08	0.05	0.01	0.12	0.22
Crit Moves:	****			****			****			****		
Delay/Veh:	9.4	12.0	7.9	9.9	9.7	8.3	9.8	9.5	8.6	9.4	9.6	9.4
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	9.4	12.0	7.9	9.9	9.7	8.3	9.8	9.5	8.6	9.4	9.6	9.4
LOS by Move:	A	B	A	A	A	A	A	A	A	A	A	A
ApproachDel:	11.5			9.5			9.3			9.5		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	11.5			9.5			9.3			9.5		
LOS by Appr:	B			A			A			A		
AllWayAvgQ:	0.1	0.6	0.0	0.1	0.2	0.0	0.0	0.1	0.0	0.0	0.1	0.2

Note: Queue reported is the number of cars per lane.

Level Of Service Detailed Computation Report
2000 HCM 4-Way Stop Method
Future Volume Alternative

Intersection #18

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R	
----- ----- ----- ----- -----																
Time Period:	0.25 hour															
HevVeh:	0%				0%				0%				0%			
Alpha Value:	0.01															
----- ----- ----- ----- -----																
GroupType:	6				6				6				6			
P[C1]:	0.44				0.34				0.30				0.36			
P[C2]:	0.16				0.25				0.13				0.06			
P[C3]:	0.27				0.21				0.32				0.40			
P[C4]:	0.13				0.18				0.22				0.16			
P[C5]:	0.01				0.02				0.03				0.02			
Padj[C1]:	0.011				0.013				0.016				0.014			
Padj[C2]:	0.004				0.004				0.007				0.007			
Padj[C3]:	-0.007				-0.004				-0.007				-0.010			
Padj[C4]:	-0.008				-0.011				-0.013				-0.010			
Padj[C5]:	-0.001				-0.002				-0.003				-0.002			
----- ----- ----- ----- -----																
Lanes:	L1		L2		L1		L2		L1		L2		L1		L2	
LaneType:	LEFT		RITE		LEFT		RITE		LEFT		RITE		LEFT		RITE	
----- ----- ----- ----- -----																
HeadwayAdj:	0.500		-0.700		0.500		-0.700		0.500		-0.700		0.500		-0.700	
Volume:	34		12		53		34		18		27		7		137	
Capacity:	546		666		520		629		492		587		516		629	
DegOfUtil:	0.06		0.02		0.10		0.05		0.03		0.04		0.01		0.20	
DepHeadway:	6.31		5.11		6.54		5.34		6.81		5.61		6.57		5.37	
ServiceTime:	4.0		2.8		4.2		3.0		4.5		3.3		4.3		3.1	
Delay:	9.4		7.9		9.9		8.3		9.8		8.6		9.4		9.4	
Queue:	0.1		0.0		0.1		0.0		0.0		0.0		0.0		0.2	
----- ----- ----- ----- -----																
Lane:	L3				L3				L3				L3			
LaneType:	THRU				THRU				THRU				THRU			
----- ----- ----- ----- -----																
HeadwayAdj:	0.000				0.000				0.000				0.000			
Volume:	233				84				44				69			
Capacity:	596				562				528				558			
DegOfUtil:	0.38				0.14				0.08				0.12			
DepHeadway:	5.81				6.04				6.31				6.07			
ServiceTime:	3.5				3.7				4.0				3.8			
Delay:	12.0				9.7				9.5				9.6			
Queue:	0.6				0.2				0.1				0.1			
----- ----- ----- ----- -----																
Approach:	North Bound				South Bound				East Bound				West Bound			
----- ----- ----- ----- -----																
ApproachDel:	11.5				9.5				9.3				9.5			
Delay Adj:	1.00				1.00				1.00				1.00			
ApprAdjDel:	11.5				9.5				9.3				9.5			
LOS by Appr:	B				A				A				A			

OverallDel:	10.2
OverallLOS:	B

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #18

Future Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound	South Bound	East Bound	West Bound
Movement:	L - T - R	L - T - R	L - T - R	L - T - R
Control:	Stop Sign	Stop Sign	Stop Sign	Stop Sign
Lanes:	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1
Initial Vol:	34 233 12	53 84 34	18 44 27	7 69 137

Major Street Volume: 450
Minor Approach Volume: 213
Minor Approach Volume Threshold: 717

SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

Existing, No Project, PM

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR-99 Northbound
 From/To: Jack Tone to Austin
 Jurisdiction: City of Manteca
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4846	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	1275	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1819	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1819	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	28.5	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: _____ Fax: _____
 E-mail: _____

 Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR-99 Northbound
 From/To: Austin to SR-120
 Jurisdiction: City of Manteca
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

 Flow Inputs and Adjustments

Volume, V	4713	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	1240	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1769	pc/h/ln

 Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

 LOS and Performance Measures

Flow rate, vp	1769	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.1	mi/h
Number of lanes, N	3	
Density, D	27.6	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: _____ Fax: _____
 E-mail: _____

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR-99 Northbound
 From/To: Yosemite to Louise
 Jurisdiction: City of Manteca
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2955	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	778	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1664	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1664	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.7	mi/h
Number of lanes, N	2	
Density, D	25.7	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: Louise to Yosemite
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2930	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	771	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1650	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1650	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.7	mi/h
Number of lanes, N	2	
Density, D	25.5	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR-99 Northbound
From/To: SR-120 to Yosemite
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3551	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	934	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2000	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2000	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	61.4	mi/h
Number of lanes, N	2	
Density, D	32.5	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR-99 Southbound
 From/To: Yosemite to SR-120
 Jurisdiction: City of Manteca
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3383	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	890	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1905	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1905	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.8	mi/h
Number of lanes, N	2	
Density, D	30.3	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: SR-120 to Austin
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4650	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	1224	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1746	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1746	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.3	mi/h
Number of lanes, N	3	
Density, D	27.2	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR-99 Southbound
 From/To: Austin to Jack Tone
 Jurisdiction: City of Manteca
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4932	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	1298	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1852	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1852	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	29.2	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: I-5 to Yosemite
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3252	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	884	v
Trucks and buses	7	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.966	
Driver population factor, fp	1.00	
Flow rate, vp	1829	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1829	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.7	mi/h
Number of lanes, N	2	
Density, D	28.7	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Yosemite to Airport
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Commercial EIR

Flow Inputs and Adjustments

Volume, V	3177	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	863	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1813	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1813	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.8	mi/h
Number of lanes, N	2	
Density, D	28.4	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Airport to Union
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2970	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	807	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1695	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1695	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.6	mi/h
Number of lanes, N	2	
Density, D	26.3	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR 120 Eastbound
 From/To: Union to Main
 Jurisdiction: City of Manteca
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2730	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	742	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1558	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1558	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	2	
Density, D	24.0	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Main to SR 99
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2382	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	647	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1359	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

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	2	
Density, D	20.9	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: _____ Fax: _____
 E-mail: _____

 Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR 120 Westbound
 From/To: SR 99 to Main
 Jurisdiction: City of Manteca
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

 Flow Inputs and Adjustments

Volume, V	2277	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	619	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1299	pc/h/ln

 Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

 LOS and Performance Measures

Flow rate, vp	1299	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	20.0	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Main to Union
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2445	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	664	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1395	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1395	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	21.5	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Union to Airport
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2260	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	614	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1290	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1290	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.8	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Airport to Yosemite
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2182	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	593	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1245	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1245	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.2	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: _____ Fax: _____
 E-mail: _____

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR 120 Westbound
 From/To: Yosemite to I-5
 Jurisdiction: City of Manteca
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2262	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	602	v
Trucks and buses	7	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.966	
Driver population factor, fp	1.00	
Flow rate, vp	1245	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1245	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.2	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: _____ Fax: _____
E-mail: _____

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3177	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	461	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
Volume, V (vph)	3177	461	vph
Peak-hour factor, PHF	0.92	0.80	
Peak 15-min volume, v15	863	144	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3626	591	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 1.000 Using Equation 0

$$v = v + (v - v) P = 3626 \text{ pc/h}$$

$$12 \quad R \quad F \quad R \quad FD$$

Capacity Checks

$v = v$	Actual	Maximum	LOS F?
$F_i \quad F$	3626	4700	No
$v = v - v$	3035	4700	No
$FO \quad F \quad R$			
v	591	2000	No
R			
$v \quad v$	0 pc/h	(Equation 25-15 or 25-16)	
$3 \text{ or } av34$			
Is $v \quad v > 2700 \text{ pc/h?}$		No	
$3 \text{ or } av34$			
Is $v \quad v > 1.5 \quad v / 2$		No	
$3 \text{ or } av34 \quad 12$			
If yes, $v =$		(Equation 25-18)	
$12A$			

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v	3626	4600	No
12			!

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 \quad v - 0.009 \quad L = 34.1 \text{ pc/mi/ln}$

$$R \quad 12 \quad D$$

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

Speed Estimation

Intermediate speed variable,	$D = 0.481$
S	
Space mean speed in ramp influence area,	$S = 53.9 \text{ mph}$
R	
Space mean speed in outer lanes,	$S = N/A \text{ mph}$
0	
Space mean speed for all vehicles,	$S = 53.9 \text{ mph}$

Phone: _____ Fax: _____
 E-mail: _____

 Merge Analysis

Analyst: Fehr and Peers
 Agency/Co.: Fehr and Peers
 Date performed: 9/10/2008
 Analysis time period: PM Peak
 Freeway/Dir of Travel: SR 120 EB
 Junction: Airport Way
 Jurisdiction: City of Manteca
 Analysis Year: Existing
 Description: Union Crossing EIR

 Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2716	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	254	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	2716	254	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	738	69	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3100	283	pcph

 Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
 EQ
 P = 1.000 Using Equation 0

$$v_{12} = v_{FM} (P_{FM}) = 3100 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v	3383	4700	No
FO			
v	0	pc/h	(Equation 25-4 or 25-5)
3 or av34			
Is v	> 2700 pc/h?	No	
3 or av34			
Is v	> 1.5 v / 2	No	
3 or av34	12		
If yes, v	=	(Equation 25-8)	
12A			

Flow Entering Merge Influence Area

v_{12}	Actual 3100	Max Desirable 4400	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_{12} + 0.0078 v_A - 0.00627 L = 28.6 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$M = 0.401$
Space mean speed in ramp influence area, S_R	$S = 55.8 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = N/A \text{ mph}$
Space mean speed for all vehicles, S	$S = 55.8 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: _____ Fax: _____
E-mail: _____

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2970	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	495	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
Volume, V (vph)	2970	495	vph
Peak-hour factor, PHF	0.92	0.80	
Peak 15-min volume, v15	807	155	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3390	634	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 1.000 Using Equation 0

$$v = v + (v - v) P = 3390 \text{ pc/h}$$

$$12 \quad R \quad F \quad R \quad FD$$

Capacity Checks

$v = v$	Actual	Maximum	LOS F?
$F_i \quad F$	3390	4700	No
$v = v - v$	2756	4700	No
$FO \quad F \quad R$			
v	634	2000	No
R			
$v \quad v$	0 pc/h	(Equation 25-15 or 25-16)	
$3 \text{ or } av34$			
Is $v \quad v > 2700 \text{ pc/h?}$		No	
$3 \text{ or } av34$			
Is $v \quad v > 1.5 \quad v / 2$		No	
$3 \text{ or } av34 \quad 12$			
If yes, $v =$		(Equation 25-18)	
$12A$			

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v	3390	4600	No
12			!

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 \quad v - 0.009 \quad L = 32.1 \text{ pc/mi/ln}$

$$R \quad 12 \quad D$$

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

Speed Estimation

Intermediate speed variable,	$D = 0.485$
S	
Space mean speed in ramp influence area,	$S = 53.8 \text{ mph}$
R	
Space mean speed in outer lanes,	$S = N/A \text{ mph}$
0	
Space mean speed for all vehicles,	$S = 53.8 \text{ mph}$

Phone: _____ Fax: _____
 E-mail: _____

 Merge Analysis

Analyst: Fehr and Peers
 Agency/Co.: Fehr and Peers
 Date performed: 9/10/2008
 Analysis time period: PM Peak
 Freeway/Dir of Travel: SR 120 EB
 Junction: Airport Way
 Jurisdiction: City of Manteca
 Analysis Year: Existing
 Description: Union Crossing EIR

 Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2475	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	255	vph
Length of first accel/decel lane	500	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)	2475	255	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	673	69	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2825	284	pcph

 Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
 EQ
 P = 1.000 Using Equation 0

$$v_{12} = v_{FM} (P_{FM}) = 2825 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v	3109	4700	No
FO			
v	0	pc/h	(Equation 25-4 or 25-5)
3 or av34			
Is v	> 2700 pc/h?	No	
3 or av34			
Is v	> 1.5 v / 2	No	
3 or av34	12		
If yes, v	=	(Equation 25-8)	
12A			

Flow Entering Merge Influence Area

v_{12}	Actual 2825	Max Desirable 4400	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 26.5 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S_R	$M = 0.373$
Space mean speed in ramp influence area, S_R	$S = 56.4 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = \text{N/A} \text{ mph}$
Space mean speed for all vehicles, S_0	$S = 56.4 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: _____ Fax: _____
E-mail: _____

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2260	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	289	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
Volume, V (vph)	2260	289	vph
Peak-hour factor, PHF	0.92	0.95	
Peak 15-min volume, v15	614	76	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2579	312	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 1.000 Using Equation 0

$$v = v + (v - v) P = 2579 \text{ pc/h}$$

$$12 \text{ R} \quad \text{F} \quad \text{R} \quad \text{FD}$$

Capacity Checks

$v = v$	Actual 2579	Maximum 4700	LOS F? No
$F_i \text{ F}$			
$v = v - v$	2267	4700	No
$F_O \text{ F} \text{ R}$			
v	312	2000	No
R			
$v \text{ v}$	0 pc/h	(Equation 25-15 or 25-16)	
3 or av_{34}			
Is $v \text{ v} > 2700 \text{ pc/h?}$		No	
3 or av_{34}			
Is $v \text{ v} > 1.5 v / 2$		No	
3 or av_{34}	12		
If yes, $v =$		(Equation 25-18)	
12A			

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v	2579	4600	No
12			!

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v - 0.009 L = 25.1 \text{ pc/mi/ln}$

$$R \quad 12 \quad D$$

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

Speed Estimation

Intermediate speed variable,	$D = 0.456$
S	
Space mean speed in ramp influence area,	$S = 54.5 \text{ mph}$
R	
Space mean speed in outer lanes,	$S = \text{N/A} \text{ mph}$
O	
Space mean speed for all vehicles,	$S = 54.5 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: _____ Fax: _____
E-mail: _____

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1971	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	211	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	1971	211	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	536	57	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2250	235	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_{FM} (P_{FM}) = 2250 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v	2485	4700	No
FO			
v v	0 pc/h	(Equation 25-4 or 25-5)	
3 or av34			
Is v v > 2700 pc/h?		No	
3 or av34			
Is v v > 1.5 v / 2		No	
3 or av34	12		
If yes, v =		(Equation 25-8)	
12A			

Flow Entering Merge Influence Area

v_{12}	Actual 2250	Max Desirable 4400	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 21.6 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S_R	$M = 0.333$
Space mean speed in ramp influence area, S_R	$S = 57.3 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = \text{N/A} \text{ mph}$
Space mean speed for all vehicles, S_0	$S = 57.3 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: _____ Fax: _____
E-mail: _____

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1971	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	211	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	1971	211	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	536	57	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2250	235	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_{FM} (P_{FM}) = 2250 \text{ pc/h}$$

Capacity Checks

v_{FO}	Actual 2485	Maximum 4700	LOS F? No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34} > 2700 \text{ pc/h?}$		No	
Is $v_{3 \text{ or } av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} =$		(Equation 25-8)	

Flow Entering Merge Influence Area

v_{12}	Actual 2250	Max Desirable 4400	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_{12} + 0.0078 v_A - 0.00627 L = 21.6 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S_R	$M = 0.333$
Space mean speed in ramp influence area, S_R	$S = 57.3 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = \text{N/A} \text{ mph}$
Space mean speed for all vehicles, S	$S = 57.3 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2445	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	350	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
Volume, V (vph)	2445	350	vph
Peak-hour factor, PHF	0.92	0.95	
Peak 15-min volume, v15	664	92	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2790	378	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 2790 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	2790	4700	No
v = v - v FO F R	2412	4700	No
v R	378	2000	No
v v 3 or av34	0 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h? 3 or av34		No	
Is v v > 1.5 v /2 3 or av34	12	No	
If yes, v = 12A		(Equation 25-18)	

Flow Entering Diverge Influence Area

v_{12}	Actual 2790	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 4.252 + 0.0086 v_{12} - 0.009 L = 26.9 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$D = 0.462$
Space mean speed in ramp influence area, S_R	$S = 54.4 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = \text{N/A} \text{ mph}$
Space mean speed for all vehicles, S	$S = 54.4 \text{ mph}$

Leisch Method for Weaving Analysis

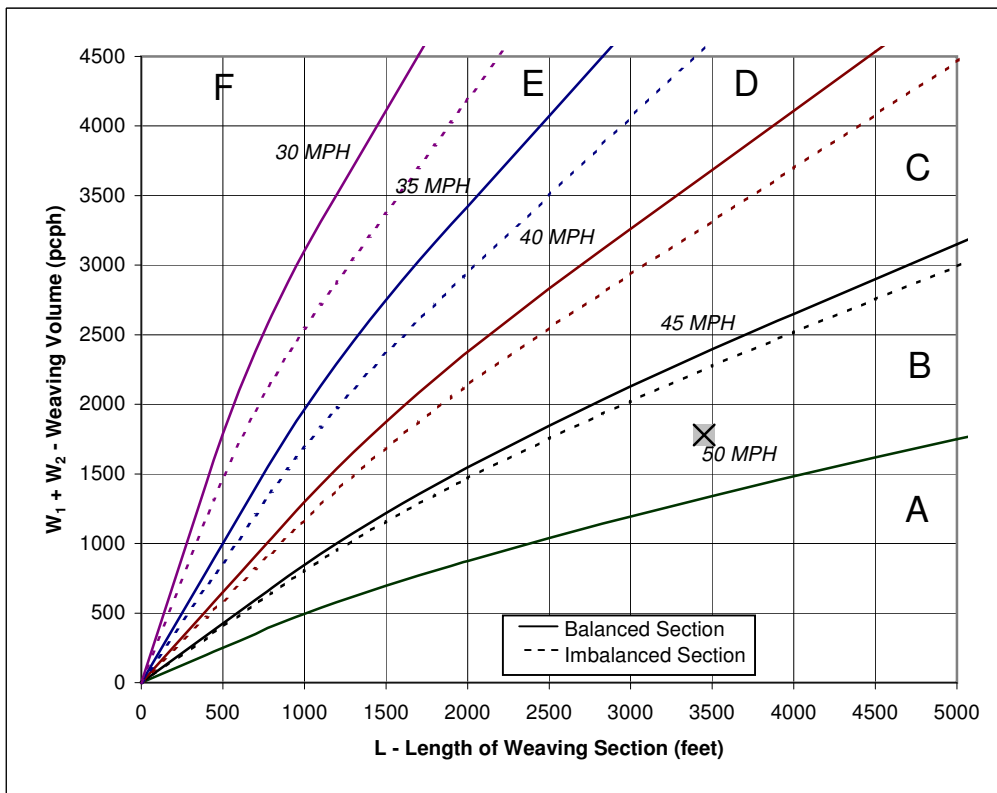
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,450

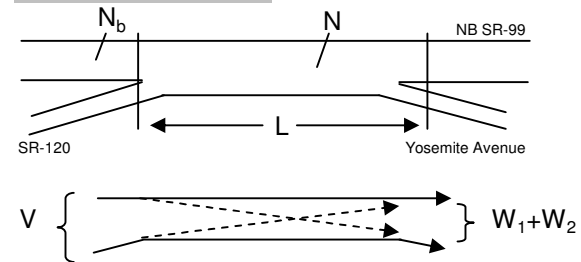
Project Information

Project	Union Crossing
Scenario	EXISTING NO PROJECT - PM
Freeway	NB SR-99
On-ramp	SR-120
Off-ramp	Yosemite Avenue

Total Weaving Section (V)	On-ramp to Mainline (W_1)	Mainline to Off-ramp (W_2)
Volume (vph)*	Volume (vph)*	Volume (vph)*
Truck Percentage	Truck Percentage	Truck Percentage
PCE for Trucks	PCE for Trucks	PCE for Trucks
Volume (pcph)	Volume (pcph)	Volume (pcph)



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? Y
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

45 mph and 50 mph

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

3. Interpolated Weaving Speed (S_w , mph)	47.8
4. Weaving Intensity Factor (k)	1.55
5. Service Volume (SV, pcph)	
SV = $(1/N) * [V + (k - 1) * \min(W_1, W_2)]$	1,405
6. Level of Service (LOS)	D

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Leisch Method for Weaving Analysis

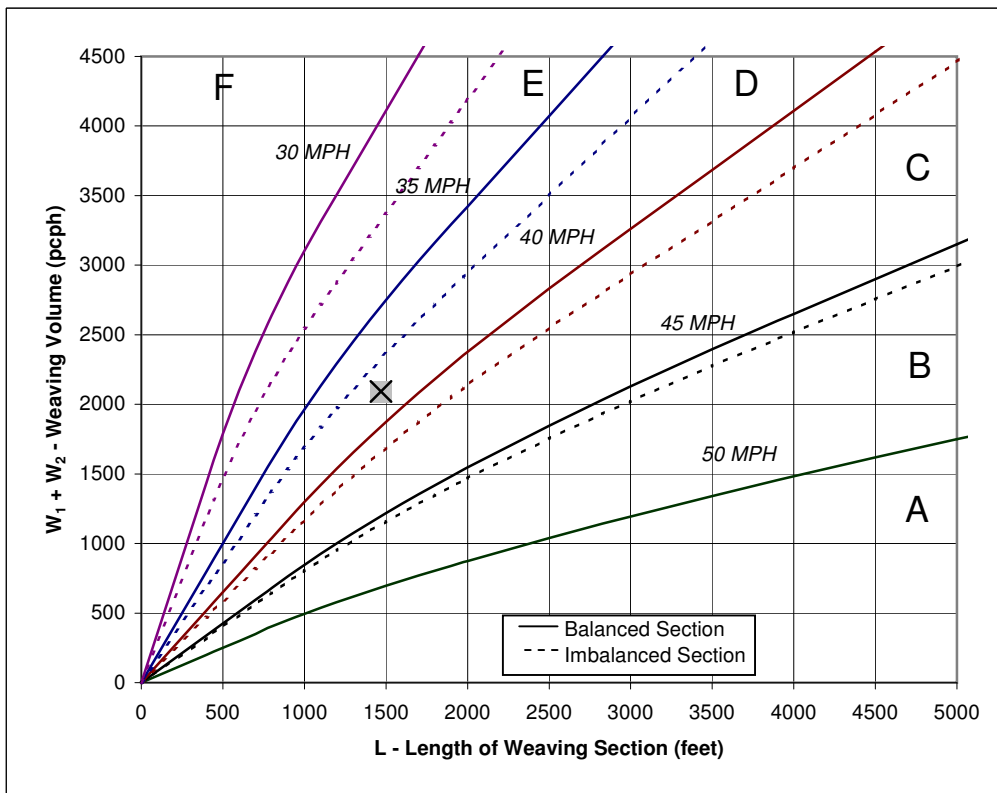
Data Input

Number of Entering Mainline Lanes	N_b	3
Number of Lanes in Weaving Section	N	4
Length of Weaving Section (feet)	L	1,470

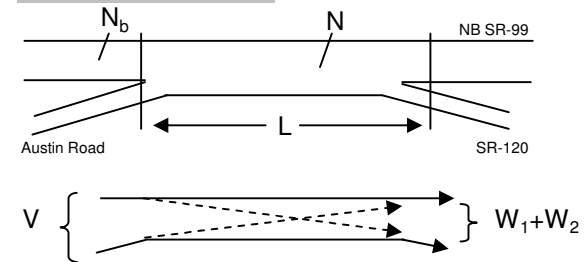
Project Information

Project	Union Crossing
Scenario	EXISTING NO PROJECT - PM
Freeway	NB SR-99
On-ramp	Austin Road
Off-ramp	SR-120

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,713	Volume (vph)*	119	Volume (vph)*	1,877
Truck Percentage	14%	Truck Percentage	6%	Truck Percentage	10%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	5,043	Volume (pcph)	123	Volume (pcph)	1,971



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? **Y**
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

35 MPH and **40 MPH**

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

3. Interpolated Weaving Speed (S_w , mph)	38.5
4. Weaving Intensity Factor (k)	3.00
5. Service Volume (SV, pcph) $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	1,322
6. Level of Service (LOS)	C

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF)**. The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Leisch Method for Weaving Analysis

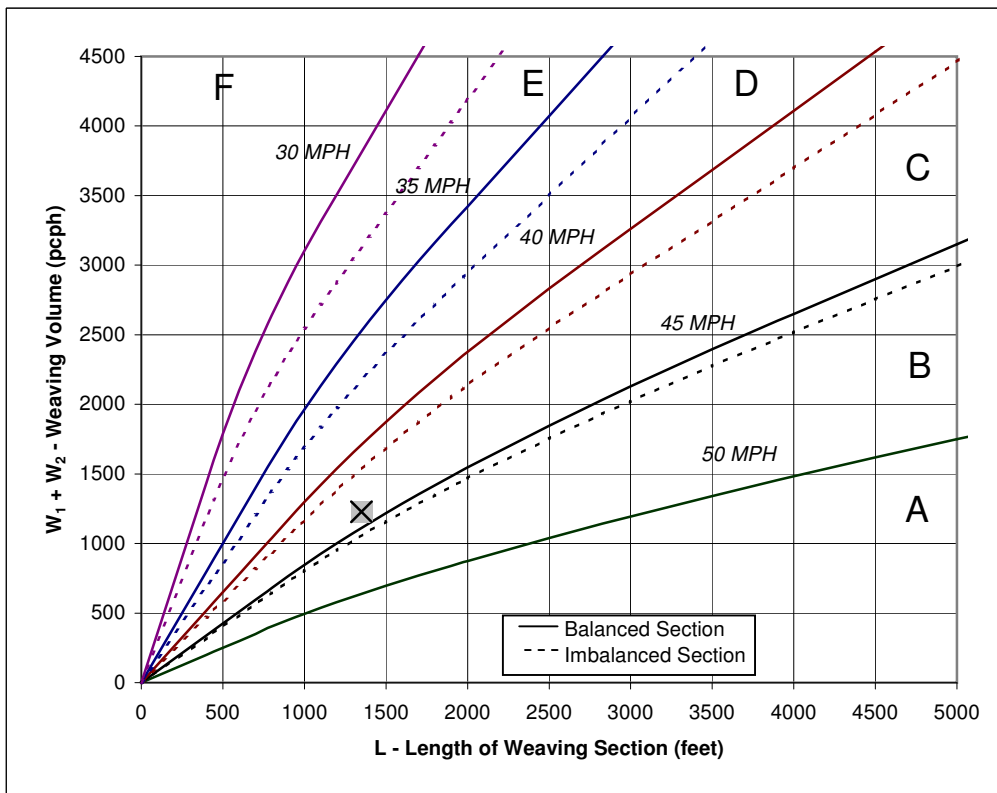
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	1,350

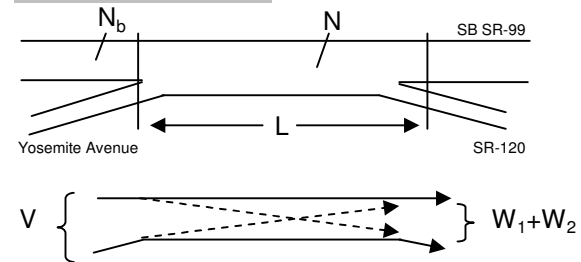
Project Information

Project	Union Crossing
Scenario	EXISTING NO PROJECT - PM
Freeway	SB SR-99
On-ramp	Yosemite Avenue
Off-ramp	SR-120

Total Weaving Section (V)	On-ramp to Mainline (W_1)	Mainline to Off-ramp (W_2)
Volume (vph)*	Volume (vph)*	Volume (vph)*
Truck Percentage	Truck Percentage	Truck Percentage
PCE for Trucks	PCE for Trucks	PCE for Trucks
Volume (pcph)	Volume (pcph)	Volume (pcph)



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? n
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

40 mph and 45 mph

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

3. Interpolated Weaving Speed (S_w , mph)	43.2
4. Weaving Intensity Factor (k)	2.20
5. Service Volume (SV, pcph) $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	1,371
6. Level of Service (LOS)	D

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Major Street Airport Way
 Minor Street Atherton Drive

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour PM

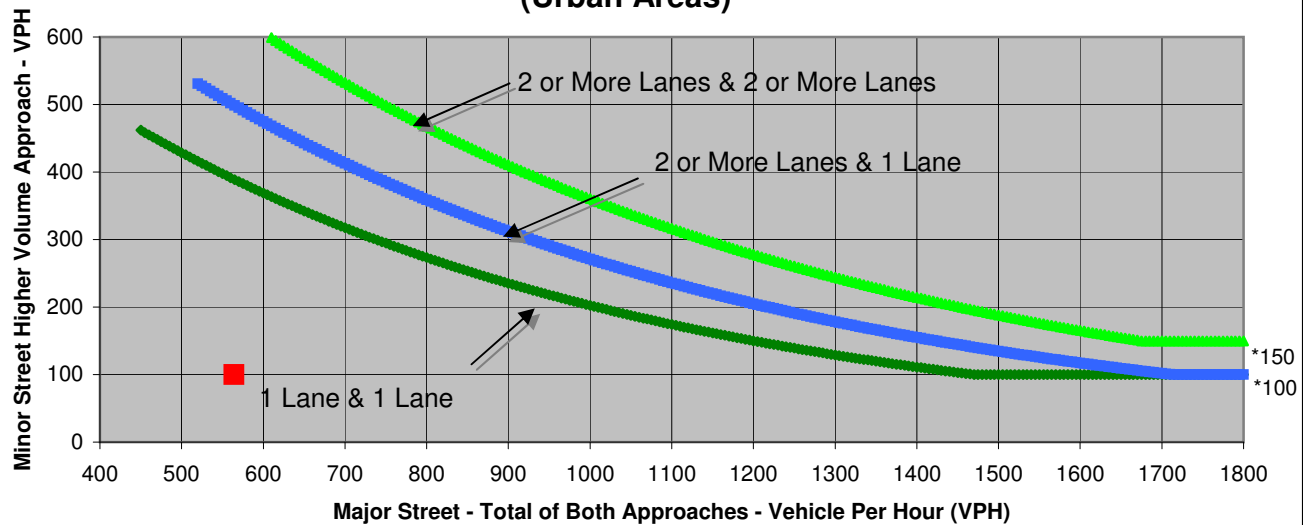
Turn Movement Volumes

	NB	SB	EB	WB
Left	3	92	87	4
Through	140	272	7	3
Right	6	51	6	61
Total	149	415	100	68

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Atherton Drive	<u>Warrant Met</u>
Number of Approach Lanes	3	3	<u>NO</u>
Traffic Volume (VPH) *	564	100	

* 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 Airport Way
 Minor Street SR 120 EB

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour PM

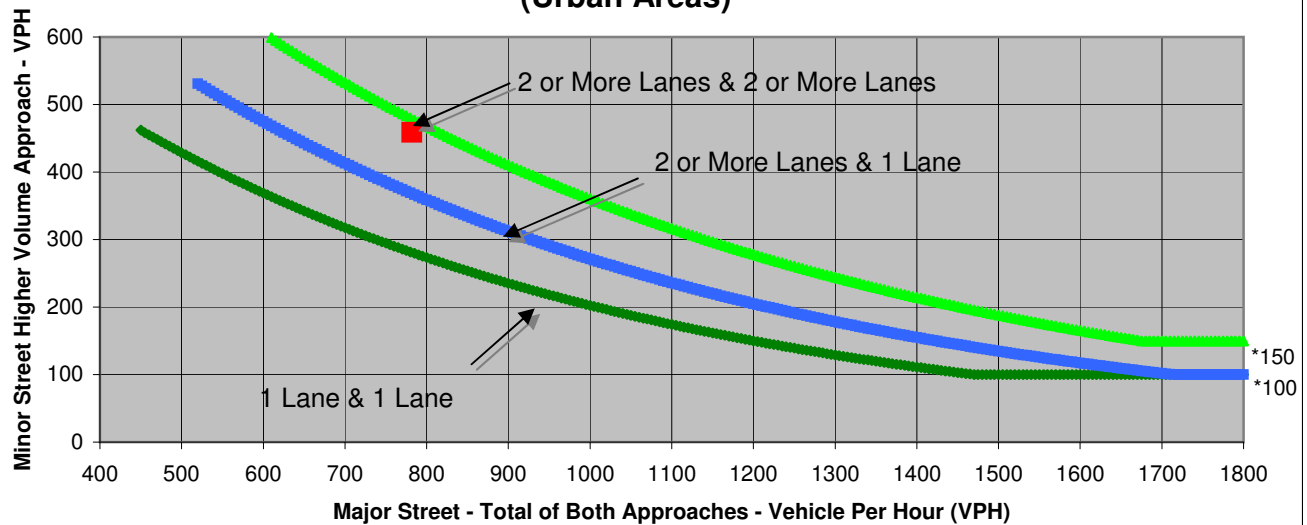
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	198	340	0
Through	234	296	0	0
Right	54	0	119	0
Total	288	494	459	0

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street SR 120 EB	<u>Warrant Met</u>
Number of Approach Lanes	2	1	<u>YES</u>
Traffic Volume (VPH) *	782	459	

* 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 Airport Way
 Minor Street SR 120 WB

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour PM

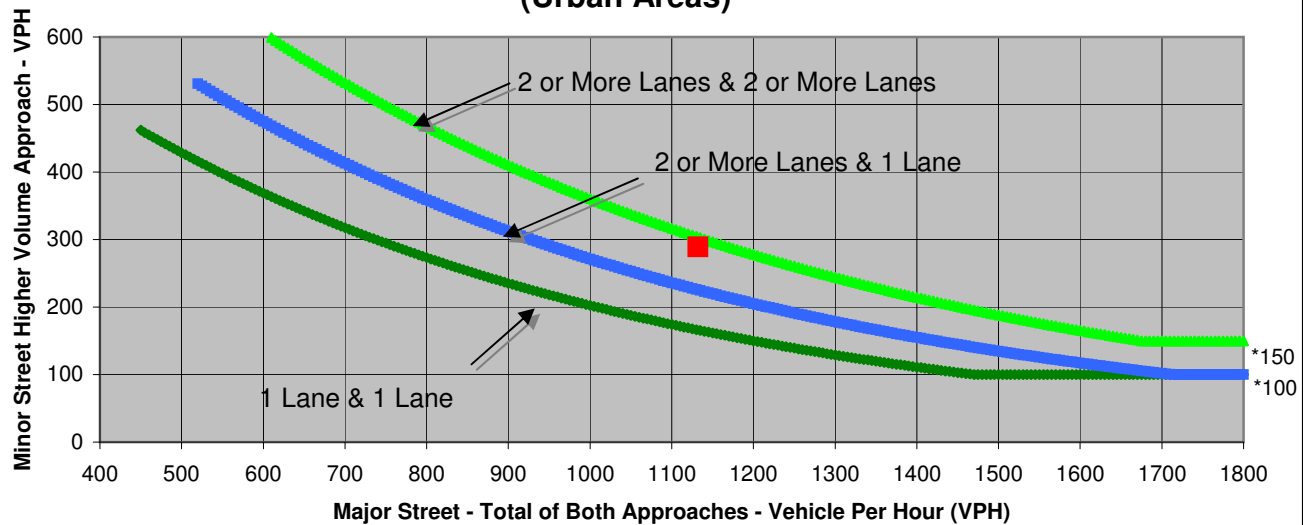
Turn Movement Volumes

	NB	SB	EB	WB
Left	46	0	0	188
Through	528	393	0	0
Right	0	165	0	101
Total	574	558	0	289

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street SR 120 WB	<u>Warrant Met</u>
Number of Approach Lanes	2	1	<u>YES</u>
Traffic Volume (VPH) *	1,132	289	

* 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 Airport Way
 Minor Street Wawona Street

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour PM

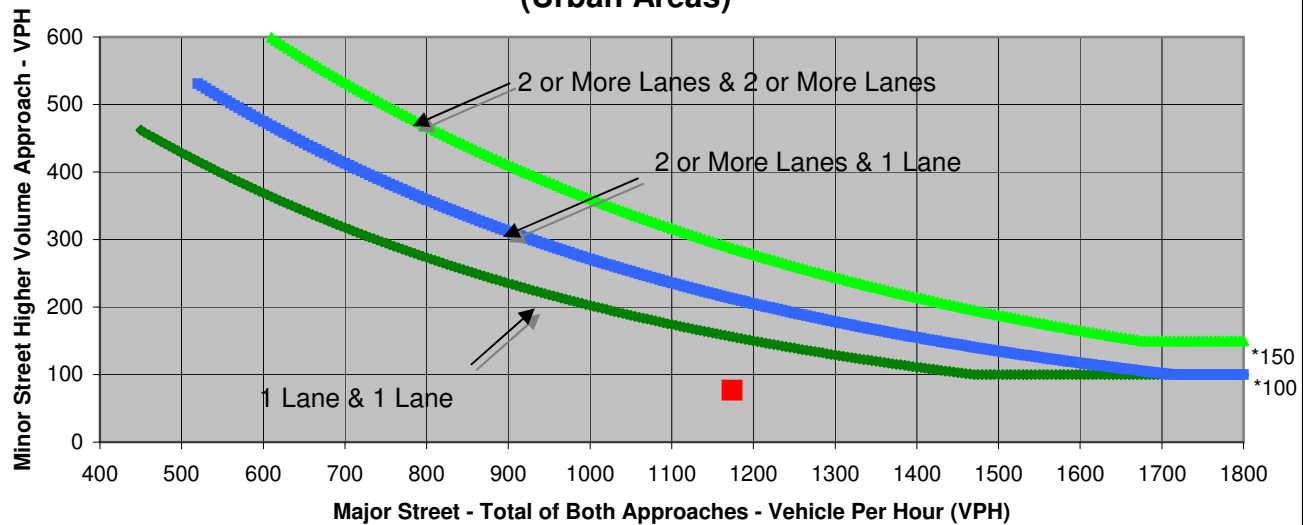
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	76	0	46
Through	478	551	0	0
Right	69	0	0	31
Total	547	627	0	77

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Wawona Street	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	1,174	77	

* 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 Airport Way
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour PM

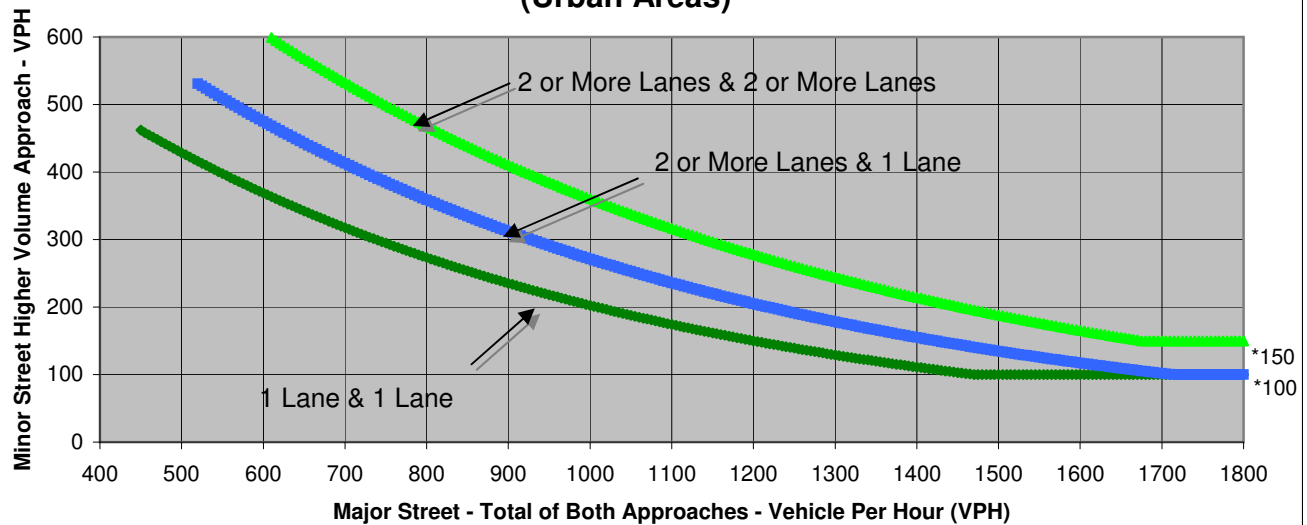
Turn Movement Volumes

	NB	SB	EB	WB
Left	7	42	36	3
Through	82	199	22	22
Right	5	43	4	31
Total	94	284	62	56

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Woodward Avenue	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	378	62	

* 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 Main Street
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour PM

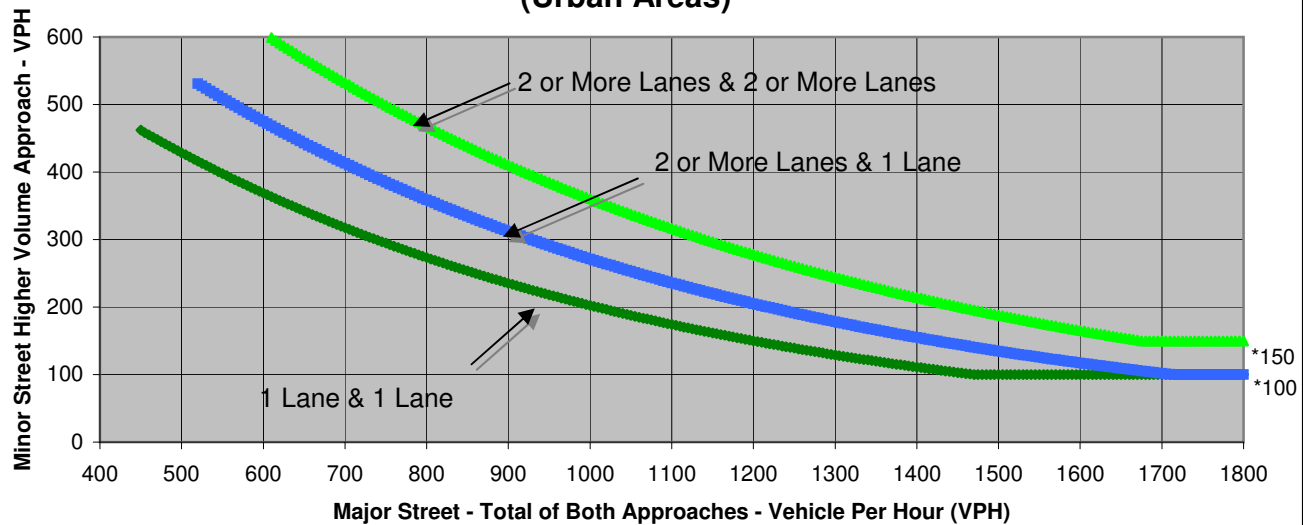
Turn Movement Volumes

	NB	SB	EB	WB
Left	23	209	22	20
Through	160	223	117	66
Right	16	32	49	107
Total	199	464	188	193

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Main Street	Woodward Avenue	
Number of Approach Lanes	2	3	<u>NO</u>
Traffic Volume (VPH) *	381	464	

* 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 Union Road
 Minor Street Atherton Drive

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour PM

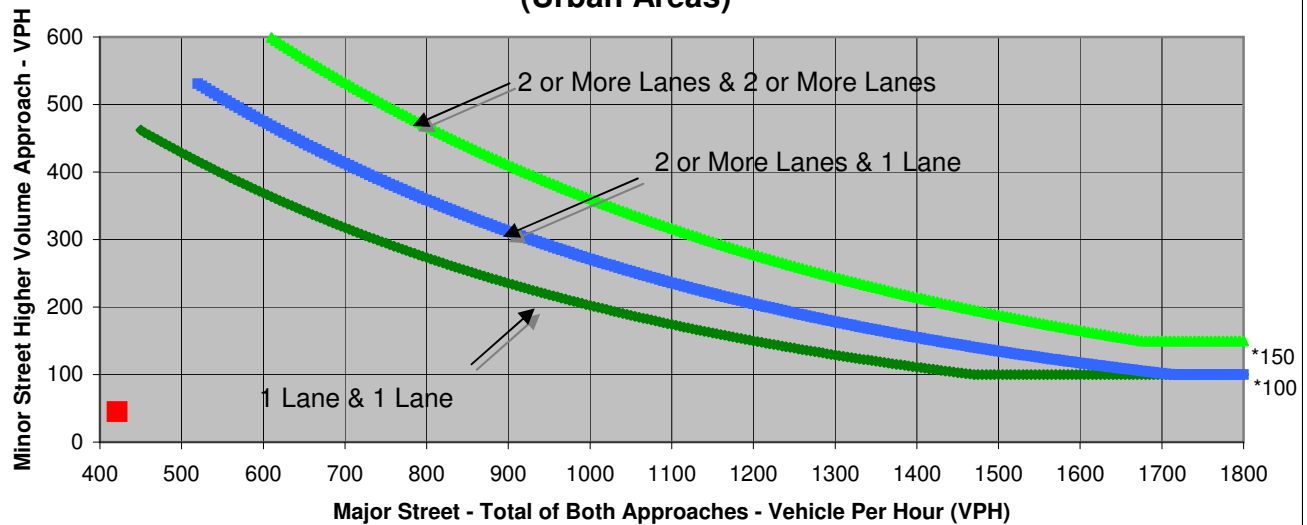
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	31	0	1
Through	167	221	0	0
Right	2	0	0	44
Total	169	252	0	45

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Union Road	Minor Street Atherton Drive	<u>Warrant Met</u>
Number of Approach Lanes	3	3	<u>NO</u>
Traffic Volume (VPH) *	421	45	

* 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 Union Road
 Minor Street Daniels Street

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour PM

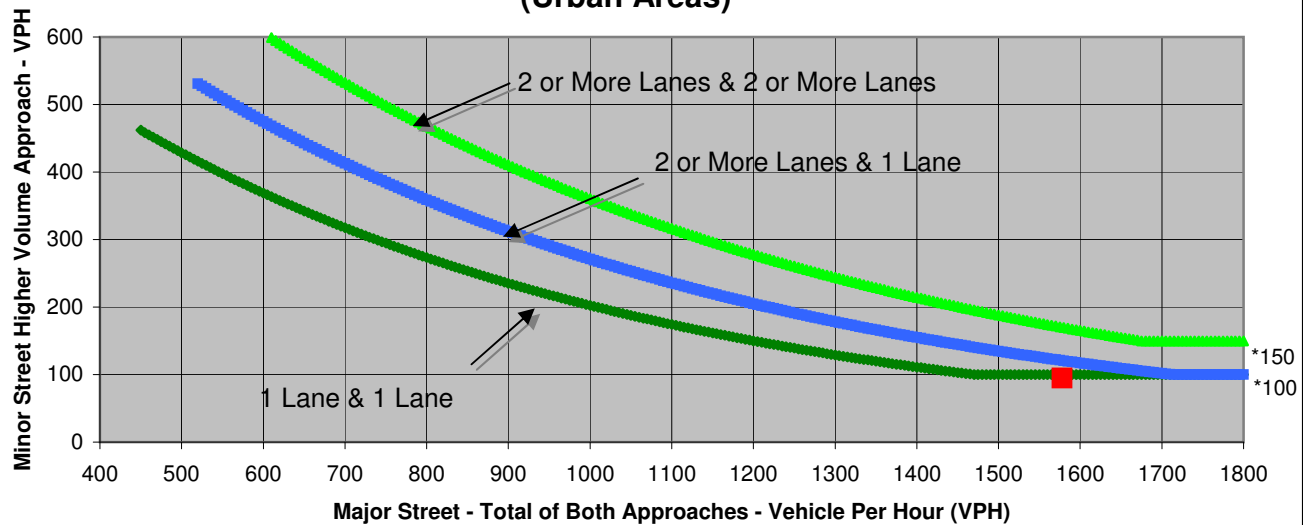
Turn Movement Volumes

	NB	SB	EB	WB
Left	80	0	0	35
Through	901	447	0	0
Right	0	150	0	60
Total	981	597	0	95

Major Street Direction

<u>x</u>	North/South
	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Union Road	Minor Street Daniels Street	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	1,578	95	

* 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 Union Road
 Minor Street SR 120 EB

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour PM

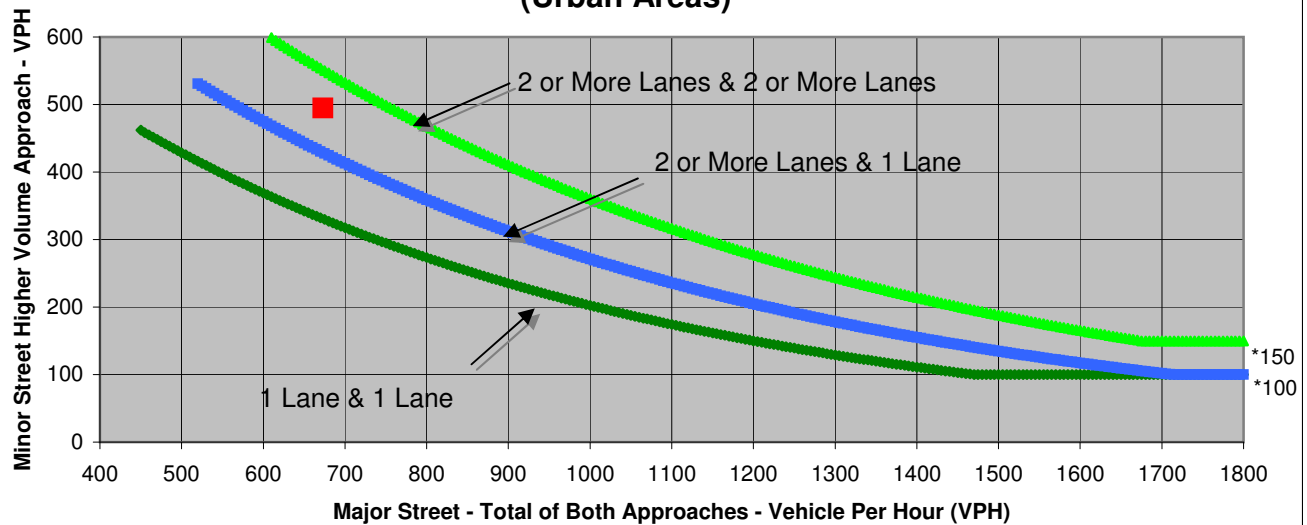
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	250	455	0
Through	206	212	0	0
Right	5	0	40	0
Total	211	462	495	0

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Union Road	SR 120 EB	
Number of Approach Lanes	2	1	<u>YES</u>
Traffic Volume (VPH) *	673	495	

* 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 Union Road
 Minor Street SR 120 WB

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour PM

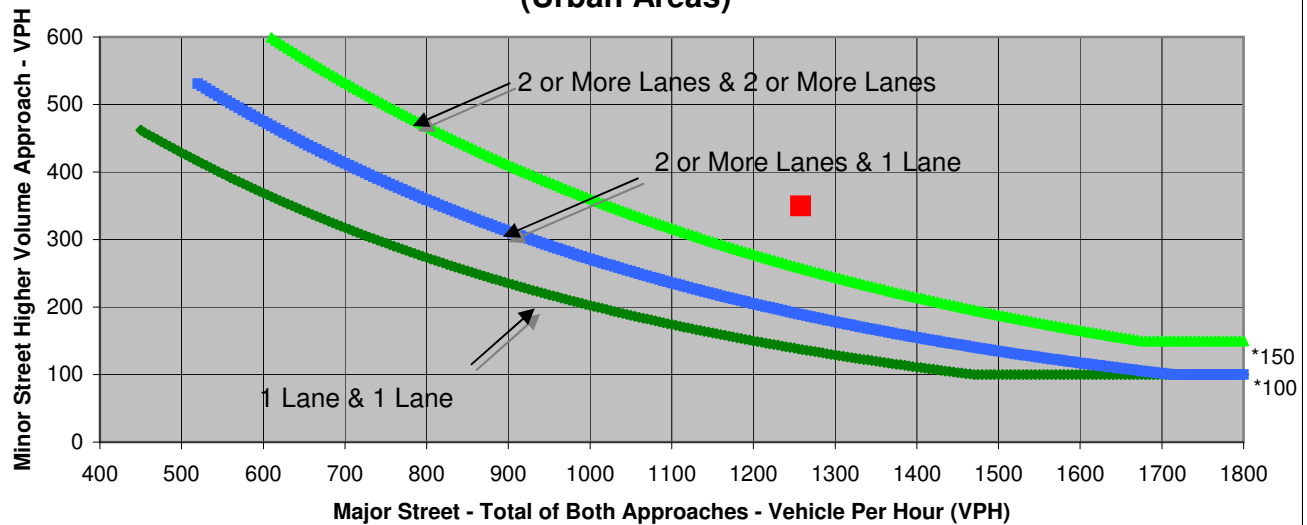
Turn Movement Volumes

	NB	SB	EB	WB
Left	15	447	0	335
Through	646	150	0	0
Right	0	0	0	15
Total	661	597	0	350

Major Street Direction

x	North/South
	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Union Road	SR 120 WB	
Number of Approach Lanes	2	2	<u>YES</u>
Traffic Volume (VPH) *	1,258	350	

* 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 Union Road
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing No Project
 Peak Hour PM

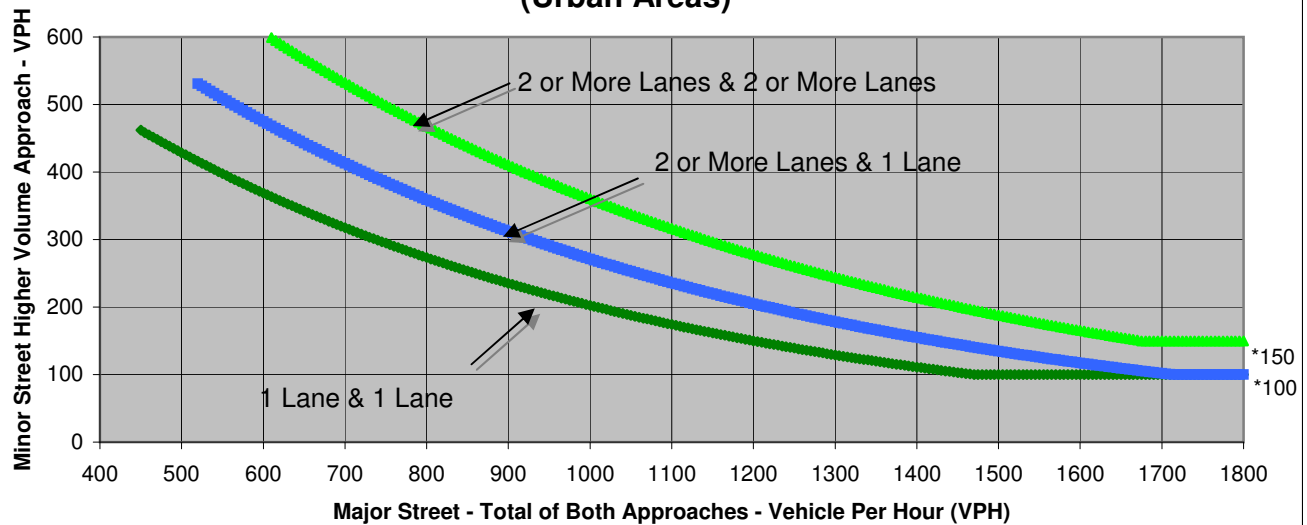
Turn Movement Volumes

	NB	SB	EB	WB
Left	2	102	12	8
Through	114	127	75	37
Right	12	9	3	49
Total	128	238	90	94

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Union Road	Woodward Avenue	
Number of Approach Lanes	2	3	<u>NO</u>
Traffic Volume (VPH) *	366	94	

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

HCM Signalized Intersection Capacity Analysis

1: Yosemite Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↶↷		↰	↶↷		↰	↶	↷	↰	↶↷	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.92		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3394		1770	3256		1770	1827	1583	1770	1801	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3394		1770	3256		1770	1827	1583	1770	1801	
Volume (vph)	87	250	94	249	180	206	41	295	173	200	284	34
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	95	272	102	271	196	224	46	328	192	211	299	36
RTOR Reduction (vph)	0	36	0	0	166	0	0	0	123	0	4	0
Lane Group Flow (vph)	95	338	0	271	254	0	46	328	69	211	331	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	8.2	15.0		19.1	25.9		3.8	34.1	34.1	15.6	45.9	
Effective Green, g (s)	8.2	15.0		19.1	25.9		3.8	34.1	34.1	15.6	45.9	
Actuated g/C Ratio	0.08	0.15		0.19	0.26		0.04	0.34	0.34	0.16	0.46	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	145	510		339	845		67	624	541	277	828	
v/s Ratio Prot	0.05	c0.10		c0.15	0.08		0.03	c0.18		c0.12	0.18	
v/s Ratio Perm									0.04			
v/c Ratio	0.66	0.66		0.80	0.30		0.69	0.53	0.13	0.76	0.40	
Uniform Delay, d1	44.4	40.0		38.5	29.7		47.4	26.4	22.6	40.3	17.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	10.2	3.2		12.4	0.2		25.3	3.1	0.5	11.7	1.4	
Delay (s)	54.6	43.3		50.9	29.9		72.8	29.5	23.1	52.0	19.3	
Level of Service	D	D		D	C		E	C	C	D	B	
Approach Delay (s)		45.6			38.1			30.8			31.9	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM Average Control Delay			36.4			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.66									
Actuated Cycle Length (s)			99.8			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			63.7%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Wawona St. & Airport Way

1/5/2009

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Volume (veh/h)	46	31	478	69	76	551			
Peak Hour Factor	0.85	0.85	0.90	0.90	0.95	0.95			
Hourly flow rate (vph)	54	36	531	77	80	580			
Pedestrians	2					2			
Lane Width (ft)	12.0					12.0			
Walking Speed (ft/s)	4.0					4.0			
Percent Blockage	0					0			
Right turn flare (veh)									
Median type	None								
Median storage veh									
Upstream signal (ft)	1313								
pX, platoon unblocked	0.82	0.82			0.82				
vC, conflicting volume	1311	573			610				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	1378	482			526				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	54	92			91				
cM capacity (veh/h)	119	480			856				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	91	608	660						
Volume Left	54	0	80						
Volume Right	36	77	0						
cSH	170	1700	856						
Volume to Capacity	0.53	0.36	0.09						
Queue Length 95th (ft)	67	0	8						
Control Delay (s)	47.8	0.0	2.4						
Lane LOS	E		A						
Approach Delay (s)	47.8	0.0	2.4						
Approach LOS	E								
Intersection Summary									
Average Delay	4.3								
Intersection Capacity Utilization		77.7%		ICU Level of Service		D			
Analysis Period (min)			15						

HCM Signalized Intersection Capacity Analysis

3: Daniels Street & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1565	1770	1863	1562	1770	3471	1548	1770	1827	1548
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1565	1770	1863	1562	1770	3471	1548	1770	1827	1548
Volume (vph)	77	26	120	54	22	8	174	462	80	22	384	191
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	91	31	141	64	26	9	193	513	89	23	404	201
RTOR Reduction (vph)	0	0	96	0	0	7	0	0	49	0	0	136
Lane Group Flow (vph)	91	31	45	64	26	2	193	513	40	23	404	65
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	pm+ov		Prot	Perm		Prot	Perm		Prot	Perm	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	6.8	11.0	20.8	7.0	11.2	11.2	9.8	28.9	28.9	1.8	20.9	20.9
Effective Green, g (s)	6.8	11.0	20.8	7.0	11.2	11.2	9.8	28.9	28.9	1.8	20.9	20.9
Actuated g/C Ratio	0.11	0.17	0.32	0.11	0.17	0.17	0.15	0.45	0.45	0.03	0.32	0.32
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	361	317	600	191	322	270	268	1550	691	49	590	500
v/s Ratio Prot	0.03	c0.02	0.01	c0.04	0.01		c0.11	0.15		0.01	c0.22	
v/s Ratio Perm			0.02			0.00			0.03			0.04
v/c Ratio	0.25	0.10	0.08	0.34	0.08	0.01	0.72	0.33	0.06	0.47	0.68	0.13
Uniform Delay, d1	26.6	22.7	15.3	26.7	22.4	22.1	26.1	11.6	10.2	31.0	19.0	15.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.01	0.99	0.89	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.1	0.1	1.0	0.1	0.0	9.2	0.1	0.0	6.9	3.3	0.1
Delay (s)	27.0	22.8	15.3	27.7	22.5	22.2	35.5	11.6	9.1	37.9	22.3	15.6
Level of Service	C	C	B	C	C	C	D	B	A	D	C	B
Approach Delay (s)		20.2			25.9			17.1			20.7	
Approach LOS		C			C			B			C	
Intersection Summary												
HCM Average Control Delay			19.3				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.51									
Actuated Cycle Length (s)			64.7				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			50.8%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

4: SR 120 WB & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	0	0	0	101	0	188	46	528	0	0	393	165
Peak Hour Factor	0.25	0.25	0.25	0.65	0.65	0.65	0.80	0.80	0.80	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	0	155	0	289	58	660	0	0	437	183
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)											494	
pX, platoon unblocked	0.81	0.81	0.81	0.81	0.81		0.81					
vC, conflicting volume	1593	1303	528	1303	1395	660	620			660		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1736	1377	414	1377	1490	660	528			660		
tC, single (s)	7.1	6.5	6.2	*6.4	6.5	6.3	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2			2.2		
p0 queue free %	100	100	100	0	100	36	93			100		
cM capacity (veh/h)	19	109	514	123	93	453	837			928		
Direction, Lane #	WB 1	NB 1	NB 2	SB 1								
Volume Total	445	58	660	620								
Volume Left	155	58	0	0								
Volume Right	289	0	0	183								
cSH	234	837	1700	1700								
Volume to Capacity	1.90	0.07	0.39	0.36								
Queue Length 95th (ft)	791	6	0	0								
Control Delay (s)	456.9	9.6	0.0	0.0								
Lane LOS	F	A										
Approach Delay (s)	456.9	0.8		0.0								
Approach LOS	F											
Intersection Summary												
Average Delay	114.3											
Intersection Capacity Utilization	62.8%			ICU Level of Service			B					
Analysis Period (min)	15											

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

5: SR 120 EB & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	340	2	119	0	0	0	0	234	54	198	296	0
Peak Hour Factor	0.90	0.90	0.90	0.25	0.25	0.25	0.90	0.90	0.90	0.80	0.80	0.80
Hourly flow rate (vph)	378	2	132	0	0	0	0	260	60	248	370	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1155	1185	370	1288	1155	290	370			320		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1155	1185	370	1288	1155	290	370			320		
tC, single (s)	*6.5	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	0	99	80	100	100	100	100			79		
cM capacity (veh/h)	177	150	676	94	156	749	1189			1207		
Direction, Lane #	EB 1	NB 1	SB 1	SB 2								
Volume Total	512	320	248	370								
Volume Left	378	0	248	0								
Volume Right	132	60	0	0								
cSH	219	1700	1207	1700								
Volume to Capacity	2.34	0.19	0.21	0.22								
Queue Length 95th (ft)	1034	0	19	0								
Control Delay (s)	653.1	0.0	8.8	0.0								
Lane LOS	F		A									
Approach Delay (s)	653.1	0.0	3.5									
Approach LOS	F											
Intersection Summary												
Average Delay		232.2										
Intersection Capacity Utilization		62.8%	ICU Level of Service						B			
Analysis Period (min)		15										

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

6: Atherton Dr & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	87	7	6	4	3	61	3	140	6	92	272	51
Peak Hour Factor	0.90	0.90	0.90	0.70	0.70	0.70	0.90	0.90	0.90	0.85	0.85	0.85
Hourly flow rate (vph)	97	8	7	6	4	87	3	156	7	108	320	60
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			14			14						
Median type		None			None							
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	744	705	320	706	759	156	380			162		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	744	705	320	706	759	156	380			162		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	65	98	99	98	99	90	100			92		
cM capacity (veh/h)	277	332	721	321	310	890	1178			1417		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3			
Volume Total	111	6	91	3	156	7	108	320	60			
Volume Left	97	6	0	3	0	0	108	0	0			
Volume Right	7	0	87	0	0	7	0	0	60			
cSH	299	321	934	1178	1700	1700	1417	1700	1700			
Volume to Capacity	0.37	0.02	0.10	0.00	0.09	0.00	0.08	0.19	0.04			
Queue Length 95th (ft)	41	1	8	0	0	0	6	0	0			
Control Delay (s)	24.3	16.4	9.8	8.1	0.0	0.0	7.8	0.0	0.0			
Lane LOS	C	C	A	A			A					
Approach Delay (s)	24.3	10.2		0.2			1.7					
Approach LOS	C	B										
Intersection Summary												
Average Delay			5.3									
Intersection Capacity Utilization			39.5%			ICU Level of Service				A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

7: Woodward Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Stop			Stop		
Volume (vph)	36	22	4	3	22	31	7	82	5	42	199	43
Peak Hour Factor	0.85	0.85	0.85	0.80	0.80	0.80	0.85	0.85	0.85	0.90	0.90	0.90
Hourly flow rate (vph)	42	26	5	4	28	39	8	96	6	47	221	48
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	73	70	111	316								
Volume Left (vph)	42	4	8	47								
Volume Right (vph)	5	39	6	48								
Hadj (s)	0.11	-0.29	0.02	-0.03								
Departure Headway (s)	5.1	4.7	4.6	4.4								
Degree Utilization, x	0.10	0.09	0.14	0.38								
Capacity (veh/h)	643	690	736	792								
Control Delay (s)	8.7	8.2	8.4	10.1								
Approach Delay (s)	8.7	8.2	8.4	10.1								
Approach LOS	A	A	A	B								
Intersection Summary												
Delay				9.3								
HCM Level of Service				A								
Intersection Capacity Utilization				38.8%	ICU Level of Service	A						
Analysis Period (min)				15								

HCM Signalized Intersection Capacity Analysis

8: Yosemite Avenue & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.98		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	3407		1770	3300		1770	3361	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	1770	3407		1770	3300		1770	3361	
Volume (vph)	287	419	251	85	326	108	214	479	74	116	440	222
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.85	0.85	0.85	0.90	0.90	0.90
Adj. Flow (vph)	312	455	273	92	354	117	252	564	87	129	489	247
RTOR Reduction (vph)	0	0	184	0	42	0	0	15	0	0	78	0
Lane Group Flow (vph)	312	455	89	92	429	0	252	636	0	129	658	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	13.0	25.0	25.0	4.7	16.7		11.0	23.3		7.8	20.1	
Effective Green, g (s)	13.0	25.0	25.0	4.7	16.7		11.0	23.3		7.8	20.1	
Actuated g/C Ratio	0.17	0.33	0.33	0.06	0.22		0.14	0.30		0.10	0.26	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	300	606	515	108	741		254	1001		180	880	
v/s Ratio Prot	c0.18	c0.24		0.05	0.13		c0.14	c0.19		0.07	c0.20	
v/s Ratio Perm			0.06									
v/c Ratio	1.04	0.75	0.17	0.85	0.58		0.99	0.64		0.72	0.75	
Uniform Delay, d1	31.9	23.1	18.5	35.7	26.9		32.9	23.1		33.4	26.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	62.7	5.2	0.2	43.9	1.1		54.1	3.1		12.7	5.8	
Delay (s)	94.6	28.3	18.7	79.6	28.0		86.9	26.2		46.2	31.8	
Level of Service	F	C	B	E	C		F	C		D	C	
Approach Delay (s)		45.7			36.4			43.1			33.9	
Approach LOS		D			D			D			C	
Intersection Summary												
HCM Average Control Delay			40.4			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.87									
Actuated Cycle Length (s)			76.8			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			72.8%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: Wawona St. & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	↰
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.94		1.00	0.91		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1754		1770	1704		1770	3282		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1754		1770	1704		1770	3282		1770	1863	1583
Volume (vph)	45	95	60	75	95	125	90	625	145	155	425	70
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.90	0.90	0.90
Adj. Flow (vph)	53	112	71	88	112	147	106	735	171	172	472	78
RTOR Reduction (vph)	0	37	0	0	76	0	0	26	0	0	0	72
Lane Group Flow (vph)	53	146	0	88	183	0	106	880	0	172	472	6
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot			Prot			Prot			Prot		Over
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												
Actuated Green, G (s)	4.5	11.6		4.5	11.6		4.5	22.5		7.1	25.1	4.5
Effective Green, g (s)	4.5	11.6		4.5	11.6		4.5	22.5		7.1	25.1	4.5
Actuated g/C Ratio	0.07	0.19		0.07	0.19		0.07	0.36		0.12	0.41	0.07
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	129	330		129	320		129	1197		204	758	115
v/s Ratio Prot	0.03	0.08		c0.05	c0.11		0.06	c0.27		c0.10	c0.25	0.00
v/s Ratio Perm												
v/c Ratio	0.41	0.44		0.68	0.57		0.82	0.74		0.84	0.62	0.05
Uniform Delay, d1	27.3	22.2		27.9	22.8		28.2	17.0		26.8	14.5	26.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.1	0.9		13.9	2.5		32.6	4.0		25.8	3.8	0.2
Delay (s)	29.5	23.1		41.8	25.2		60.8	21.1		52.6	18.4	26.8
Level of Service	C	C		D	C		E	C		D	B	C
Approach Delay (s)		24.5			29.4			25.2			27.4	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			26.5			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.75									
Actuated Cycle Length (s)			61.7			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			59.8%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

10: Daniels Street & Union Road

1/5/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	35	60	80	901	537	35
Peak Hour Factor	0.92	0.92	0.85	0.85	0.90	0.90
Hourly flow rate (vph)	38	65	94	1060	597	39
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1864	616	636			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1864	616	636			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	47	87	90			
cM capacity (veh/h)	72	490	948			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	103	1154	636			
Volume Left	38	94	0			
Volume Right	65	0	39			
cSH	156	948	1700			
Volume to Capacity	0.66	0.10	0.37			
Queue Length 95th (ft)	93	8	0			
Control Delay (s)	64.3	3.0	0.0			
Lane LOS	F	A				
Approach Delay (s)	64.3	3.0	0.0			
Approach LOS	F					
Intersection Summary						
Average Delay		5.3				
Intersection Capacity Utilization		97.9%		ICU Level of Service		F
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

11: SR 120 WB Ramps & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	0	0	0	15	0	335	15	646	0	0	447	150
Peak Hour Factor	0.25	0.25	0.25	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	0	17	0	372	17	718	0	0	497	167
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1703	1331	580	1331	1414	718	663			718		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1703	1331	580	1331	1414	718	663			718		
tC, single (s)	7.1	6.5	6.2	*6.5	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	90	100	13	98			100		
cM capacity (veh/h)	9	152	514	162	135	429	925			883		
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1							
Volume Total	17	372	17	718	663							
Volume Left	17	0	17	0	0							
Volume Right	0	372	0	0	167							
cSH	162	429	925	1700	1700							
Volume to Capacity	0.10	0.87	0.02	0.42	0.39							
Queue Length 95th (ft)	8	220	1	0	0							
Control Delay (s)	29.8	48.1	9.0	0.0	0.0							
Lane LOS	D	E	A									
Approach Delay (s)	47.3		0.2		0.0							
Approach LOS	E											
Intersection Summary												
Average Delay	10.4											
Intersection Capacity Utilization	62.6%			ICU Level of Service				B				
Analysis Period (min)	15											

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

12: SR 120 EB Ramps & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	455	0	40	0	0	0	0	206	5	250	212	0
Peak Hour Factor	0.90	0.90	0.90	0.25	0.25	0.25	0.90	0.90	0.90	0.85	0.85	0.85
Hourly flow rate (vph)	506	0	44	0	0	0	0	229	6	294	249	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1069	1072	249	1114	1069	232	249			234		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1069	1072	249	1114	1069	232	249			234		
tC, single (s)	*6.4	6.5	6.3	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	94	100	100	100	100			78		
cM capacity (veh/h)	205	172	775	145	172	807	1316			1333		
Direction, Lane #	EB 1	NB 1	SB 1	SB 2								
Volume Total	550	234	294	249								
Volume Left	506	0	294	0								
Volume Right	44	6	0	0								
cSH	218	1700	1333	1700								
Volume to Capacity	2.53	0.14	0.22	0.15								
Queue Length 95th (ft)	1151	0	21	0								
Control Delay (s)	735.8	0.0	8.5	0.0								
Lane LOS	F		A									
Approach Delay (s)	735.8	0.0	4.6									
Approach LOS	F											
Intersection Summary												
Average Delay		306.6										
Intersection Capacity Utilization		62.6%		ICU Level of Service					B			
Analysis Period (min)		15										

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

13: Atherton Dr. & Union Road

1/5/2009

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	1	44	167	2	31	221
Peak Hour Factor	0.85	0.85	0.75	0.75	0.85	0.85
Hourly flow rate (vph)	1	52	223	3	36	260
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh	1					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	557	224			225	
vC1, stage 1 conf vol	224					
vC2, stage 2 conf vol	333					
vCu, unblocked vol	557	224			225	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	94			97	
cM capacity (veh/h)	560	815			1343	
Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2	
Volume Total	1	52	225	36	260	
Volume Left	1	0	0	36	0	
Volume Right	0	52	3	0	0	
cSH	560	815	1700	1343	1700	
Volume to Capacity	0.00	0.06	0.13	0.03	0.15	
Queue Length 95th (ft)	0	5	0	2	0	
Control Delay (s)	11.4	9.7	0.0	7.8	0.0	
Lane LOS	B	A		A		
Approach Delay (s)	9.8		0.0	1.0		
Approach LOS	A					
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			25.6%		ICU Level of Service	A
Analysis Period (min)			15			

Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

HCM Signalized Intersection Capacity Analysis

15: SR 120 WB Ramp & Main Street

1/5/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↰	↰	↰	↰			↰	↰
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00
Frpb, ped/bikes					1.00	0.98	1.00	1.00			1.00	0.98
Flpb, ped/bikes					1.00	1.00	1.00	1.00			1.00	1.00
Frt					1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1736	1492	1736	1792			1792	1491
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1736	1492	1736	1792			1792	1491
Volume (vph)	0	0	0	37	0	249	66	616	0	0	472	388
Peak-hour factor, PHF	0.25	0.25	0.25	0.95	0.95	0.95	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	39	0	262	73	684	0	0	497	408
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	222
Lane Group Flow (vph)	0	0	0	0	39	262	73	684	0	0	497	186
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	2%	2%	2%	4%	2%	6%	4%	6%	2%	2%	6%	6%
Turn Type				Split		Free	Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases						Free						6
Actuated Green, G (s)					8.0	52.1	8.9	36.1			23.2	23.2
Effective Green, g (s)					8.0	52.1	8.9	36.1			23.2	23.2
Actuated g/C Ratio					0.15	1.00	0.17	0.69			0.45	0.45
Clearance Time (s)					4.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)					4.0		4.0	4.0			4.0	4.0
Lane Grp Cap (vph)					267	1492	297	1242			798	664
v/s Ratio Prot					0.02		0.04	c0.38			c0.28	
v/s Ratio Perm						c0.18						0.12
v/c Ratio					0.15	0.18	0.25	0.55			0.62	0.28
Uniform Delay, d1					19.1	0.0	18.7	4.0			11.1	9.2
Progression Factor					1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2					0.3	0.3	0.6	0.7			1.7	0.3
Delay (s)					19.4	0.3	19.3	4.6			12.8	9.5
Level of Service					B	A	B	A			B	A
Approach Delay (s)		0.0			2.7			6.0			11.3	
Approach LOS		A			A			A			B	
Intersection Summary												
HCM Average Control Delay			8.0									
HCM Volume to Capacity ratio			0.51									
Actuated Cycle Length (s)			52.1									
Intersection Capacity Utilization			61.4%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

16: SR 120 EB Ramps & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.98					1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00					1.00		1.00	1.00	
Frt		1.00	0.85					0.99		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1703	1518					1800		1703	1827	
Flt Permitted		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (perm)		1703	1518					1800		1703	1827	
Volume (vph)	420	0	183	0	0	0	0	262	27	228	281	0
Peak-hour factor, PHF	0.80	0.80	0.80	0.25	0.25	0.25	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	525	0	229	0	0	0	0	291	30	240	296	0
RTOR Reduction (vph)	0	0	127	0	0	0	0	4	0	0	0	0
Lane Group Flow (vph)	0	525	102	0	0	0	0	317	0	240	296	0
Confl. Peds. (#/hr)			2				2			2		2
Heavy Vehicles (%)	6%	2%	4%	2%	2%	2%	2%	4%	4%	6%	4%	2%
Turn Type	Split		Perm							Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases			4									
Actuated Green, G (s)		30.9	30.9					19.2		13.1	36.3	
Effective Green, g (s)		30.9	30.9					19.2		13.1	36.3	
Actuated g/C Ratio		0.41	0.41					0.26		0.17	0.48	
Clearance Time (s)		4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)		700	624					460		297	882	
v/s Ratio Prot		c0.31						c0.18		c0.14	0.16	
v/s Ratio Perm			0.07									
v/c Ratio		0.75	0.16					0.69		0.81	0.34	
Uniform Delay, d1		18.9	14.0					25.3		29.8	12.0	
Progression Factor		1.00	1.00					1.00		1.00	1.00	
Incremental Delay, d2		4.5	0.1					4.3		14.8	0.2	
Delay (s)		23.4	14.1					29.6		44.7	12.2	
Level of Service		C	B					C		D	B	
Approach Delay (s)		20.6			0.0			29.6			26.7	
Approach LOS		C			A			C			C	
Intersection Summary												
HCM Average Control Delay			24.4									HCM Level of Service C
HCM Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			75.2							12.0		
Intersection Capacity Utilization			61.4%									ICU Level of Service B
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

17: Atherton Drive & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	0	0	0	0	0	0	0	289	0	0	464	0
Peak Hour Factor	0.25	0.25	0.25	0.25	0.25	0.25	0.95	0.95	0.95	0.85	0.85	0.85
Hourly flow rate (vph)	0	0	0	0	0	0	0	304	0	0	546	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)											640	
pX, platoon unblocked	0.92	0.92	0.92	0.92	0.92		0.92					
vC, conflicting volume	850	850	546	850	850	304	546	304				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	837	837	507	837	837	304	507	304				
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1	4.1				
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2	2.2				
p0 queue free %	100	100	100	100	100	100	100	100				
cM capacity (veh/h)	263	279	521	263	279	736	974	1257				
Direction, Lane #	NB 1	SB 1										
Volume Total	304	546										
Volume Left	0	0										
Volume Right	0	0										
cSH	974	1257										
Volume to Capacity	0.00	0.00										
Queue Length 95th (ft)	0	0										
Control Delay (s)	0.0	0.0										
Lane LOS												
Approach Delay (s)	0.0	0.0										
Approach LOS												
Intersection Summary												
Average Delay	0.0											
Intersection Capacity Utilization	27.8%			ICU Level of Service					A			
Analysis Period (min)	15											

Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

Level Of Service Computation Report

2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #14

Cycle (sec): 100 Critical Vol./Cap.(X): 0.196

Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 9.2

Optimal Cycle: 0 Level Of Service: A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0	1	0	1	0	1	0	1	0	1	0

Volume Module:

Base Vol:	2	114	12	102	127	9	12	75	3	8	37	49
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	2	114	12	102	127	9	12	75	3	8	37	49
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	2	114	12	102	127	9	12	75	3	8	37	49
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	2	114	12	102	127	9	12	75	3	8	37	49
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	2	114	12	102	127	9	12	75	3	8	37	49
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	2	114	12	102	127	9	12	75	3	8	37	49

Saturation Flow Module:

Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	567	618	699	596	650	741	543	590	663	542	588	665

Capacity Analysis Module:

Vol/Sat:	0.00	0.18	0.02	0.17	0.20	0.01	0.02	0.13	0.00	0.01	0.06	0.07
Crit Moves:	****			****			****			****		
Delay/Veh:	8.8	9.4	7.6	9.7	9.3	7.4	9.1	9.2	7.8	9.0	8.8	8.1
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	8.8	9.4	7.6	9.7	9.3	7.4	9.1	9.2	7.8	9.0	8.8	8.1
LOS by Move:	A	A	A	A	A	A	A	A	A	A	A	A
ApproachDel:	9.3			9.4			9.2			8.5		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	9.3			9.4			9.2			8.5		
LOS by Appr:	A			A			A			A		
AllWayAvgQ:	0.0	0.2	0.0	0.2	0.2	0.0	0.0	0.1	0.0	0.0	0.1	0.1

Note: Queue reported is the number of cars per lane.

Level Of Service Detailed Computation Report
2000 HCM 4-Way Stop Method
Future Volume Alternative

Intersection #14

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R	
----- ----- ----- ----- -----																
Time Period:	0.25 hour															
HevVeh:	0%				0%				0%				0%			
Alpha Value:	0.01															
----- ----- ----- ----- -----																
GroupType:	6				6				6				6			
P[C1]:	0.50				0.60				0.47				0.46			
P[C2]:	0.25				0.14				0.07				0.08			
P[C3]:	0.16				0.19				0.34				0.34			
P[C4]:	0.09				0.06				0.11				0.11			
P[C5]:	0.01				0.00				0.01				0.01			
Padj[C1]:	0.009				0.007				0.011				0.011			
Padj[C2]:	0.001				0.002				0.005				0.005			
Padj[C3]:	-0.004				-0.005				-0.009				-0.009			
Padj[C4]:	-0.005				-0.004				-0.006				-0.007			
Padj[C5]:	-0.001				-0.000				-0.001				-0.001			
----- ----- ----- ----- -----																
Lanes:	L1		L2		L1		L2		L1		L2		L1		L2	
LaneType:	LEFT		RITE		LEFT		RITE		LEFT		RITE		LEFT		RITE	
----- ----- ----- ----- -----																
HeadwayAdj:	0.500		-0.700		0.500		-0.700		0.500		-0.700		0.500		-0.700	
Volume:	2		12		102		9		12		3		8		49	
Capacity:	567		699		596		741		543		663		542		665	
DegOfUtil:	0.00		0.02		0.17		0.01		0.02		0.00		0.01		0.07	
DepHeadway:	6.06		4.86		5.84		4.64		6.25		5.05		6.25		5.05	
ServiceTime:	3.8		2.6		3.5		2.3		3.9		2.7		4.0		2.8	
Delay:	8.8		7.6		9.7		7.4		9.1		7.8		9.0		8.1	
Queue:	0.0		0.0		0.2		0.0		0.0		0.0		0.0		0.1	
----- ----- ----- ----- -----																
Lane:	L3				L3				L3				L3			
LaneType:	THRU				THRU				THRU				THRU			
----- ----- ----- ----- -----																
HeadwayAdj:	0.000				0.000				0.000				0.000			
Volume:	114				127				75				37			
Capacity:	618				650				590				588			
DegOfUtil:	0.18				0.19				0.12				0.06			
DepHeadway:	5.56				5.34				5.75				5.75			
ServiceTime:	3.3				3.0				3.4				3.5			
Delay:	9.4				9.3				9.2				8.8			
Queue:	0.2				0.2				0.1				0.1			
----- ----- ----- ----- -----																
Approach:	North Bound				South Bound				East Bound				West Bound			
----- ----- ----- ----- -----																
ApproachDel:	9.3				9.4				9.2				8.5			
Delay Adj:	1.00				1.00				1.00				1.00			
ApprAdjDel:	9.3				9.4				9.2				8.5			
LOS by Appr:	A				A				A				A			

OverallDel:	9.2
OverallLOS:	A

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #14

Future Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound	South Bound	East Bound	West Bound
Movement:	L - T - R	L - T - R	L - T - R	L - T - R
Control:	Stop Sign	Stop Sign	Stop Sign	Stop Sign
Lanes:	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1
Initial Vol:	2 114 12	102 127 9	12 75 3	8 37 49

Major Street Volume: 366
Minor Approach Volume: 94
Minor Approach Volume Threshold: 806

SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

Level Of Service Computation Report

2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #18

Cycle (sec): 100 Critical Vol./Cap.(X): 0.409

Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 12.1

Optimal Cycle: 0 Level Of Service: B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0	1	0	1	0	1	0	1	0	1	0

Volume Module:

Base Vol:	23	160	16	209	223	32	22	117	49	20	66	107
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	23	160	16	209	223	32	22	117	49	20	66	107
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	23	160	16	209	223	32	22	117	49	20	66	107
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	23	160	16	209	223	32	22	117	49	20	66	107
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	23	160	16	209	223	32	22	117	49	20	66	107
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	23	160	16	209	223	32	22	117	49	20	66	107

Saturation Flow Module:

Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	459	496	542	512	550	608	447	480	526	446	477	528

Capacity Analysis Module:

Vol/Sat:	0.05	0.32	0.03	0.41	0.41	0.05	0.05	0.24	0.09	0.04	0.14	0.20
Crit Moves:	****			****			****			****		
Delay/Veh:	10.4	12.6	9.0	13.9	13.0	8.6	10.6	11.8	9.6	10.6	10.8	10.5
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	10.4	12.6	9.0	13.9	13.0	8.6	10.6	11.8	9.6	10.6	10.8	10.5
LOS by Move:	B	B	A	B	B	A	B	B	A	B	B	B
ApproachDel:	12.0			13.1			11.1			10.6		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	12.0			13.1			11.1			10.6		
LOS by Appr:	B			B			B			B		
AllWayAvgQ:	0.0	0.4	0.0	0.6	0.6	0.0	0.0	0.3	0.1	0.0	0.1	0.2

Note: Queue reported is the number of cars per lane.

Level Of Service Detailed Computation Report
2000 HCM 4-Way Stop Method
Future Volume Alternative

Intersection #18

Approach:	North Bound				South Bound				East Bound				West Bound							
Movement:	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R
----- ----- ----- ----- -----																				
Time Period:	0.25 hour																			
HevVeh:	0%				0%				0%				0%							
Alpha Value:	0.01																			
----- ----- ----- ----- -----																				
GroupType:	6				6				6				6							
P[C1]:	0.16				0.29				0.15				0.15							
P[C2]:	0.30				0.16				0.07				0.07							
P[C3]:	0.15				0.28				0.37				0.37							
P[C4]:	0.32				0.22				0.33				0.33							
P[C5]:	0.07				0.04				0.07				0.08							
Padj[C1]:	0.018				0.015				0.021				0.021							
Padj[C2]:	0.007				0.007				0.012				0.012							
Padj[C3]:	-0.000				-0.005				-0.006				-0.006							
Padj[C4]:	-0.019				-0.013				-0.019				-0.019							
Padj[C5]:	-0.007				-0.004				-0.007				-0.008							
----- ----- ----- ----- -----																				
Lanes:	L1		L2		L1		L2		L1		L2		L1		L2					
LaneType:	LEFT		RITE		LEFT		RITE		LEFT		RITE		LEFT		RITE					
----- ----- ----- ----- -----																				
HeadwayAdj:	0.500		-0.700		0.500		-0.700		0.500		-0.700		0.500		-0.700					
Volume:	23		16		209		32		22		49		20		107					
Capacity:	459		542		512		608		447		526		446		528					
DegOfUtil:	0.05		0.03		0.40		0.05		0.05		0.09		0.04		0.19					
DepHeadway:	7.36		6.16		6.82		5.62		7.52		6.32		7.53		6.33					
ServiceTime:	5.1		3.9		4.5		3.3		5.2		4.0		5.2		4.0					
Delay:	10.4		9.0		13.9		8.6		10.6		9.6		10.6		10.5					
Queue:	0.0		0.0		0.6		0.0		0.0		0.1		0.0		0.2					
----- ----- ----- ----- -----																				
Lane:	L3				L3				L3				L3							
LaneType:	THRU				THRU				THRU				THRU							
----- ----- ----- ----- -----																				
HeadwayAdj:	0.000				0.000				0.000				0.000							
Volume:	160				223				117				66							
Capacity:	496				550				480				477							
DegOfUtil:	0.31				0.39				0.23				0.13							
DepHeadway:	6.86				6.32				7.02				7.03							
ServiceTime:	4.6				4.0				4.7				4.7							
Delay:	12.6				13.0				11.8				10.8							
Queue:	0.4				0.6				0.3				0.1							
----- ----- ----- ----- -----																				
Approach:	North Bound				South Bound				East Bound				West Bound							
----- ----- ----- ----- -----																				
ApproachDel:	12.0				13.1				11.1				10.6							
Delay Adj:	1.00				1.00				1.00				1.00							
ApprAdjDel:	12.0				13.1				11.1				10.6							
LOS by Appr:	B				B				B				B							

OverallDel:	12.1
OverallLOS:	B

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #18

Future Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound			South Bound			East Bound			West Bound					
Movement:	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign					
Lanes:	1	0	1	0	1	1	0	1	0	1	1	0	1	0	1
Initial Vol:	23	160		16	209	223	32	22	117	49	20	66	107		
Major Street Volume:				663											
Minor Approach Volume:				193											
Minor Approach Volume Threshold:				551											

SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

Existing, Plus Project, AM

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: I-5 to Yosemite
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	1975	veh/h
Peak-hour factor, PHF	0.97	
Peak 15-min volume, v15	509	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1089	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1089	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	16.8	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: SR 120 Eastbound
 From/To: Yosemite to Airport
 Jurisdiction: City of Manteca
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	1938	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	527	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1106	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

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	2	
Density, D	17.0	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Airport to Union
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2027	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	551	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1157	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1157	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	17.8	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Union to Main
Jurisdiction:
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2141	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	582	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1222	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1222	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.8	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Main to SR 99
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2013	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	547	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1149	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1149	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	17.7	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: SR 99 to Main
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2487	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	676	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1419	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1419	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	21.8	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Main to Union
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2724	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	740	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1554	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1554	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	23.9	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Union to Airport
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2806	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	762	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1601	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1601	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	2	
Density, D	24.7	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: SR 120 Westbound
 From/To: Airport to Yosemite
 Jurisdiction: City of Manteca
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2996	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	814	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1710	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1710	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.5	mi/h
Number of lanes, N	2	
Density, D	26.5	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Yosemite to I-5
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3006	veh/h
Peak-hour factor, PHF	0.93	
Peak 15-min volume, v15	808	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1697	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1697	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.6	mi/h
Number of lanes, N	2	
Density, D	26.3	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Northbound
From/To: Jack Tone to Austin
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4589	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1275	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1819	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1819	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	28.5	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Northbound
From/To: Austin to SR-120
Jurisdiction:
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4386	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1218	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1738	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1738	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.3	mi/h
Number of lanes, N	3	
Density, D	27.0	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Northbound
From/To: Yosemite to Louise
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2706	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	752	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1609	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1609	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	2	
Density, D	24.8	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: Louise to Yosemite
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2707	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	752	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1609	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1609	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	2	
Density, D	24.8	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: _____ Fax: _____
 E-mail: _____

 Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: SR-99 Northbound
 From/To: SR-120 to Yosemite
 Jurisdiction:
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

 Flow Inputs and Adjustments

Volume, V	3017	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	838	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1196	pc/h/ln

 Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

 LOS and Performance Measures

Flow rate, vp	1196	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	18.4	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: SR-99 Southbound
 From/To: Yosemite to SR-120
 Jurisdiction: City of Manteca
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3245	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	901	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1929	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1929	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.5	mi/h
Number of lanes, N	2	
Density, D	30.9	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: SR-120 to Austin
Jurisdiction:
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4140	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1150	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1641	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1641	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	25.3	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: Austin to Jack Tone
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4276	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1188	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1695	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1695	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	26.3	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge
Number of lanes in freeway	2
Free-flow speed on freeway	65.0 mph
Volume on freeway	1938 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	114 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)	1938	114	vph
Peak-hour factor, PHF	0.92	0.80	
Peak 15-min volume, v15	527	36	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2212	146	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 2212 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	2212	4700	No
v = v - v FO F R	2066	4700	No
v R	146	2000	No
v v 3 or av34	0 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h? 3 or av34		No	
Is v v > 1.5 v /2 3 or av34	12	No	
If yes, v = 12A		(Equation 25-18)	

Flow Entering Diverge Influence Area

v_{12}	Actual 2212	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 4.252 + 0.0086 v_{12} - 0.009 L = 21.9 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$D = 0.441$
Space mean speed in ramp influence area, S_R	$S = 54.9 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = \text{N/A} \text{ mph}$
Space mean speed for all vehicles, S	$S = 54.9 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/2008
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1824	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	203	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	1824	203	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	496	55	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2082	226	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_{FM} (P_{FM}) = 2082 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2308	4700	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34} > 2700 \text{ pc/h?}$		No	
$v_{3 \text{ or } av34}$			
Is $v_{3 \text{ or } av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} =$		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2082	4400	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 20.2 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M = 0.325$
Space mean speed in ramp influence area,	$S_R = 57.5 \text{ mph}$
Space mean speed in outer lanes,	$S = N/A \text{ mph}$
Space mean speed for all vehicles,	$S = 57.5 \text{ mph}$

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Phone: _____ Fax: _____
E-mail: _____

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2027	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	187	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
Volume, V (vph)	2027	187	vph
Peak-hour factor, PHF	0.92	0.80	
Peak 15-min volume, v15	551	58	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2313	240	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 2313 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	2313	4700	No
v = v - v FO F R	2073	4700	No
v R	240	2000	No
v v 3 or av34	0 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h? 3 or av34		No	
Is v v > 1.5 v /2 3 or av34	12	No	
If yes, v = 12A		(Equation 25-18)	

Flow Entering Diverge Influence Area

v_{12}	Actual 2313	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 4.252 + 0.0086 v_{12} - 0.009 L = 22.8 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$D = 0.450$
Space mean speed in ramp influence area, S_R	$S = 54.7 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = \text{N/A} \text{ mph}$
Space mean speed for all vehicles, S	$S = 54.7 \text{ mph}$

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/2008
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge
Number of lanes in freeway	2
Free-flow speed on freeway	65.0 mph
Volume on freeway	1844 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	297 vph
Length of first accel/decel lane	500 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)	1844	297	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	501	81	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2105	331	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_{FM} (P_{FM}) = 2105 \text{ pc/h}$$

Capacity Checks

v_{12}	Actual 2436	Maximum 4700	LOS F? No
FO			
v_{12}	0 pc/h	(Equation 25-4 or 25-5)	
3 or av34			
Is $v_{12} > 2700$ pc/h?		No	
3 or av34			
Is $v_{12} > 1.5 v_{12} / 2$		No	
3 or av34	12		
If yes, $v_{12} =$		(Equation 25-8)	
12A			

Flow Entering Merge Influence Area

v_{12}	Actual 2105	Max Desirable 4400	Violation? No
12			!

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_{12} + 0.0078 v_{12} - 0.00627 L = 21.2 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M = 0.331$
Space mean speed in ramp influence area,	$S_R = 57.4 \text{ mph}$
Space mean speed in outer lanes,	$S = N/A \text{ mph}$
Space mean speed for all vehicles,	$S = 57.4 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge
Number of lanes in freeway	2
Free-flow speed on freeway	65.0 mph
Volume on freeway	2806 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	214 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)	2806	214	vph
Peak-hour factor, PHF	0.92	0.95	
Peak 15-min volume, v15	762	56	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3202	231	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 3202 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	3202	4700	No
v = v - v FO F R	2971	4700	No
v R	231	2000	No
v v 3 or av34	0 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h?	No		
3 or av34			
Is v v > 1.5 v /2	No		
3 or av34	12		
If yes, v =	(Equation 25-18)		
12A			

Flow Entering Diverge Influence Area

v_{12}	Actual 3202	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 4.252 + 0.0086 v_{12} - 0.009 L = 30.4 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$D = 0.449$
Space mean speed in ramp influence area, S_R	$S = 54.7 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = \text{N/A} \text{ mph}$
Space mean speed for all vehicles, S	$S = 54.7 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2592	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	404	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	2592	404	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	704	110	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2958	450	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_{FM} (P_{FM}) = 2958 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v	3408	4700	No
FO			
v v	0 pc/h	(Equation 25-4 or 25-5)	
3 or av34			
Is v v > 2700 pc/h?		No	
3 or av34			
Is v v > 1.5 v /2		No	
3 or av34	12		
If yes, v =		(Equation 25-8)	
12A			

Flow Entering Merge Influence Area

v_{12}	Actual 2958	Max Desirable 4400	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_{12} + 0.0078 v_A - 0.00627 L = 28.7 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$M = 0.404$
Space mean speed in ramp influence area, S_R	$S = 55.7 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = \text{N/A} \text{ mph}$
Space mean speed for all vehicles, S	$S = 55.7 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2372	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	434	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	2372	434	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	645	118	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2707	484	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_{FM} (P_{FM}) = 2707 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v	3191	4700	No
FO			
v	0	pc/h	(Equation 25-4 or 25-5)
3 or av34			
Is v	> 2700 pc/h?	No	
3 or av34			
Is v	> 1.5 v / 2	No	
3 or av34	12		
If yes, v	=	(Equation 25-8)	
12A			

Flow Entering Merge Influence Area

v_{12}	Actual 2707	Max Desirable 4400	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_{12} + 0.0078 v_A - 0.00627 L = 27.0 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$M = 0.381$
Space mean speed in ramp influence area, S_R	$S = 56.2 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = \text{N/A} \text{ mph}$
Space mean speed for all vehicles, S	$S = 56.2 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2724	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	357	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
Volume, V (vph)	2724	357	vph
Peak-hour factor, PHF	0.92	0.95	
Peak 15-min volume, v15	740	94	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3109	385	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 3109 \text{ pc/h}$$

Capacity Checks

$v_{Fi} = v_F$	Actual 3109	Maximum 4700	LOS F? No
$v_{FO} = v_F - v_R$	2724	4700	No
v_R	385	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700 \text{ pc/h}$?		No	
Is $v_{3 \text{ or } av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} =$		(Equation 25-18)	

Flow Entering Diverge Influence Area

v_{12}	Actual 3109	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 29.6 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable, S_D	$D = 0.463$
Space mean speed in ramp influence area, S_R	$S = 54.4 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = \text{N/A} \text{ mph}$
Space mean speed for all vehicles, S	$S = 54.4 \text{ mph}$

Leisch Method for Weaving Analysis

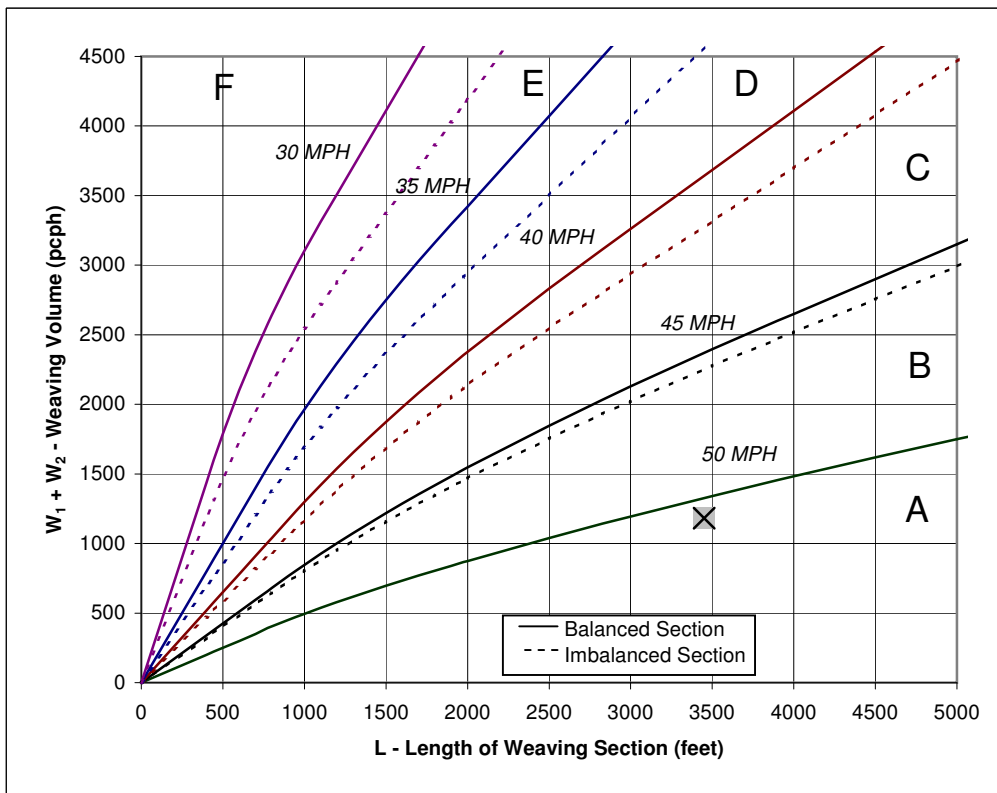
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,450

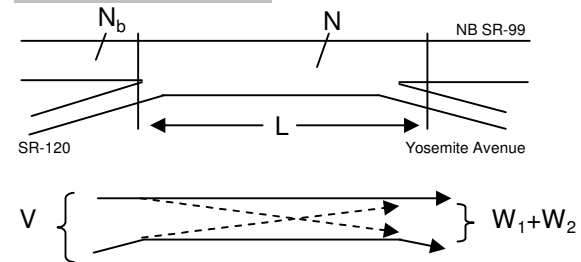
Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	3,017	Volume (vph)*	558	Volume (vph)*	634
Truck Percentage	14%	Truck Percentage	10%	Truck Percentage	6%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	3,228	Volume (pcph)	550	Volume (pcph)	632

Project Information

Project	Union Crossing
Scenario	EXISTING NO PROJECT - AM
Freeway	NB SR-99
On-ramp	SR-120
Off-ramp	Yosemite Avenue



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? **Y**
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

45 mph and **50 mph**

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

3. Interpolated Weaving Speed (S_w , mph)	50.7
4. Weaving Intensity Factor (k)	1.00
5. Service Volume (SV, pcph) $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	1,076
6. Level of Service (LOS)	C

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF)**. The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Leisch Method for Weaving Analysis

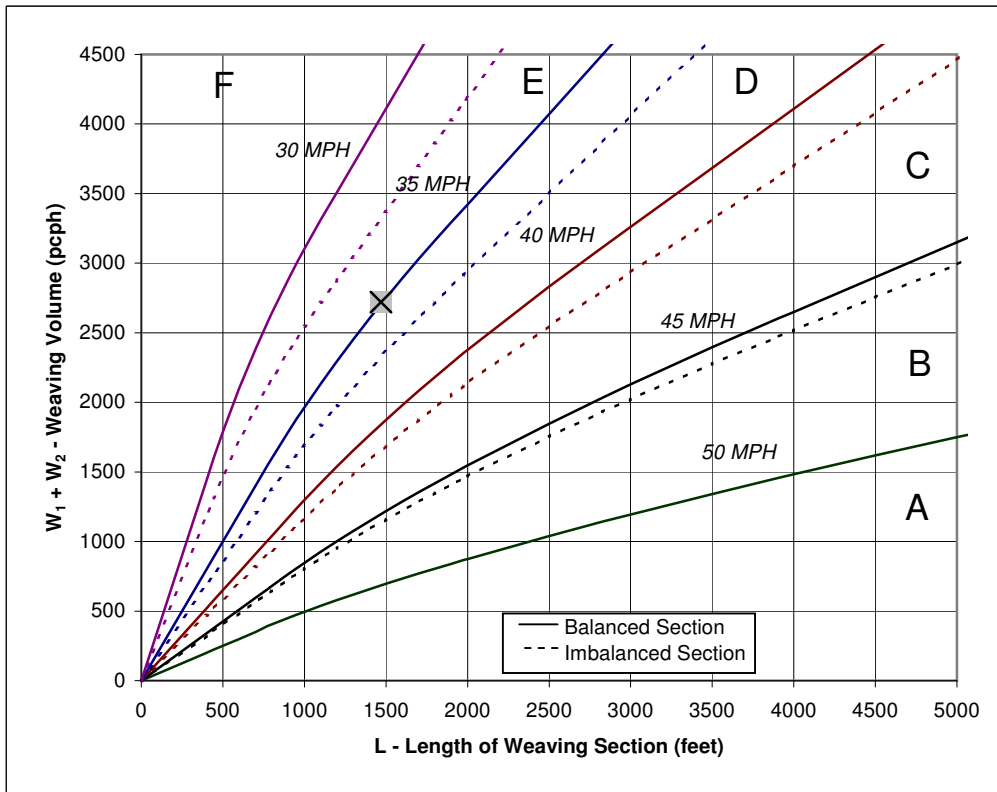
Data Input

Number of Entering Mainline Lanes	N_b	3
Number of Lanes in Weaving Section	N	4
Length of Weaving Section (feet)	L	1,470

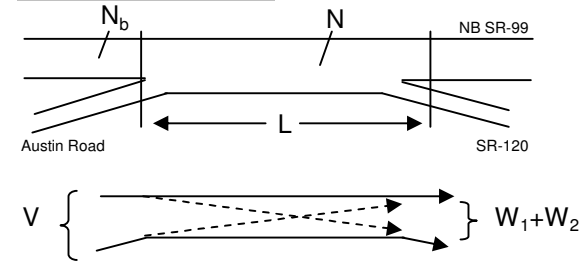
Total Weaving Section (V)	On-ramp to Mainline (W_1)	Mainline to Off-ramp (W_2)
Volume (vph)*	Volume (vph)*	Volume (vph)*
Truck Percentage	Truck Percentage	Truck Percentage
PCE for Trucks	PCE for Trucks	PCE for Trucks
Volume (pcph)	Volume (pcph)	Volume (pcph)
4,386	97	2,495
14%	6%	10%
1.5	1.5	1.5
4,693	100	2,620

Project Information

Project	Union Crossing
Scenario	EXISTING NO PROJECT - AM
Freeway	NB SR-99
On-ramp	Austin Road
Off-ramp	SR-120



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? Y
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

35 MPH and 40 MPH

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

- Interpolated Weaving Speed (S_w , mph) 34.9
- Weaving Intensity Factor (k) 3.00
- Service Volume (SV, pcph)
 $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$ 1,223
- Level of Service (LOS) C

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Leisch Method for Weaving Analysis

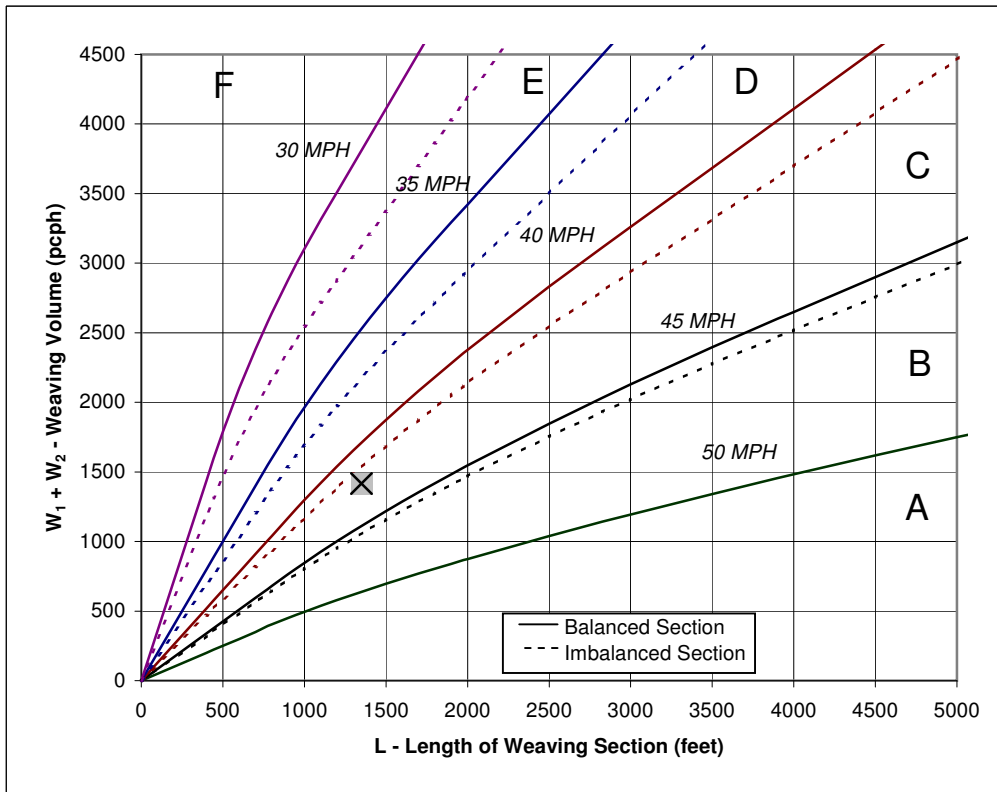
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	1,350

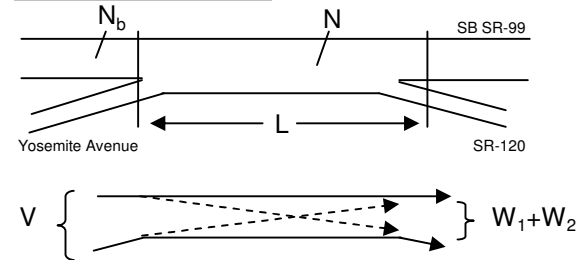
Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	3,245	Volume (vph)*	799	Volume (vph)*	560
Truck Percentage	14%	Truck Percentage	10%	Truck Percentage	6%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	3,472	Volume (pcph)	839	Volume (pcph)	577

Project Information

Project	Union Crossing
Scenario	EXISTING PLUS PROJECT - AM
Freeway	SB SR-99
On-ramp	Yosemite Avenue
Off-ramp	SR-120



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? n
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

40 mph and 45 mph

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

- Interpolated Weaving Speed (S_w , mph) 41.3
- Weaving Intensity Factor (k) 2.41
- Service Volume (SV, pcph)
 $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$ 1,428
- Level of Service (LOS) D

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Major Street Airport Way
 Minor Street SR 120 EB

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour AM

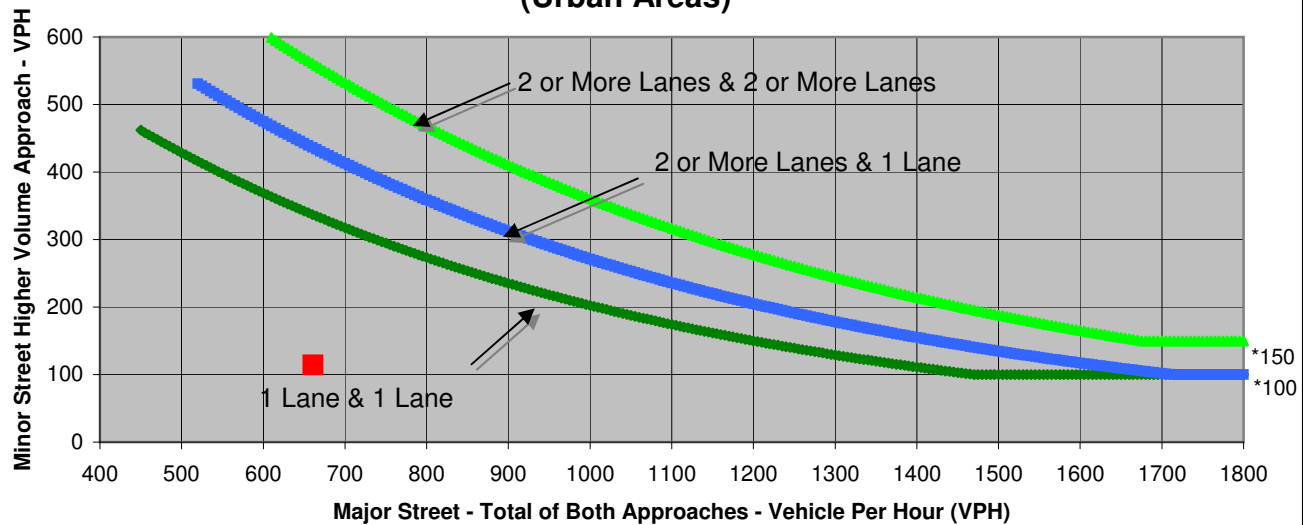
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	107	104	0
Through	323	139	0	0
Right	92	0	10	0
Total	415	246	114	0

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street SR 120 EB	<u>Warrant Met</u>
Number of Approach Lanes	2	1	<u>NO</u>
Traffic Volume (VPH) *	661	114	

* 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 Airport Way
 Minor Street SR 120 WB

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour AM

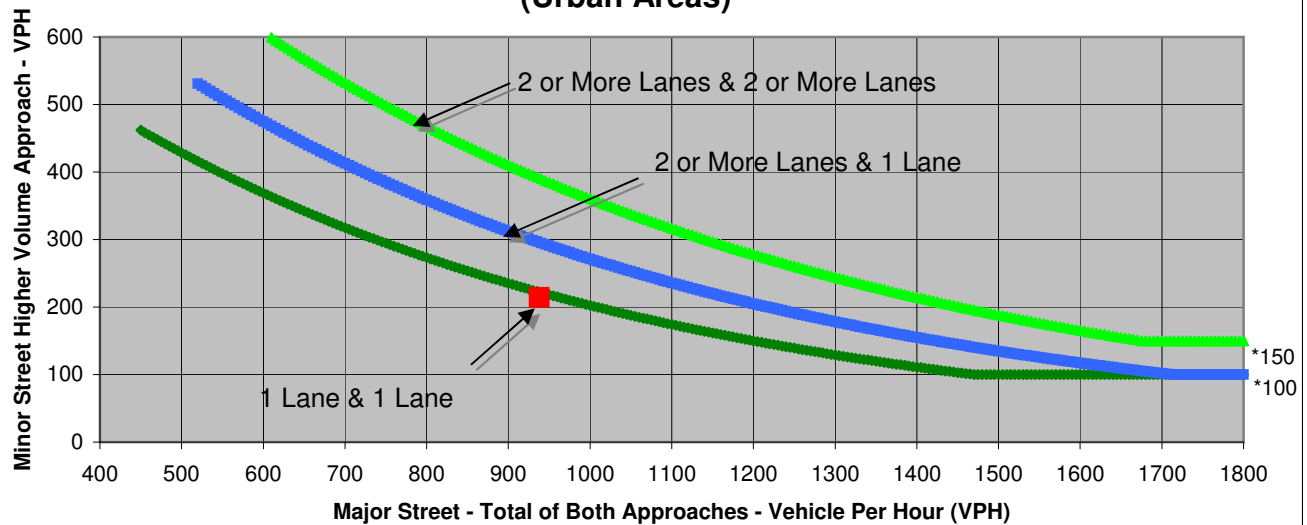
Turn Movement Volumes

	NB	SB	EB	WB
Left	109	0	0	30
Through	318	216	0	0
Right	0	295	0	184
Total	427	511	0	214

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street SR 120 WB	<u>Warrant Met</u>
Number of Approach Lanes	2	1	<u>NO</u>
Traffic Volume (VPH) *	938	214	

* 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 Airport Way
 Minor Street Wawona Street

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour AM

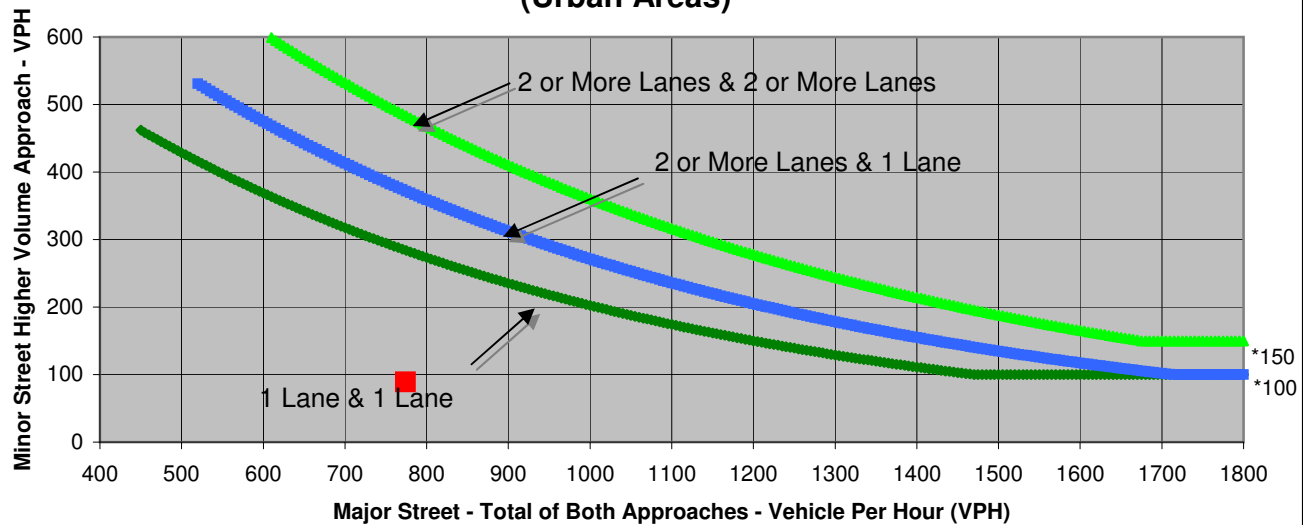
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	39	0	49
Through	326	329	0	0
Right	80	0	0	40
Total	406	368	0	89

Major Street Direction

x	North/South
	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Wawona Street	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	774	89	

* 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 Airport Way
Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
Scenario Existing + Project
Peak Hour AM

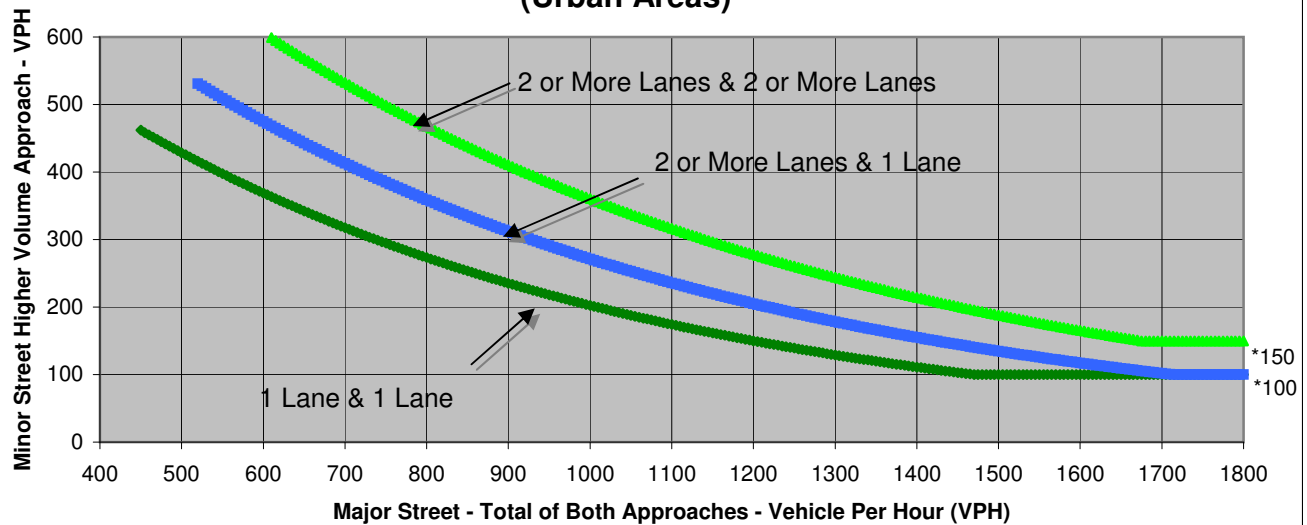
Turn Movement Volumes

	NB	SB	EB	WB
Left	13	35	45	1
Through	121	70	20	16
Right	3	38	19	25
Total	137	143	84	42

Major Street Direction

x	North/South
	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Woodward Avenue	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	280	84	

* 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 Main Street
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour AM

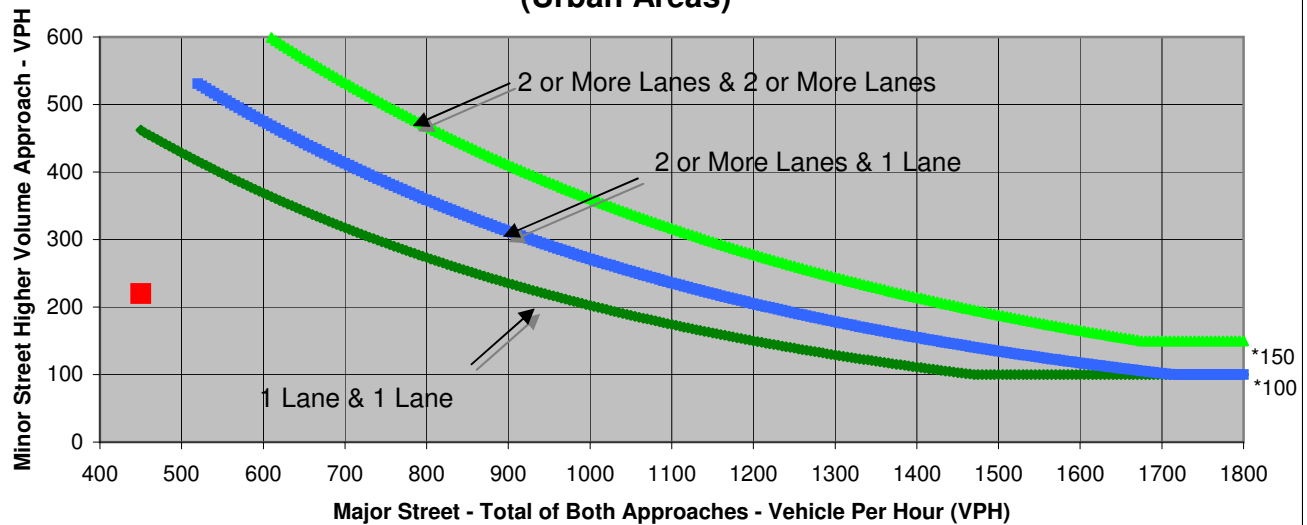
Turn Movement Volumes

	NB	SB	EB	WB
Left	34	53	18	7
Through	233	84	48	76
Right	12	34	27	137
Total	279	171	93	220

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Main Street	Woodward Avenue	
Number of Approach Lanes	2	2	<u>NO</u>
Traffic Volume (VPH) *	450	220	

* 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 Union Road
 Minor Street Project Access

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing Plus Project
 Peak Hour AM

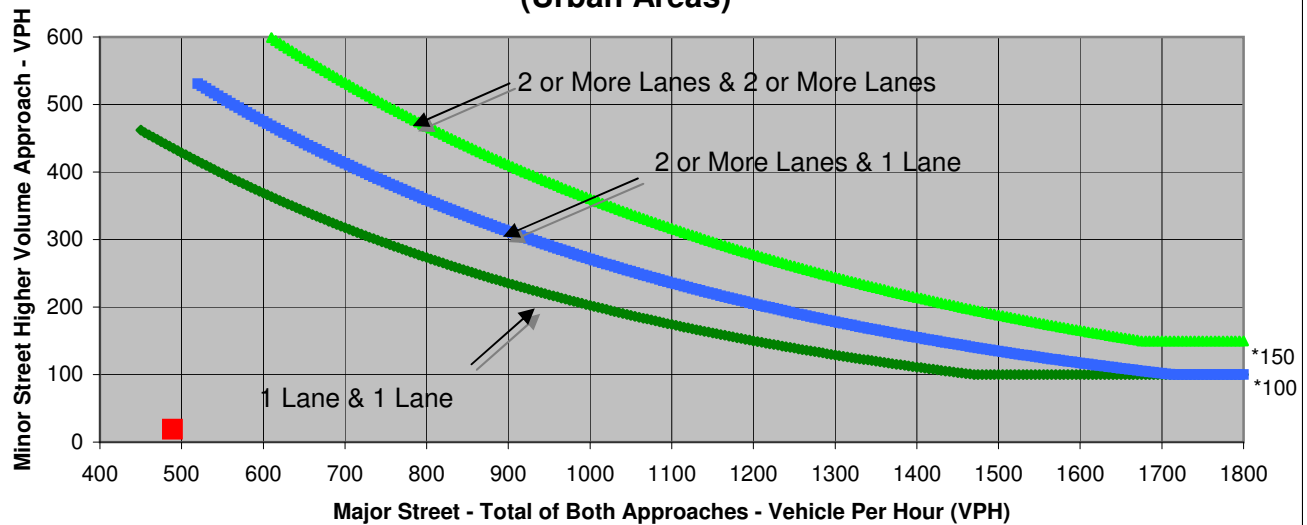
Turn Movement Volumes

	NB	SB	EB	WB
Left	11	0	17	0
Through	249	209	0	0
Right	0	20	2	0
Total	260	229	19	0

Major Street Direction

x	North/South
	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Union Road	Minor Street Project Access	<u>Warrant Met</u>
Number of Approach Lanes	2	1	<u>NO</u>
Traffic Volume (VPH) *	489	19	

* 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 Airport Way
 Minor Street Atherton Drive

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour AM

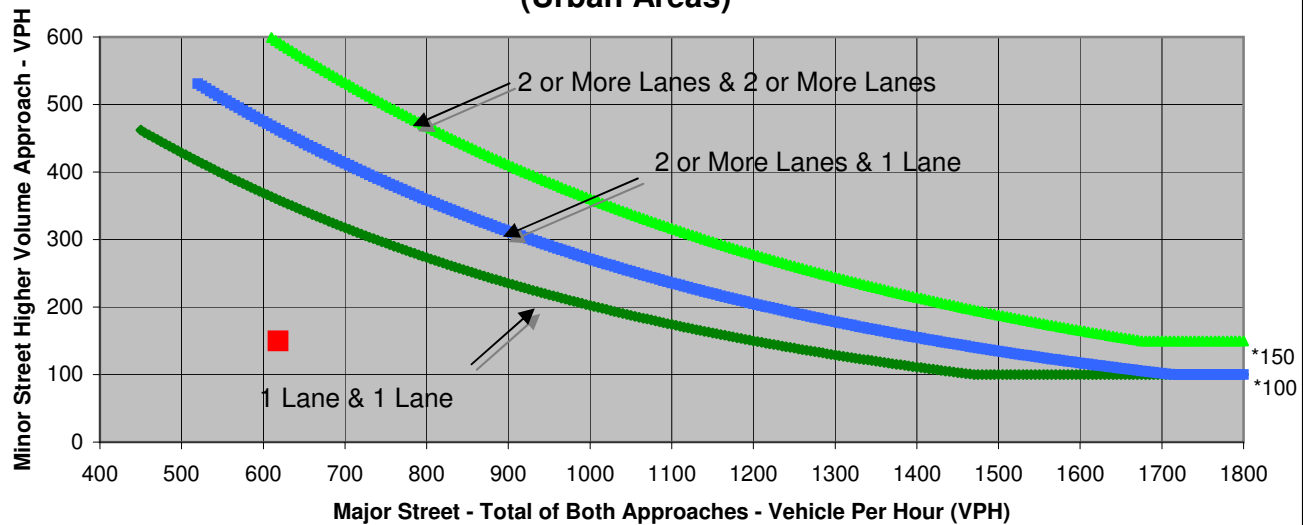
Turn Movement Volumes

	NB	SB	EB	WB
Left	37	38	141	0
Through	230	270	4	7
Right	2	41	5	38
Total	269	349	150	45

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Atherton Drive	<u>Warrant Met</u>
Number of Approach Lanes	3	3	<u>NO</u>
Traffic Volume (VPH) *	618	150	

* 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 Airport Way
 Minor Street Daniels Street

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour AM

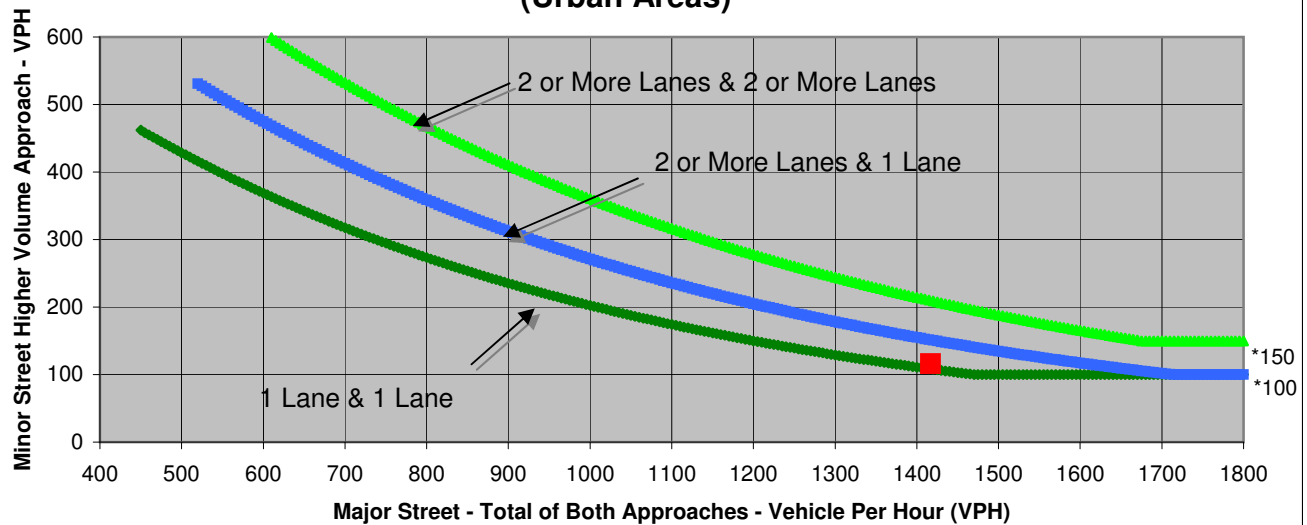
Turn Movement Volumes

	NB	SB	EB	WB
Left	52	0	35	0
Through	572	768	0	0
Right	0	25	81	0
Total	624	793	116	0

Major Street Direction

<u>x</u>	North/South
	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Daniels Street	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,417	116	

* 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 Airport Way
 Minor Street SR 120 EB

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour AM

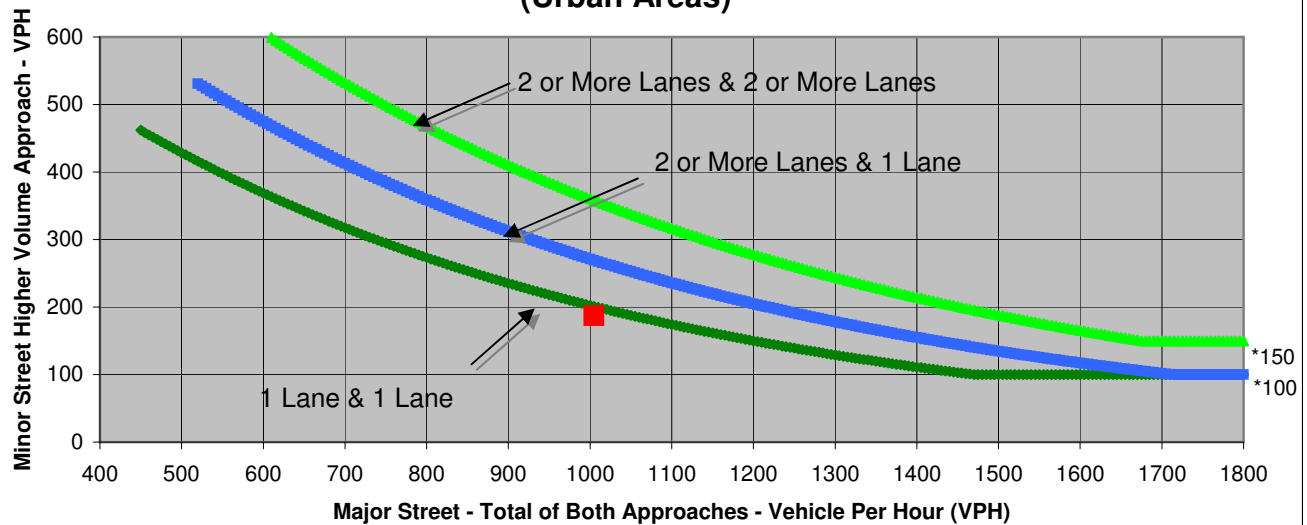
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	215	120	0
Through	337	374	0	0
Right	79	0	67	0
Total	416	589	187	0

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street SR 120 EB	<u>Warrant Met</u>
Number of Approach Lanes	2	1	<u>NO</u>
Traffic Volume (VPH) *	1,005	187	

* 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 Airport Way
 Minor Street SR 120 WB

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour AM

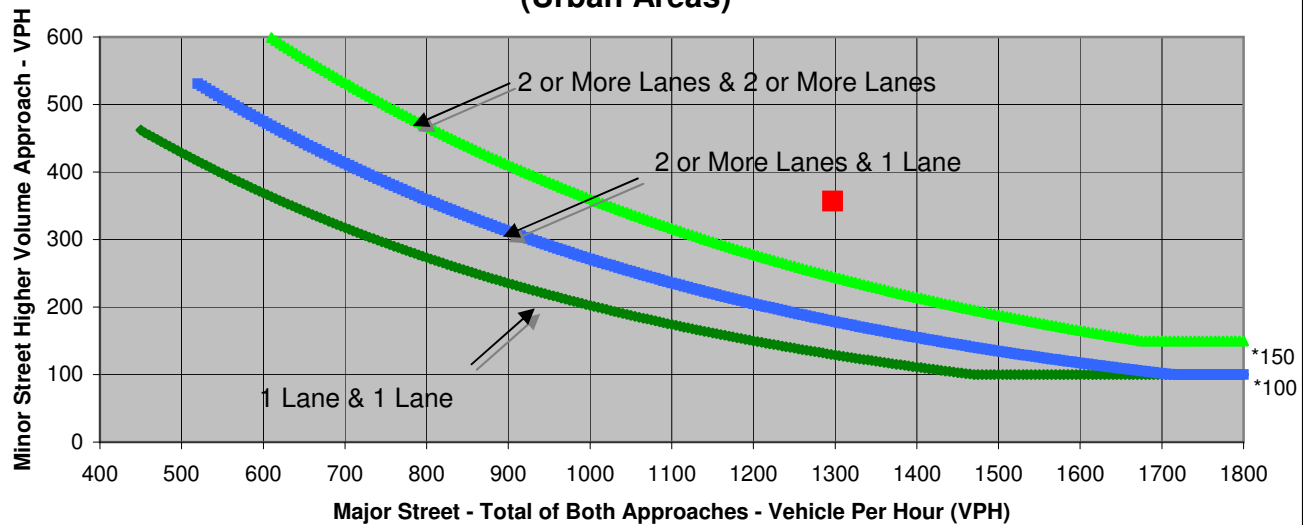
Turn Movement Volumes

	NB	SB	EB	WB
Left	69	0	0	112
Through	386	477	0	0
Right	0	365	0	245
Total	455	842	0	357

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street SR 120 WB	<u>Warrant Met</u>
Number of Approach Lanes	2	2	<u>YES</u>
Traffic Volume (VPH) *	1,297	357	

* 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 Airport Way
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour AM

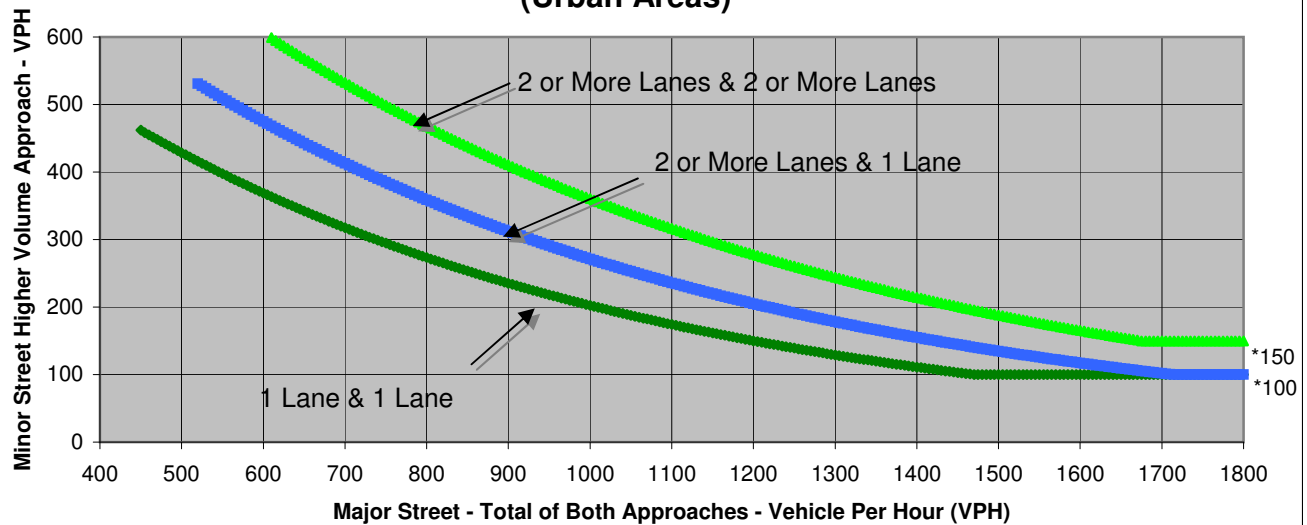
Turn Movement Volumes

	NB	SB	EB	WB
Left	4	37	14	36
Through	172	150	41	35
Right	28	7	4	71
Total	204	194	59	142

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Woodward Avenue	<u>Warrant Met</u>
Number of Approach Lanes	2	2	<u>NO</u>
Traffic Volume (VPH) *	398	142	

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

HCM Signalized Intersection Capacity Analysis

1: Yosemite Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.99		1.00	0.93		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3491		1770	3280		1770	1827	1583	1770	1789	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3491		1770	3280		1770	1827	1583	1770	1789	
Volume (vph)	37	221	22	101	158	151	70	201	94	212	245	47
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	40	240	24	110	172	164	78	223	104	223	258	49
RTOR Reduction (vph)	0	8	0	0	133	0	0	0	64	0	5	0
Lane Group Flow (vph)	40	256	0	110	203	0	78	223	40	223	302	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	4.6	12.3		8.7	16.4		7.5	33.0	33.0	15.4	40.9	
Effective Green, g (s)	4.6	12.3		8.7	16.4		7.5	33.0	33.0	15.4	40.9	
Actuated g/C Ratio	0.05	0.14		0.10	0.19		0.09	0.39	0.39	0.18	0.48	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	95	503		180	630		155	706	612	319	857	
v/s Ratio Prot	0.02	c0.07		c0.06	0.06		0.04	0.12		c0.13	c0.17	
v/s Ratio Perm									0.03			
v/c Ratio	0.42	0.51		0.61	0.32		0.50	0.32	0.07	0.70	0.35	
Uniform Delay, d1	39.1	33.8		36.7	29.7		37.2	18.3	16.5	32.8	13.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.0	0.8		6.0	0.3		2.6	1.2	0.2	6.6	1.1	
Delay (s)	42.1	34.6		42.7	30.0		39.7	19.5	16.7	39.4	15.1	
Level of Service	D	C		D	C		D	B	B	D	B	
Approach Delay (s)		35.6			33.2			22.7			25.3	
Approach LOS		D			C			C			C	
Intersection Summary												
HCM Average Control Delay			28.6			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			85.4			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			48.2%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Wawona St. & Airport Way

1/5/2009

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Volume (veh/h)	49	40	326	80	39	329			
Peak Hour Factor	0.85	0.85	0.90	0.90	0.95	0.95			
Hourly flow rate (vph)	58	47	362	89	41	346			
Pedestrians	2					2			
Lane Width (ft)	12.0					12.0			
Walking Speed (ft/s)	4.0					4.0			
Percent Blockage	0					0			
Right turn flare (veh)									
Median type	None								
Median storage veh									
Upstream signal (ft)	1313								
pX, platoon unblocked	0.89	0.89			0.89				
vC, conflicting volume	837	411			453				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	816	335			383				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	80	92			96				
cM capacity (veh/h)	294	624			1040				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	105	451	387						
Volume Left	58	0	41						
Volume Right	47	89	0						
cSH	386	1700	1040						
Volume to Capacity	0.27	0.27	0.04						
Queue Length 95th (ft)	27	0	3						
Control Delay (s)	17.8	0.0	1.3						
Lane LOS	C		A						
Approach Delay (s)	17.8	0.0	1.3						
Approach LOS	C								
Intersection Summary									
Average Delay	2.5								
Intersection Capacity Utilization		57.3%		ICU Level of Service		B			
Analysis Period (min)			15						

HCM Signalized Intersection Capacity Analysis

3: Daniels Street & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1561	3433	1863	1562	1770	3471	1549	1770	1827	1549
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1561	3433	1863	1562	1770	3471	1549	1770	1827	1549
Volume (vph)	27	13	69	141	28	16	69	363	70	9	305	64
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	32	15	81	166	33	19	77	403	78	9	321	67
RTOR Reduction (vph)	0	0	59	0	0	15	0	0	47	0	0	46
Lane Group Flow (vph)	32	15	22	166	33	4	77	403	31	9	321	21
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	pm+ov		Prot	Perm		Prot	Perm		Prot	Perm	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	6.8	10.6	16.5	8.9	12.7	12.7	5.9	23.7	23.7	0.6	18.4	18.4
Effective Green, g (s)	6.8	10.6	16.5	8.9	12.7	12.7	5.9	23.7	23.7	0.6	18.4	18.4
Actuated g/C Ratio	0.11	0.18	0.28	0.15	0.21	0.21	0.10	0.40	0.40	0.01	0.31	0.31
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	390	330	535	511	396	332	175	1376	614	18	562	477
v/s Ratio Prot	0.01	0.01	0.00	c0.05	c0.02		c0.04	0.12		0.01	c0.18	
v/s Ratio Perm			0.01			0.00			0.02			0.01
v/c Ratio	0.08	0.05	0.04	0.32	0.08	0.01	0.44	0.29	0.05	0.50	0.57	0.04
Uniform Delay, d1	23.7	20.4	15.9	22.8	18.9	18.6	25.4	12.3	11.1	29.5	17.4	14.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.01	0.99	0.93	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.1	0.0	0.4	0.1	0.0	1.8	0.1	0.0	20.2	1.4	0.0
Delay (s)	23.8	20.5	15.9	23.1	19.0	18.6	27.4	12.3	10.4	49.6	18.8	14.6
Level of Service	C	C	B	C	B	B	C	B	B	D	B	B
Approach Delay (s)		18.4			22.1			14.1			18.8	
Approach LOS		B			C			B			B	
Intersection Summary												
HCM Average Control Delay			17.3				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.35									
Actuated Cycle Length (s)			59.8				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			42.1%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

4: SR 120 WB & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	0	0	0	30	0	184	109	318	0	0	220	295
Peak Hour Factor	0.25	0.25	0.25	0.65	0.65	0.65	0.80	0.80	0.80	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	0	46	0	283	136	398	0	0	244	328
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)											494	
pX, platoon unblocked	0.86	0.86	0.86	0.86	0.86		0.86					
vC, conflicting volume	1361	1078	408	1078	1242	398	572	398				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1421	1091	310	1091	1282	398	501	398				
tC, single (s)	7.1	6.5	6.2	*6.4	6.5	6.3	4.1	4.1				
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2	2.2				
p0 queue free %	100	100	100	75	100	56	85	100				
cM capacity (veh/h)	49	157	626	182	121	639	912	1161				
Direction, Lane #	WB 1	NB 1	NB 2	SB 1								
Volume Total	329	136	398	572								
Volume Left	46	136	0	0								
Volume Right	283	0	0	328								
cSH	472	912	1700	1700								
Volume to Capacity	0.70	0.15	0.23	0.34								
Queue Length 95th (ft)	133	13	0	0								
Control Delay (s)	28.3	9.6	0.0	0.0								
Lane LOS	D	A										
Approach Delay (s)	28.3	2.5		0.0								
Approach LOS	D											
Intersection Summary												
Average Delay	7.4											
Intersection Capacity Utilization	58.7%			ICU Level of Service			B					
Analysis Period (min)	15											

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

5: SR 120 EB & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	104	0	10	0	0	0	0	323	92	111	139	0
Peak Hour Factor	0.90	0.90	0.90	0.25	0.25	0.25	0.90	0.90	0.90	0.80	0.80	0.80
Hourly flow rate (vph)	116	0	11	0	0	0	0	359	102	139	174	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	861	912	174	872	861	410	174			461		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	861	912	174	872	861	410	174			461		
tC, single (s)	*6.5	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	59	100	99	100	100	100	100			87		
cM capacity (veh/h)	285	238	870	241	255	642	1403			1069		
Direction, Lane #	EB 1	NB 1	SB 1	SB 2								
Volume Total	127	461	139	174								
Volume Left	116	0	139	0								
Volume Right	11	102	0	0								
cSH	303	1700	1069	1700								
Volume to Capacity	0.42	0.27	0.13	0.10								
Queue Length 95th (ft)	49	0	11	0								
Control Delay (s)	25.2	0.0	8.9	0.0								
Lane LOS	D		A									
Approach Delay (s)	25.2	0.0	3.9									
Approach LOS	D											
Intersection Summary												
Average Delay			4.9									
Intersection Capacity Utilization			58.7%	ICU Level of Service						B		
Analysis Period (min)			15									

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

6: Atherton Dr & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	147	2	5	5	1	87	6	181	3	22	101	26
Peak Hour Factor	0.85	0.85	0.85	0.75	0.75	0.75	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	173	2	6	7	1	116	8	226	4	28	126	32
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			14			14						
Median type		None			None							
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	481	426	126	427	455	226	159			230		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	481	426	126	427	455	226	159			230		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	58	100	99	99	100	86	99			98		
cM capacity (veh/h)	415	507	924	522	488	813	1421			1338		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3			
Volume Total	181	7	117	8	226	4	28	126	32			
Volume Left	173	7	0	8	0	0	28	0	0			
Volume Right	6	0	116	0	0	4	0	0	32			
cSH	431	522	822	1421	1700	1700	1338	1700	1700			
Volume to Capacity	0.42	0.01	0.14	0.01	0.13	0.00	0.02	0.07	0.02			
Queue Length 95th (ft)	51	1	12	0	0	0	2	0	0			
Control Delay (s)	19.4	12.0	10.2	7.5	0.0	0.0	7.7	0.0	0.0			
Lane LOS	C	B	B	A			A					
Approach Delay (s)	19.4	10.3		0.2			1.1					
Approach LOS	C	B										
Intersection Summary												
Average Delay			6.9									
Intersection Capacity Utilization			37.8%			ICU Level of Service			A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

7: Woodward Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	45	20	19	1	16	25	13	121	3	35	70	38
Peak Hour Factor	0.60	0.60	0.60	0.65	0.65	0.65	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	75	33	32	2	25	38	15	142	4	41	82	45
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	140	65	161	168								
Volume Left (vph)	75	2	15	41								
Volume Right (vph)	32	38	4	45								
Hadj (s)	0.01	-0.32	0.04	-0.08								
Departure Headway (s)	4.8	4.6	4.6	4.5								
Degree Utilization, x	0.19	0.08	0.21	0.21								
Capacity (veh/h)	700	720	735	749								
Control Delay (s)	8.9	8.0	8.9	8.7								
Approach Delay (s)	8.9	8.0	8.9	8.7								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.7									
HCM Level of Service			A									
Intersection Capacity Utilization			33.7%	ICU Level of Service		A						
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

8: Yosemite Avenue & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.98		1.00	0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	3391		1770	3294		1770	3332	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	1770	3391		1770	3294		1770	3332	
Volume (vph)	121	163	121	61	169	65	160	308	55	67	326	209
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.85	0.85	0.85	0.90	0.90	0.90
Adj. Flow (vph)	132	177	132	66	184	71	188	362	65	74	362	232
RTOR Reduction (vph)	0	0	103	0	57	0	0	15	0	0	109	0
Lane Group Flow (vph)	132	177	29	66	198	0	188	412	0	74	485	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	7.3	15.1	15.1	3.3	11.1		9.2	31.0		4.4	26.2	
Effective Green, g (s)	7.3	15.1	15.1	3.3	11.1		9.2	31.0		4.4	26.2	
Actuated g/C Ratio	0.10	0.22	0.22	0.05	0.16		0.13	0.44		0.06	0.38	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	185	403	342	84	539		233	1463		112	1251	
v/s Ratio Prot	c0.07	c0.10		0.04	0.06		c0.11	0.13		0.04	c0.15	
v/s Ratio Perm			0.02									
v/c Ratio	0.71	0.44	0.08	0.79	0.37		0.81	0.28		0.66	0.39	
Uniform Delay, d1	30.2	23.7	21.8	32.9	26.2		29.4	12.3		32.0	15.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	12.3	0.8	0.1	37.0	0.4		18.2	0.5		13.7	0.9	
Delay (s)	42.5	24.5	21.9	69.9	26.6		47.6	12.8		45.6	16.8	
Level of Service	D	C	C	E	C		D	B		D	B	
Approach Delay (s)		29.1			35.5			23.4			20.0	
Approach LOS		C			D			C			C	
Intersection Summary												
HCM Average Control Delay			25.4			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.51									
Actuated Cycle Length (s)			69.8			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			51.4%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: Wawona St. & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.91		1.00	0.93		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1687		1770	1737		1770	3308		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1687		1770	1737		1770	3308		1770	1863	1583
Volume (vph)	55	75	127	152	85	70	84	443	54	75	491	10
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.90	0.90	0.90
Adj. Flow (vph)	65	88	149	179	100	82	99	521	64	83	546	11
RTOR Reduction (vph)	0	99	0	0	45	0	0	12	0	0	0	10
Lane Group Flow (vph)	65	138	0	179	137	0	99	573	0	83	546	1
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot			Prot			Prot			Prot		Over
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												
Actuated Green, G (s)	3.4	12.3		7.0	15.9		4.7	24.2		4.6	24.1	3.4
Effective Green, g (s)	3.4	12.3		7.0	15.9		4.7	24.2		4.6	24.1	3.4
Actuated g/C Ratio	0.05	0.19		0.11	0.25		0.07	0.38		0.07	0.38	0.05
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	94	324		193	431		130	1249		127	700	84
v/s Ratio Prot	0.04	c0.08		c0.10	c0.08		c0.06	0.17		0.05	c0.29	0.00
v/s Ratio Perm												
v/c Ratio	0.69	0.43		0.93	0.32		0.76	0.46		0.65	0.78	0.01
Uniform Delay, d1	29.8	22.8		28.3	19.7		29.1	15.0		29.0	17.7	28.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	1.00
Incremental Delay, d2	19.7	0.9		44.2	0.4		22.8	1.2		11.5	8.4	0.0
Delay (s)	49.5	23.7		72.5	20.1		51.9	16.1		40.4	26.1	28.8
Level of Service	D	C		E	C		D	B		D	C	C
Approach Delay (s)		29.3			46.1			21.3			28.0	
Approach LOS		C			D			C			C	
Intersection Summary												
HCM Average Control Delay			29.2			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			64.1			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			64.0%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

10: Daniels Street & Union Road

1/5/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	35	82	53	572	768	25
Peak Hour Factor	0.92	0.92	0.85	0.85	0.90	0.90
Hourly flow rate (vph)	38	89	62	673	853	28
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1665	867	881			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1665	867	881			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	61	75	92			
cM capacity (veh/h)	98	352	767			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	127	735	881			
Volume Left	38	62	0			
Volume Right	89	0	28			
cSH	198	767	1700			
Volume to Capacity	0.64	0.08	0.52			
Queue Length 95th (ft)	94	7	0			
Control Delay (s)	51.0	2.1	0.0			
Lane LOS	F	A				
Approach Delay (s)	51.0	2.1	0.0			
Approach LOS	F					
Intersection Summary						
Average Delay		4.6				
Intersection Capacity Utilization		87.7%		ICU Level of Service		E
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

11: SR 120 WB Ramps & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	0	0	0	104	0	245	69	380	0	0	485	365
Peak Hour Factor	0.25	0.25	0.25	0.90	0.90	0.90	0.85	0.85	0.85	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	0	116	0	272	81	447	0	0	539	406
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1623	1351	742	1351	1554	447	944				447	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1623	1351	742	1351	1554	447	944				447	
tC, single (s)	7.1	6.5	6.2	*6.5	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	21	100	55	89				100	
cM capacity (veh/h)	42	133	416	146	100	611	726				1113	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1								
Volume Total	388	81	447	944								
Volume Left	116	81	0	0								
Volume Right	272	0	0	406								
cSH	313	726	1700	1700								
Volume to Capacity	1.24	0.11	0.26	0.56								
Queue Length 95th (ft)	439	9	0	0								
Control Delay (s)	165.9	10.6	0.0	0.0								
Lane LOS	F	B										
Approach Delay (s)	165.9	1.6		0.0								
Approach LOS	F											
Intersection Summary												
Average Delay	35.0											
Intersection Capacity Utilization	82.5%			ICU Level of Service			E					
Analysis Period (min)	15											

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

12: SR 120 EB Ramps & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	120	0	67	0	0	0	0	329	80	215	374	0
Peak Hour Factor	0.90	0.90	0.90	0.25	0.25	0.25	0.90	0.90	0.90	0.85	0.85	0.85
Hourly flow rate (vph)	133	0	74	0	0	0	0	366	89	253	440	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)								859				
pX, platoon unblocked	0.97	0.97		0.97	0.97	0.97				0.97		
vC, conflicting volume	1356	1400	440	1430	1356	410	440			454		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1366	1412	440	1442	1366	393	440			439		
tC, single (s)	*6.4	6.5	6.3	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	88	100	100	100	100			77		
cM capacity (veh/h)	131	103	605	77	110	638	1120			1090		
Direction, Lane #	EB 1	NB 1	SB 1	SB 2								
Volume Total	208	454	253	440								
Volume Left	133	0	253	0								
Volume Right	74	89	0	0								
cSH	182	1700	1090	1700								
Volume to Capacity	1.14	0.27	0.23	0.26								
Queue Length 95th (ft)	265	0	22	0								
Control Delay (s)	163.4	0.0	9.3	0.0								
Lane LOS	F		A									
Approach Delay (s)	163.4	0.0	3.4									
Approach LOS	F											
Intersection Summary												
Average Delay		26.8										
Intersection Capacity Utilization		82.5%		ICU Level of Service		E						
Analysis Period (min)		15										

* User Entered Value

HCM Signalized Intersection Capacity Analysis

13: Atherton Dr. & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	0.88	0.97	0.95	0.88	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	2787	3433	3539	2787	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	2787	3433	3539	2787	3433	3539	1583
Volume (vph)	134	4	13	2	5	38	28	236	3	38	257	51
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	146	4	14	2	5	41	30	257	3	41	279	55
RTOR Reduction (vph)	0	0	12	0	0	38	0	0	1	0	0	19
Lane Group Flow (vph)	146	4	2	2	5	3	30	257	2	41	279	36
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	10.1	16.1	16.1	1.2	7.2	7.2	4.1	72.3	72.3	4.4	72.6	72.6
Effective Green, g (s)	10.1	16.1	16.1	1.2	7.2	7.2	4.1	72.3	72.3	4.4	72.6	72.6
Actuated g/C Ratio	0.09	0.15	0.15	0.01	0.07	0.07	0.04	0.66	0.66	0.04	0.66	0.66
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	315	518	232	37	232	182	128	2326	1832	137	2336	1045
v/s Ratio Prot	c0.04	0.00		0.00	c0.00		0.01	0.07		c0.01	c0.08	
v/s Ratio Perm			0.00			0.00			0.00			0.02
v/c Ratio	0.46	0.01	0.01	0.05	0.02	0.01	0.23	0.11	0.00	0.30	0.12	0.03
Uniform Delay, d1	47.4	40.1	40.1	53.8	48.1	48.1	51.4	7.0	6.5	51.3	6.9	6.5
Progression Factor	0.82	0.69	0.54	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95
Incremental Delay, d2	1.1	0.0	0.0	0.6	0.0	0.0	0.9	0.1	0.0	1.2	0.1	0.1
Delay (s)	39.9	27.6	21.7	54.4	48.1	48.1	52.4	7.1	6.5	52.5	7.0	6.2
Level of Service	D	C	C	D	D	D	D	A	A	D	A	A
Approach Delay (s)		38.0			48.4			11.7			11.8	
Approach LOS		D			D			B			B	
Intersection Summary												
HCM Average Control Delay			18.7				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.15									
Actuated Cycle Length (s)			110.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			30.9%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

HCM Signalized Intersection Capacity Analysis

15: SR 120 WB Ramp & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00
Frpb, ped/bikes					1.00	0.98	1.00	1.00			1.00	0.98
Flpb, ped/bikes					1.00	1.00	1.00	1.00			1.00	1.00
Frt					1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1736	1492	1736	1792			1792	1491
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1736	1492	1736	1792			1792	1491
Volume (vph)	0	0	0	30	0	209	185	418	0	0	231	283
Peak-hour factor, PHF	0.25	0.25	0.25	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	33	0	232	206	464	0	0	257	314
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	156
Lane Group Flow (vph)	0	0	0	0	33	232	206	464	0	0	257	158
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	2%	2%	2%	4%	2%	6%	4%	6%	2%	2%	6%	6%
Turn Type				Split		Free	Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases						Free						6
Actuated Green, G (s)					1.1	47.3	10.4	38.2			23.8	23.8
Effective Green, g (s)					1.1	47.3	10.4	38.2			23.8	23.8
Actuated g/C Ratio					0.02	1.00	0.22	0.81			0.50	0.50
Clearance Time (s)					4.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)					3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					40	1492	382	1447			902	750
v/s Ratio Prot					c0.02		c0.12	c0.26			0.14	
v/s Ratio Perm						0.16						0.11
v/c Ratio					0.82	0.16	0.54	0.32			0.28	0.21
Uniform Delay, d1					23.0	0.0	16.3	1.2			6.8	6.5
Progression Factor					1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2					76.6	0.2	1.5	0.1			0.2	0.1
Delay (s)					99.6	0.2	17.8	1.3			7.0	6.7
Level of Service					F	A	B	A			A	A
Approach Delay (s)		0.0			12.6			6.4			6.8	
Approach LOS		A			B			A			A	
Intersection Summary												
HCM Average Control Delay			7.6									
HCM Volume to Capacity ratio			0.38									
Actuated Cycle Length (s)			47.3						8.0			
Intersection Capacity Utilization			52.6%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

16: SR 120 EB Ramps & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.98					1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00					1.00		1.00	1.00	
Frt		1.00	0.85					0.99		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1703	1516					1799		1703	1827	
Flt Permitted		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (perm)		1703	1516					1799		1703	1827	
Volume (vph)	252	0	52	0	0	0	0	351	37	142	119	0
Peak-hour factor, PHF	0.80	0.80	0.80	0.25	0.25	0.25	0.95	0.95	0.95	0.85	0.85	0.85
Adj. Flow (vph)	315	0	65	0	0	0	0	369	39	167	140	0
RTOR Reduction (vph)	0	0	48	0	0	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	315	17	0	0	0	0	405	0	167	140	0
Confl. Peds. (#/hr)			2				2			2		2
Heavy Vehicles (%)	6%	2%	4%	2%	2%	2%	2%	4%	4%	6%	4%	2%
Turn Type	Split		Perm							Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases			4									
Actuated Green, G (s)		16.2	16.2					22.9		9.6	36.5	
Effective Green, g (s)		16.2	16.2					22.9		9.6	36.5	
Actuated g/C Ratio		0.27	0.27					0.38		0.16	0.60	
Clearance Time (s)		4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)		455	405					679		269	1099	
v/s Ratio Prot		c0.18						c0.23		c0.10	0.08	
v/s Ratio Perm			0.01									
v/c Ratio		0.69	0.04					0.60		0.62	0.13	
Uniform Delay, d1		20.0	16.5					15.2		23.9	5.2	
Progression Factor		1.00	1.00					1.00		1.00	1.00	
Incremental Delay, d2		4.5	0.0					1.4		4.4	0.1	
Delay (s)		24.5	16.5					16.6		28.3	5.3	
Level of Service		C	B					B		C	A	
Approach Delay (s)		23.2			0.0			16.6			17.8	
Approach LOS		C			A			B			B	
Intersection Summary												
HCM Average Control Delay		19.2										
HCM Volume to Capacity ratio		0.63										
Actuated Cycle Length (s)		60.7								12.0		
Intersection Capacity Utilization		52.6%								A		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

17: Atherton Drive & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	0	0	0	0	0	388	0	0	171	0
Peak Hour Factor	0.25	0.25	0.25	0.25	0.25	0.25	0.95	0.95	0.95	0.85	0.85	0.85
Hourly flow rate (vph)	0	0	0	0	0	0	0	408	0	0	201	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)												640
pX, platoon unblocked												
vC, conflicting volume	610	610	201	610	610	408	201				408	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	610	610	201	610	610	408	201				408	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	100	100	100	100				100	
cM capacity (veh/h)	407	409	840	407	409	643	1371				1150	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	0	0	408	201								
Volume Left	0	0	0	0								
Volume Right	0	0	0	0								
cSH	1700	1700	1371	1150								
Volume to Capacity	0.00	0.00	0.00	0.00								
Queue Length 95th (ft)	0	0	0	0								
Control Delay (s)	0.0	0.0	0.0	0.0								
Lane LOS	A	A										
Approach Delay (s)	0.0	0.0	0.0	0.0								
Approach LOS	A	A										
Intersection Summary												
Average Delay			0.0									
Intersection Capacity Utilization			23.8%	ICU Level of Service		A						
Analysis Period (min)			15									

Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

HCM Unsignalized Intersection Capacity Analysis

19: Union Road &

1/5/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	0	0	408	346	95
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	443	376	103
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)				370		
pX, platoon unblocked	0.99					
vC, conflicting volume	649	240	479			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	638	240	479			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	406	761	1079			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	0	222	222	251	229	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	103	
cSH	1700	1700	1700	1700	1700	
Volume to Capacity	0.00	0.13	0.13	0.15	0.13	
Queue Length 95th (ft)	0	0	0	0	0	
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	
Lane LOS	A					
Approach Delay (s)	0.0	0.0		0.0		
Approach LOS	A					
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization		15.9%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

20: Union Road &

1/5/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	7	0	267	222	51
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	8	0	290	241	55
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)	310					
pX, platoon unblocked	0.98	0.98	0.98			
vC, conflicting volume	414	148	297			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	387	117	268			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	579	898	1271			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	8	145	145	161	136	
Volume Left	0	0	0	0	0	
Volume Right	8	0	0	0	55	
cSH	898	1700	1700	1700	1700	
Volume to Capacity	0.01	0.09	0.09	0.09	0.08	
Queue Length 95th (ft)	1	0	0	0	0	
Control Delay (s)	9.0	0.0	0.0	0.0	0.0	
Lane LOS	A					
Approach Delay (s)	9.0	0.0		0.0		
Approach LOS	A					
Intersection Summary						
Average Delay		0.1				
Intersection Capacity Utilization		17.8%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

21: Union Road &

1/5/2009

							
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Sign Control	Stop			Free	Free		
Grade	0%			0%	0%		
Volume (veh/h)	17	2	11	249	209	20	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	18	2	12	271	227	22	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None						
Median storage veh							
Upstream signal (ft)					530		
pX, platoon unblocked							
vC, conflicting volume	397	124	249				
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	397	124	249				
tC, single (s)	6.8	6.9	4.1				
tC, 2 stage (s)							
tF (s)	3.5	3.3	2.2				
p0 queue free %	97	100	99				
cM capacity (veh/h)	575	903	1314				
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	18	2	12	135	135	151	97
Volume Left	18	0	12	0	0	0	0
Volume Right	0	2	0	0	0	0	22
cSH	575	903	1314	1700	1700	1700	1700
Volume to Capacity	0.03	0.00	0.01	0.08	0.08	0.09	0.06
Queue Length 95th (ft)	2	0	1	0	0	0	0
Control Delay (s)	11.5	9.0	7.8	0.0	0.0	0.0	0.0
Lane LOS	B	A	A				
Approach Delay (s)	11.2		0.3			0.0	
Approach LOS	B						
Intersection Summary							
Average Delay			0.6				
Intersection Capacity Utilization			19.1%		ICU Level of Service		A
Analysis Period (min)			15				

HCM Unsignalized Intersection Capacity Analysis

22: Union Road &

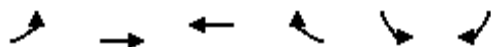
1/5/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	2	0	260	196	14
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	2	0	283	213	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)				720		
pX, platoon unblocked						
vC, conflicting volume	362	114	228			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	362	114	228			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	610	917	1337			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	2	141	141	142	86	
Volume Left	0	0	0	0	0	
Volume Right	2	0	0	0	15	
cSH	917	1700	1700	1700	1700	
Volume to Capacity	0.00	0.08	0.08	0.08	0.05	
Queue Length 95th (ft)	0	0	0	0	0	
Control Delay (s)	8.9	0.0	0.0	0.0	0.0	
Lane LOS	A					
Approach Delay (s)	8.9	0.0		0.0		
Approach LOS	A					
Intersection Summary						
Average Delay		0.0				
Intersection Capacity Utilization		15.9%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

23: Woodward Avenue &

1/5/2009

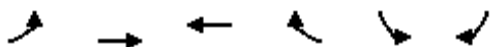


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	63	45	5	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	68	49	5	0	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	54				86	27
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	54				86	27
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1549				906	1042
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	34	34	33	22	1	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	5	1	
cSH	1700	1700	1700	1700	1042	
Volume to Capacity	0.02	0.02	0.02	0.01	0.00	
Queue Length 95th (ft)	0	0	0	0	0	
Control Delay (s)	0.0	0.0	0.0	0.0	8.5	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		8.5	
Approach LOS					A	
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			13.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

24: Int

1/5/2009



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↑	↑
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	0	0	8	9	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	9	10	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)			451			
pX, platoon unblocked						
vC, conflicting volume	9				4	4
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	9				4	4
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1610				1016	1077
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	0	0	0	9	10	0
Volume Left	0	0	0	0	10	0
Volume Right	0	0	0	9	0	0
cSH	1700	1700	1700	1700	1016	1700
Volume to Capacity	0.00	0.00	0.00	0.01	0.01	0.00
Queue Length 95th (ft)	0	0	0	0	1	0
Control Delay (s)	0.0	0.0	0.0	0.0	8.6	0.0
Lane LOS					A	A
Approach Delay (s)	0.0		0.0		8.6	
Approach LOS					A	
Intersection Summary						
Average Delay			4.5			
Intersection Capacity Utilization			13.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Int

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↵	↑↑				↵			↵
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	9	0	5	8	10	0	0	2	19	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	10	0	5	9	11	0	0	2	21	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)					249							
pX, platoon unblocked												
vC, conflicting volume	20			10			25	40	5	32	35	10
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	20			10			25	40	5	32	35	10
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	98	100	100
cM capacity (veh/h)	1595			1608			980	848	1077	967	854	1069
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1					
Volume Total	5	5	5	6	14	2	21					
Volume Left	0	0	5	0	0	0	21					
Volume Right	0	0	0	0	11	2	0					
cSH	1700	1700	1608	1700	1700	1077	967					
Volume to Capacity	0.00	0.00	0.00	0.00	0.01	0.00	0.02					
Queue Length 95th (ft)	0	0	0	0	0	0	2					
Control Delay (s)	0.0	0.0	7.2	0.0	0.0	8.4	8.8					
Lane LOS			A			A	A					
Approach Delay (s)	0.0		1.6			8.4	8.8					
Approach LOS						A	A					
Intersection Summary												
Average Delay			4.2									
Intersection Capacity Utilization			Err%	ICU Level of Service				H				
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

26: Int

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		0.95		0.97	0.95			1.00	1.00		1.00	
Frt		1.00		1.00	0.91			1.00	0.85		1.00	
Flt Protected		1.00		0.95	1.00			1.00	1.00		0.97	
Satd. Flow (prot)		3539		3433	3233			1863	1583		1799	
Flt Permitted		1.00		0.95	1.00			1.00	1.00		0.97	
Satd. Flow (perm)		3539		3433	3233			1863	1583		1799	
Volume (vph)	0	30	0	30	23	31	0	25	58	63	26	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	33	0	33	25	34	0	27	63	68	28	0
RTOR Reduction (vph)	0	0	0	0	20	0	0	0	48	0	0	0
Lane Group Flow (vph)	0	33	0	33	39	0	0	27	15	0	96	0
Turn Type	Prot			Prot			Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases									2			6
Actuated Green, G (s)		5.8		36.2	46.0			26.0	26.0		26.0	
Effective Green, g (s)		5.8		36.2	46.0			26.0	26.0		26.0	
Actuated g/C Ratio		0.05		0.33	0.42			0.24	0.24		0.24	
Clearance Time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		187		1130	1352			440	374		425	
v/s Ratio Prot		c0.01		0.01	c0.01			c0.01			c0.05	
v/s Ratio Perm									0.01			
v/c Ratio		0.18		0.03	0.03			0.06	0.04		0.23	
Uniform Delay, d1		49.8		25.0	18.8			32.5	32.4		33.9	
Progression Factor		1.00		0.61	0.34			1.00	1.00		1.00	
Incremental Delay, d2		0.5		0.0	0.0			0.3	0.2		1.2	
Delay (s)		50.3		15.4	6.5			32.8	32.6		35.1	
Level of Service		D		B	A			C	C		D	
Approach Delay (s)		50.3			9.7			32.6			35.1	
Approach LOS		D			A			C			D	
Intersection Summary												
HCM Average Control Delay			28.5			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.10									
Actuated Cycle Length (s)			110.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			25.7%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

Level Of Service Computation Report

2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #14

Cycle (sec): 100 Critical Vol./Cap.(X): 0.278

Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 9.5

Optimal Cycle: 0 Level Of Service: A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0	1	0	1	0	1	0	1	0	1	0

Volume Module:

Base Vol:	2	169	28	28	150	4	7	41	4	36	35	53
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	2	169	28	28	150	4	7	41	4	36	35	53
Added Vol:	0	5	0	9	3	3	7	0	0	0	0	14
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	2	174	28	37	153	7	14	41	4	36	35	67
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	2	174	28	37	153	7	14	41	4	36	35	67
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	2	174	28	37	153	7	14	41	4	36	35	67
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	2	174	28	37	153	7	14	41	4	36	35	67

Saturation Flow Module:

Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	572	626	707	571	624	705	521	563	630	539	583	659

Capacity Analysis Module:

Vol/Sat:	0.00	0.28	0.04	0.06	0.25	0.01	0.03	0.07	0.01	0.07	0.06	0.10
Crit Moves:	****			****			****			****		
Delay/Veh:	8.8	10.2	7.7	9.1	9.9	7.6	9.3	9.1	8.0	9.4	8.8	8.3
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	8.8	10.2	7.7	9.1	9.9	7.6	9.3	9.1	8.0	9.4	8.8	8.3
LOS by Move:	A	B	A	A	A	A	A	A	A	A	A	A
ApproachDel:	9.9			9.7			9.1			8.7		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	9.9			9.7			9.1			8.7		
LOS by Appr:	A			A			A			A		
AllWayAvgQ:	0.0	0.3	0.0	0.1	0.3	0.0	0.0	0.1	0.0	0.1	0.1	0.1

Note: Queue reported is the number of cars per lane.

Level Of Service Detailed Computation Report
2000 HCM 4-Way Stop Method
Future Volume Alternative

Intersection #14

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R	
----- ----- ----- ----- -----																
Time Period:	0.25 hour															
HevVeh:	0%				0%				0%				0%			
Alpha Value:	0.01															
----- ----- ----- ----- -----																
GroupType:	6				6				6				6			
P[C1]:	0.51				0.51				0.40				0.45			
P[C2]:	0.21				0.21				0.10				0.05			
P[C3]:	0.18				0.18				0.33				0.37			
P[C4]:	0.09				0.09				0.15				0.12			
P[C5]:	0.01				0.01				0.02				0.01			
Padj[C1]:	0.009				0.009				0.013				0.012			
Padj[C2]:	0.002				0.002				0.006				0.006			
Padj[C3]:	-0.004				-0.004				-0.008				-0.010			
Padj[C4]:	-0.005				-0.005				-0.009				-0.007			
Padj[C5]:	-0.001				-0.001				-0.002				-0.001			
----- ----- ----- ----- -----																
Lanes:	L1		L2		L1		L2		L1		L2		L1		L2	
LaneType:	LEFT		RITE		LEFT		RITE		LEFT		RITE		LEFT		RITE	
----- ----- ----- ----- -----																
HeadwayAdj:	0.500		-0.700		0.500		-0.700		0.500		-0.700		0.500		-0.700	
Volume:	2		28		37		7		14		4		36		67	
Capacity:	572		707		571		705		521		630		539		659	
DegOfUtil:	0.00		0.04		0.06		0.01		0.03		0.01		0.06		0.09	
DepHeadway:	6.03		4.83		6.04		4.84		6.45		5.25		6.30		5.10	
ServiceTime:	3.7		2.5		3.7		2.5		4.2		3.0		4.0		2.8	
Delay:	8.8		7.7		9.1		7.6		9.3		8.0		9.4		8.3	
Queue:	0.0		0.0		0.1		0.0		0.0		0.0		0.1		0.1	
----- ----- ----- ----- -----																
Lane:	L3				L3				L3				L3			
LaneType:	THRU				THRU				THRU				THRU			
----- ----- ----- ----- -----																
HeadwayAdj:	0.000				0.000				0.000				0.000			
Volume:	174				153				41				35			
Capacity:	626				624				563				583			
DegOfUtil:	0.27				0.24				0.07				0.06			
DepHeadway:	5.53				5.54				5.95				5.80			
ServiceTime:	3.2				3.2				3.7				3.5			
Delay:	10.2				9.9				9.1				8.8			
Queue:	0.3				0.3				0.1				0.1			
----- ----- ----- ----- -----																
Approach:	North Bound				South Bound				East Bound				West Bound			
----- ----- ----- ----- -----																
ApproachDel:	9.9				9.7				9.1				8.7			
Delay Adj:	1.00				1.00				1.00				1.00			
ApprAdjDel:	9.9				9.7				9.1				8.7			
LOS by Appr:	A				A				A				A			

OverallDel:	9.5
OverallLOS:	A

Peak Hour Volume Signal Warrant Report [Urban]*****
Intersection #14

Future Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound	South Bound	East Bound	West Bound
Movement:	L - T - R	L - T - R	L - T - R	L - T - R
Control:	Stop Sign	Stop Sign	Stop Sign	Stop Sign
Lanes:	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1
Initial Vol:	2 174 28	37 153 7	14 41 4	36 35 67

Major Street Volume: 401
Minor Approach Volume: 138
Minor Approach Volume Threshold: 767

SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

Level Of Service Computation Report

2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #18

Cycle (sec): 100 Critical Vol./Cap.(X): 0.394

Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 10.3

Optimal Cycle: 0 Level Of Service: B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0	1	0	1	0	1	0	1	0	1	0

Volume Module:	North Bound			South Bound			East Bound			West Bound		
Base Vol:	34	233	12	53	84	34	18	44	27	7	69	137
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	34	233	12	53	84	34	18	44	27	7	69	137
Added Vol:	0	0	0	0	0	0	0	4	0	0	7	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	34	233	12	53	84	34	18	48	27	7	76	137
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	34	233	12	53	84	34	18	48	27	7	76	137
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	34	233	12	53	84	34	18	48	27	7	76	137
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	34	233	12	53	84	34	18	48	27	7	76	137

Saturation Flow Module:	North Bound			South Bound			East Bound			West Bound		
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	542	592	661	517	559	623	490	526	586	515	557	627

Capacity Analysis Module:	North Bound			South Bound			East Bound			West Bound		
Vol/Sat:	0.06	0.39	0.02	0.10	0.15	0.05	0.04	0.09	0.05	0.01	0.14	0.22
Crit Moves:	****			****			****			****		
Delay/Veh:	9.4	12.1	7.9	10.0	9.8	8.4	9.8	9.6	8.6	9.4	9.7	9.5
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	9.4	12.1	7.9	10.0	9.8	8.4	9.8	9.6	8.6	9.4	9.7	9.5
LOS by Move:	A	B	A	A	A	A	A	A	A	A	A	A
ApproachDel:	11.6			9.6			9.4			9.5		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	11.6			9.6			9.4			9.5		
LOS by Appr:	B			A			A			A		
AllWayAvgQ:	0.1	0.6	0.0	0.1	0.2	0.0	0.0	0.1	0.0	0.0	0.1	0.2

Note: Queue reported is the number of cars per lane.

Level Of Service Detailed Computation Report
2000 HCM 4-Way Stop Method
Future Volume Alternative

Intersection #18

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R	
----- ----- ----- ----- -----																
Time Period:	0.25 hour															
HevVeh:	0%				0%				0%				0%			
Alpha Value:	0.01															
----- ----- ----- ----- -----																
GroupType:	6				6				6				6			
P[C1]:	0.43				0.33				0.29				0.36			
P[C2]:	0.15				0.25				0.13				0.06			
P[C3]:	0.27				0.21				0.32				0.39			
P[C4]:	0.13				0.19				0.22				0.17			
P[C5]:	0.01				0.02				0.04				0.02			
Padj[C1]:	0.012				0.013				0.016				0.014			
Padj[C2]:	0.004				0.004				0.007				0.007			
Padj[C3]:	-0.007				-0.004				-0.007				-0.010			
Padj[C4]:	-0.008				-0.011				-0.013				-0.010			
Padj[C5]:	-0.001				-0.002				-0.004				-0.002			
----- ----- ----- ----- -----																
Lanes:	L1		L2		L1		L2		L1		L2		L1		L2	
LaneType:	LEFT		RITE		LEFT		RITE		LEFT		RITE		LEFT		RITE	
----- ----- ----- ----- -----																
HeadwayAdj:	0.500		-0.700		0.500		-0.700		0.500		-0.700		0.500		-0.700	
Volume:	34		12		53		34		18		27		7		137	
Capacity:	542		661		517		623		490		586		515		627	
DegOfUtil:	0.06		0.02		0.10		0.05		0.03		0.04		0.01		0.21	
DepHeadway:	6.34		5.14		6.58		5.38		6.84		5.64		6.59		5.39	
ServiceTime:	4.0		2.8		4.3		3.1		4.5		3.3		4.3		3.1	
Delay:	9.4		7.9		10.0		8.4		9.8		8.6		9.4		9.5	
Queue:	0.1		0.0		0.1		0.0		0.0		0.0		0.0		0.2	
----- ----- ----- ----- -----																
Lane:	L3				L3				L3				L3			
LaneType:	THRU				THRU				THRU				THRU			
----- ----- ----- ----- -----																
HeadwayAdj:	0.000				0.000				0.000				0.000			
Volume:	233				84				48				76			
Capacity:	592				559				526				557			
DegOfUtil:	0.38				0.14				0.08				0.13			
DepHeadway:	5.84				6.08				6.34				6.09			
ServiceTime:	3.5				3.8				4.0				3.8			
Delay:	12.1				9.8				9.6				9.7			
Queue:	0.6				0.2				0.1				0.1			
----- ----- ----- ----- -----																
Approach:	North Bound				South Bound				East Bound				West Bound			
----- ----- ----- ----- -----																
ApproachDel:	11.6				9.6				9.4				9.5			
Delay Adj:	1.00				1.00				1.00				1.00			
ApprAdjDel:	11.6				9.6				9.4				9.5			
LOS by Appr:	B				A				A				A			

OverallDel:	10.3
OverallLOS:	B

 Peak Hour Volume Signal Warrant Report [Urban]

Intersection #18

Future Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Lanes:	1	0	1	0	1	0	1	0	1	1	0	1
Initial Vol:	34	233	12	53	84	34	18	48	27	7	76	137

Major Street Volume: 450
 Minor Approach Volume: 220
 Minor Approach Volume Threshold: 717

 SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

Existing, Plus Project, PM

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: I-5 to Yosemite
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3316	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	901	v
Trucks and buses	7	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.966	
Driver population factor, fp	1.00	
Flow rate, vp	1865	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1865	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.3	mi/h
Number of lanes, N	2	
Density, D	29.5	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Yosemite to Airport
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Commercial EIR

Flow Inputs and Adjustments

Volume, V	3241	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	881	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1849	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1849	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	63.5	mi/h
Number of lanes, N	2	
Density, D	29.1	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Airport to Union
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3045	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	827	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1738	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1738	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.3	mi/h
Number of lanes, N	2	
Density, D	27.0	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Union to Main
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2799	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	761	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1597	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1597	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.9	mi/h
Number of lanes, N	2	
Density, D	24.6	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Main to SR 99
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2523	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	686	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1440	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1440	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	22.2	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR 120 Westbound
 From/To: SR 99 to Main
 Jurisdiction: City of Manteca
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2407	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	654	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1374	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1374	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	21.1	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Main to Union
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2653	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	721	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1514	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1514	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	23.3	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Union to Airport
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2289	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	622	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1306	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1306	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	20.1	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Yosemite to I-5
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2284	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	607	v
Trucks and buses	7	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.966	
Driver population factor, fp	1.00	
Flow rate, vp	1257	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1257	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.3	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR 120 Westbound
 From/To: Airport to Yosemite
 Jurisdiction: City of Manteca
 Analysis Year: Existing Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2204	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	599	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1258	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1258	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.4	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR-99 Northbound
From/To: Jack Tone to Austin
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4950	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	1303	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1858	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1858	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	29.3	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR-99 Northbound
From/To: Austin to SR-120
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4820	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	1268	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1810	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1810	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	28.4	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR-99 Northbound
From/To: Yosemite to Louise
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2985	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	786	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1681	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1681	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.6	mi/h
Number of lanes, N	2	
Density, D	26.0+	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: Louise to Yosemite
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	2948	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	776	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1660	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1660	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.7	mi/h
Number of lanes, N	2	
Density, D	25.7	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR-99 Northbound
From/To: SR-120 to Yosemite
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3563	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	938	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2007	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2007	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	61.3	mi/h
Number of lanes, N	2	
Density, D	32.7	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: Yosemite to SR-120
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3406	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	896	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1918	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1918	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.7	mi/h
Number of lanes, N	2	
Density, D	30.6	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: SR-120 to Austin
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4749	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	1250	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1783	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1783	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	27.8	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: Austin to Jack Tone
Jurisdiction: City of Manteca
Analysis Year: Existing Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	5029	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	1323	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1888	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1888	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	30.0	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

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Phone: _____ Fax: _____
E-mail: _____

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge
Number of lanes in freeway	2
Free-flow speed on freeway	65.0 mph
Volume on freeway	3241 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	461 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
Volume, V (vph)	3241	461	vph
Peak-hour factor, PHF	0.92	0.80	
Peak 15-min volume, v15	881	144	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3699	591	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 1.000 Using Equation 0

$$v_{FD} = v_R + (v_F - v_R) P_F = 3699 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	3699	4700	No
v = v - v FO F R	3108	4700	No
v R	591	2000	No
v v 3 or av34	0 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h? 3 or av34		No	
Is v v > 1.5 v /2 3 or av34	12	No	
If yes, v = 12A		(Equation 25-18)	

Flow Entering Diverge Influence Area

v_{12}	Actual 3699	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D = 34.7 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable, S	$D = 0.481$
Space mean speed in ramp influence area, S_R	$S = 53.9 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = \text{N/A} \text{ mph}$
Space mean speed for all vehicles, S	$S = 53.9 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/2008
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2780	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	265	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	2780	265	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	755	72	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3173	295	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_{FM} (P_{FM}) = 3173 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v	3468	4700	No
FO			
v v	0 pc/h	(Equation 25-4 or 25-5)	
3 or av34			
Is v v > 2700 pc/h?		No	
3 or av34			
Is v v > 1.5 v / 2		No	
3 or av34	12		
If yes, v =		(Equation 25-8)	
12A			

Flow Entering Merge Influence Area

v_{12}	Actual 3173	Max Desirable 4400	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_{12} + 0.0078 v_{34} - 0.00627 L = 29.3 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$M = 0.411$
Space mean speed in ramp influence area, S_R	$S = 55.5 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = N/A \text{ mph}$
Space mean speed for all vehicles, S	$S = 55.5 \text{ mph}$

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3045	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	732	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
Volume, V (vph)	3045	732	vph
Peak-hour factor, PHF	0.92	0.80	
Peak 15-min volume, v15	827	229	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3475	938	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 3475 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	3475	4700	No
v = v - v FO F R	2537	4700	No
v R	938	2000	No
v v 3 or av34	0 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h? 3 or av34		No	
Is v v > 1.5 v /2 3 or av34	12	No	
If yes, v = 12A		(Equation 25-18)	

Flow Entering Diverge Influence Area

v_{12}	Actual 3475	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L = 32.8 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable, S	$D = 0.512$
Space mean speed in ramp influence area, S_R	$S = 53.2 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = \text{N/A} \text{ mph}$
Space mean speed for all vehicles, S	$S = 53.2 \text{ mph}$

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/2008
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2215	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	584	vph
Length of first accel/decel lane	500	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)	2215	584	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	602	159	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2528	651	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_{FM} (P_{FM}) = 2528 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v	3179	4700	No
FO			
v v	0 pc/h	(Equation 25-4 or 25-5)	
3 or av34			
Is v v > 2700 pc/h?		No	
3 or av34			
Is v v > 1.5 v / 2		No	
3 or av34 12			
If yes, v =		(Equation 25-8)	
12A			

Flow Entering Merge Influence Area

v_{12}	Actual 2528	Max Desirable 4400	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 26.8 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S_R	$M = 0.380$
Space mean speed in ramp influence area, S_R	$S = 56.3 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = N/A \text{ mph}$
Space mean speed for all vehicles, S_0	$S = 56.3 \text{ mph}$

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2289	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	296	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
Volume, V (vph)	2289	296	vph
Peak-hour factor, PHF	0.92	0.95	
Peak 15-min volume, v15	622	78	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2612	319	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 2612 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	2612	4700	No
v = v - v FO F R	2293	4700	No
v R	319	2000	No
v v 3 or av34	0 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h?	No		
3 or av34			
Is v v > 1.5 v /2	No		
3 or av34	12		
If yes, v = 12A	(Equation 25-18)		

Flow Entering Diverge Influence Area

v_{12}	Actual 2612	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 4.252 + 0.0086 v_{12} - 0.009 L = 25.4 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$D = 0.457$
Space mean speed in ramp influence area, S_R	$S = 54.5 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = \text{N/A} \text{ mph}$
Space mean speed for all vehicles, S	$S = 54.5 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge
Number of lanes in freeway	2
Free-flow speed on freeway	65.0 mph
Volume on freeway	1993 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	211 vph
Length of first accel/decel lane	500 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)	1993	211	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	542	57	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2275	235	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_{FM} (P_{FM}) = 2275 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v	2510	4700	No
FO			
v	0	pc/h	(Equation 25-4 or 25-5)
3 or av34			
Is v	> 2700 pc/h?	No	
3 or av34			
Is v	> 1.5 v / 2	No	
3 or av34	12		
If yes, v	=	(Equation 25-8)	
12A			

Flow Entering Merge Influence Area

v_{12}	Actual 2275	Max Desirable 4400	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_{12} + 0.0078 v_A - 0.00627 L = 21.8 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S_R	$M = 0.334$
Space mean speed in ramp influence area, S_R	$S = 57.3 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = N/A \text{ mph}$
Space mean speed for all vehicles, S_0	$S = 57.3 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge
Number of lanes in freeway	2
Free-flow speed on freeway	65.0 mph
Volume on freeway	1902 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	385 vph
Length of first accel/decel lane	500 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)	1902	385	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	517	105	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2171	429	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 1.000 Using Equation 0

$$v_{12} = v_{FM} (P_{FM}) = 2171 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2600	4700	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34} > 2700 \text{ pc/h?}$		No	
$v_{3 \text{ or } av34}$			
Is $v_{3 \text{ or } av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} =$		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2171	4400	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 22.4 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S_R	$M = 0.339$
Space mean speed in ramp influence area, S_R	$S = 57.2 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = N/A \text{ mph}$
Space mean speed for all vehicles, S_0	$S = 57.2 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: _____ Fax: _____
E-mail: _____

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Main St
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2653	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	632	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
Volume, V (vph)	2653	632	vph
Peak-hour factor, PHF	0.92	0.95	
Peak 15-min volume, v15	721	166	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3028	682	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 1.000 Using Equation 0

$$v = v + (v - v) P = 3028 \text{ pc/h}$$

$$12 \quad R \quad F \quad R \quad FD$$

Capacity Checks

$v = v$	Actual	Maximum	LOS F?
$F_i \quad F$	3028	4700	No
$v = v - v$	2346	4700	No
$FO \quad F \quad R$			
v	682	2000	No
R			
$v \quad v$	0 pc/h	(Equation 25-15 or 25-16)	
$3 \text{ or } av34$			
Is $v \quad v > 2700 \text{ pc/h?}$		No	
$3 \text{ or } av34$			
Is $v \quad v > 1.5 \quad v / 2$		No	
$3 \text{ or } av34$	12		
If yes, $v =$		(Equation 25-18)	
12A			

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v	3028	4600	No
12			!

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 \quad v - 0.009 \quad L = 28.9 \text{ pc/mi/ln}$

$$R \quad 12 \quad D$$

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

Speed Estimation

Intermediate speed variable,	$D = 0.489$
S	
Space mean speed in ramp influence area,	$S = 53.7 \text{ mph}$
R	
Space mean speed in outer lanes,	$S = \text{N/A} \text{ mph}$
0	
Space mean speed for all vehicles,	$S = 53.7 \text{ mph}$

Leisch Method for Weaving Analysis

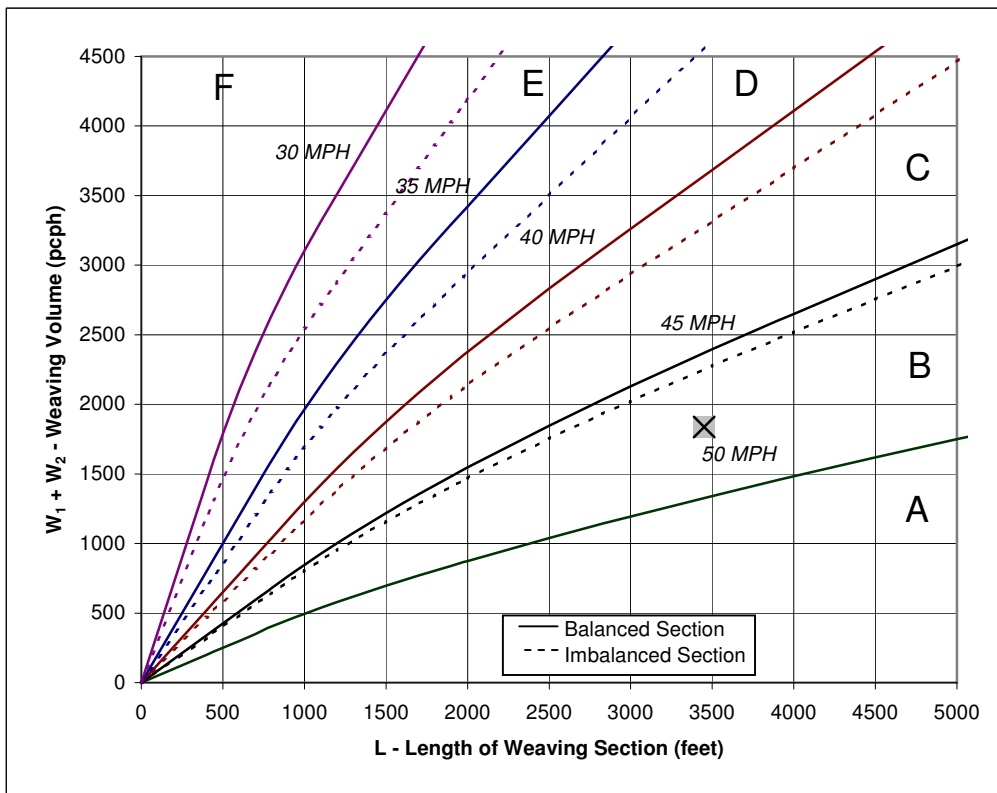
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,450

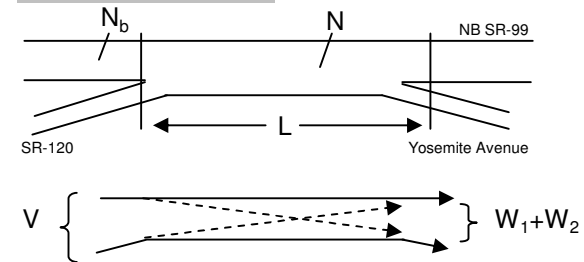
Project Information

Project	Union Crossing
Scenario	EXISTING + PROJECT - PM
Freeway	NB SR-99
On-ramp	SR-120
Off-ramp	Yosemite Avenue

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	3,593	Volume (vph)*	757	Volume (vph)*	1,012
Truck Percentage	14%	Truck Percentage	10%	Truck Percentage	6%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	3,845	Volume (pcph)	795	Volume (pcph)	1,042



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? Y
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

45 mph and 50 mph

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

3. Interpolated Weaving Speed (S_w , mph)	47.6
4. Weaving Intensity Factor (k)	1.58
5. Service Volume (SV, pcph) $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	1,436
6. Level of Service (LOS)	D

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Leisch Method for Weaving Analysis

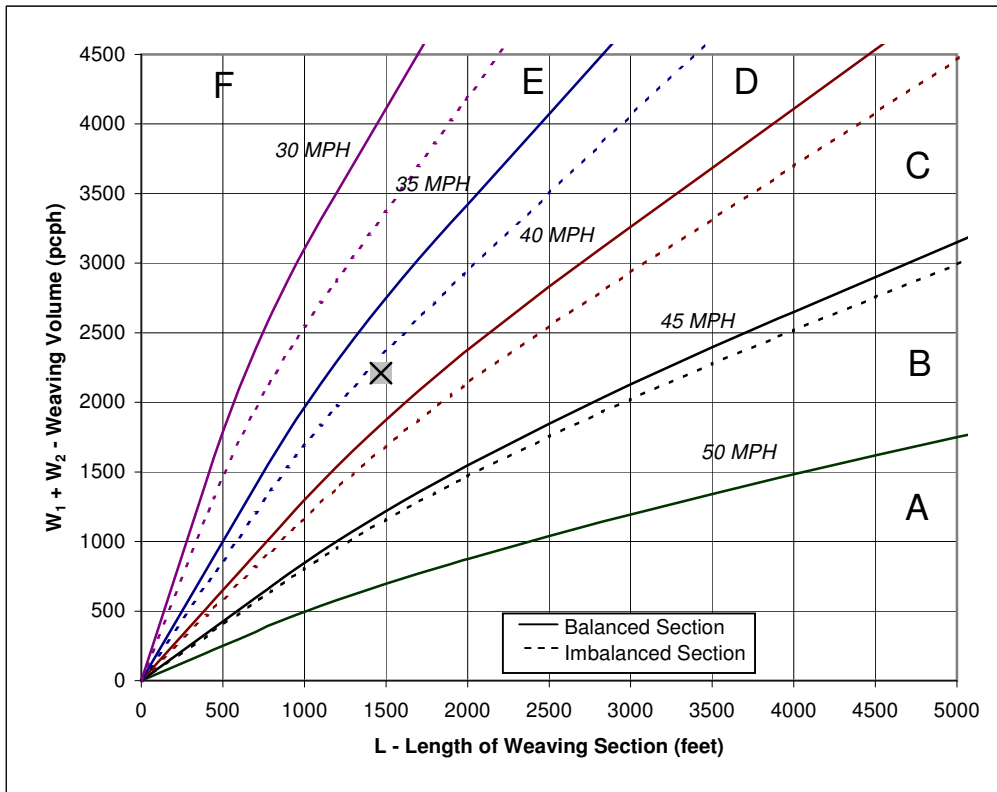
Data Input

Number of Entering Mainline Lanes	N_b	3
Number of Lanes in Weaving Section	N	4
Length of Weaving Section (feet)	L	1,470

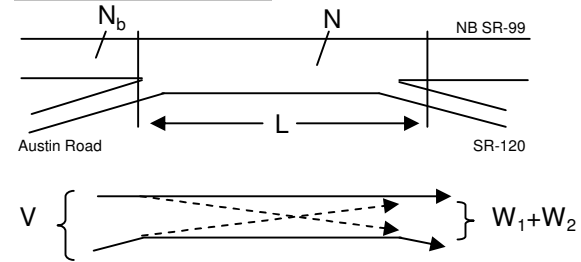
Project Information

Project	Union Crossing
Scenario	EXISTING + PROJECT - PM
Freeway	NB SR-99
On-ramp	Austin Road
Off-ramp	SR-120

Total Weaving Section (V)	On-ramp to Mainline (W_1)	Mainline to Off-ramp (W_2)
Volume (vph)*	Volume (vph)*	Volume (vph)*
Truck Percentage	Truck Percentage	Truck Percentage
PCE for Trucks	PCE for Trucks	PCE for Trucks
Volume (pcph)	Volume (pcph)	Volume (pcph)



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? Y
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

35 MPH and 40 MPH

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

- Interpolated Weaving Speed (S_w , mph) 37.9
- Weaving Intensity Factor (k) 3.00
- Service Volume (SV, pcph)
 $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$ 1,352
- Level of Service (LOS) D

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Leisch Method for Weaving Analysis

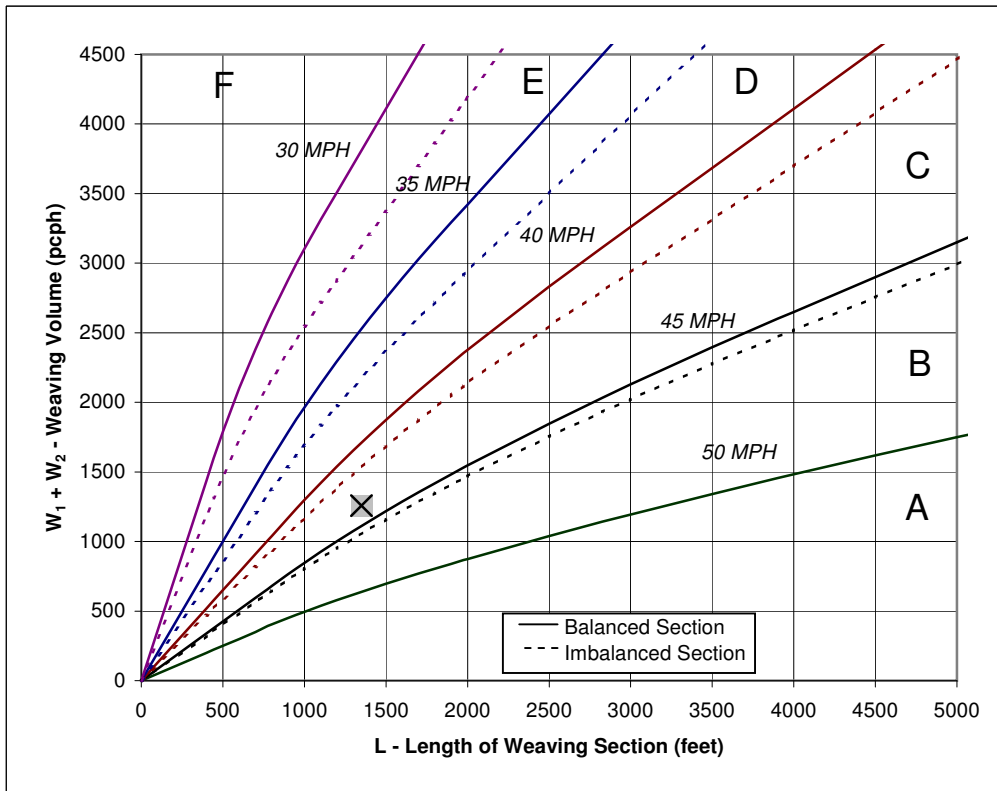
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	1,350

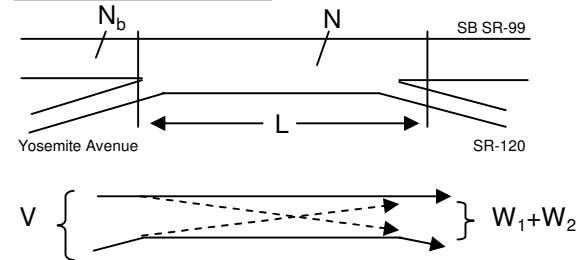
Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	3,406	Volume (vph)*	782	Volume (vph)*	423
Truck Percentage	14%	Truck Percentage	10%	Truck Percentage	6%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	3,644	Volume (pcph)	821	Volume (pcph)	436

Project Information

Project	Union Crossing
Scenario	EXISTING + PROJECT - PM
Freeway	SB SR-99
On-ramp	Yosemite Avenue
Off-ramp	SR-120



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? n
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

40 mph and 45 mph

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

- Interpolated Weaving Speed (S_w , mph) 42.9
- Weaving Intensity Factor (k) 2.23
- Service Volume (SV, pcph)
 $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$ 1,394
- Level of Service (LOS) D

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Major Street Airport Way
 Minor Street Atherton Drive

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour PM

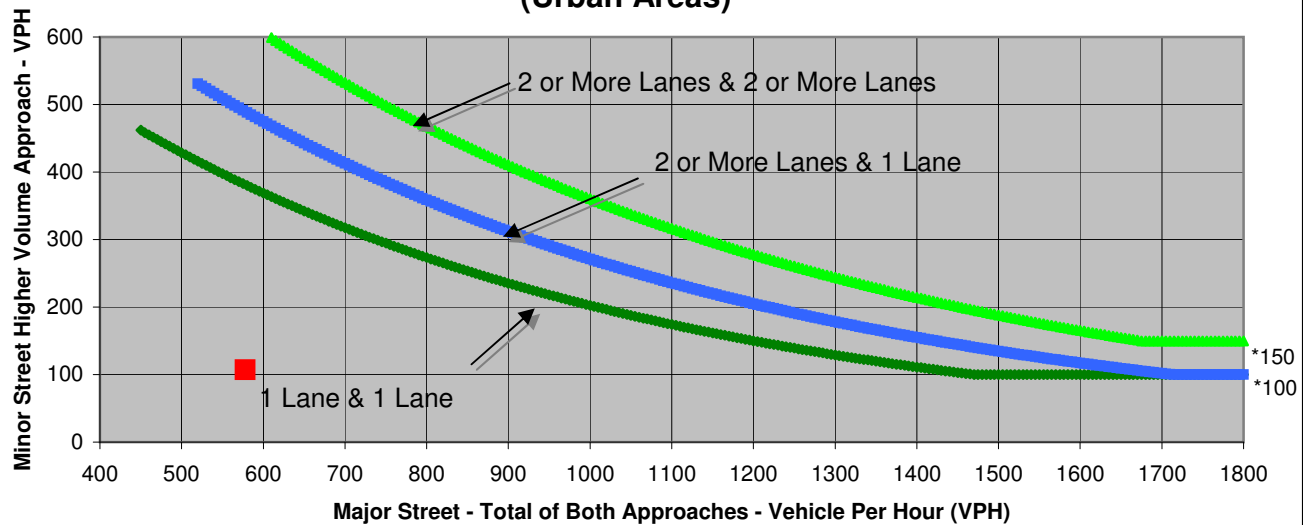
Turn Movement Volumes

	NB	SB	EB	WB
Left	10	92	87	11
Through	140	272	7	3
Right	13	51	13	61
Total	163	415	107	75

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Atherton Drive	<u>Warrant Met</u>
Number of Approach Lanes	3	3	<u>NO</u>
Traffic Volume (VPH) *	578	107	

* 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 Airport Way
 Minor Street SR 99 EB

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour PM

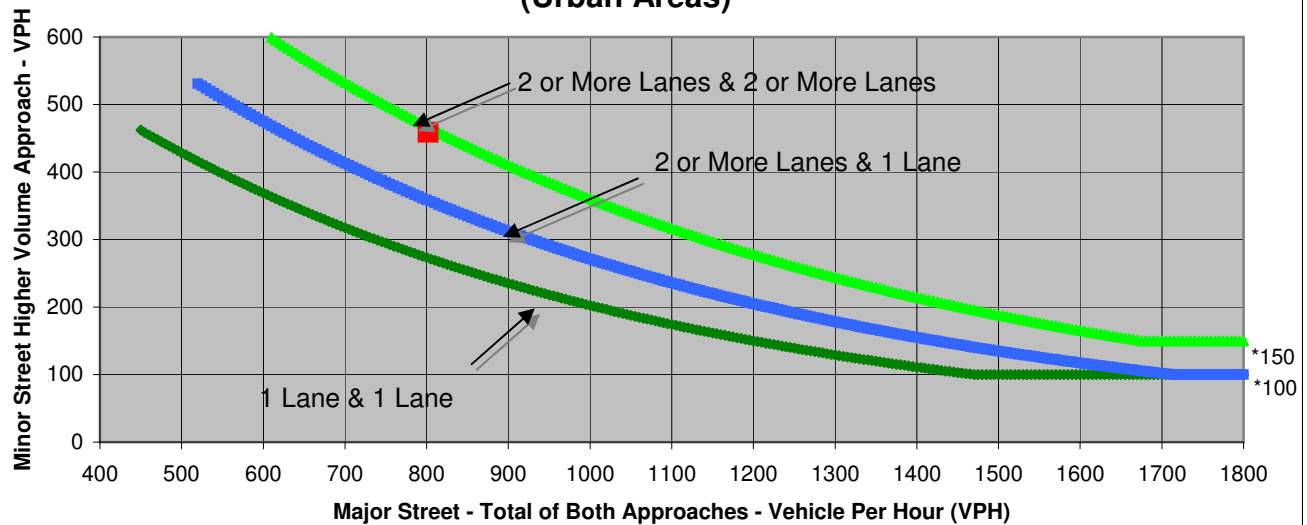
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	218	340	0
Through	234	296	0	0
Right	54	0	119	0
Total	288	514	459	0

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street SR 99 EB	<u>Warrant Met</u>
Number of Approach Lanes	2	1	<u>YES</u>
Traffic Volume (VPH) *	802	459	

* 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 Airport Way
 Minor Street SR 99 WB

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour PM

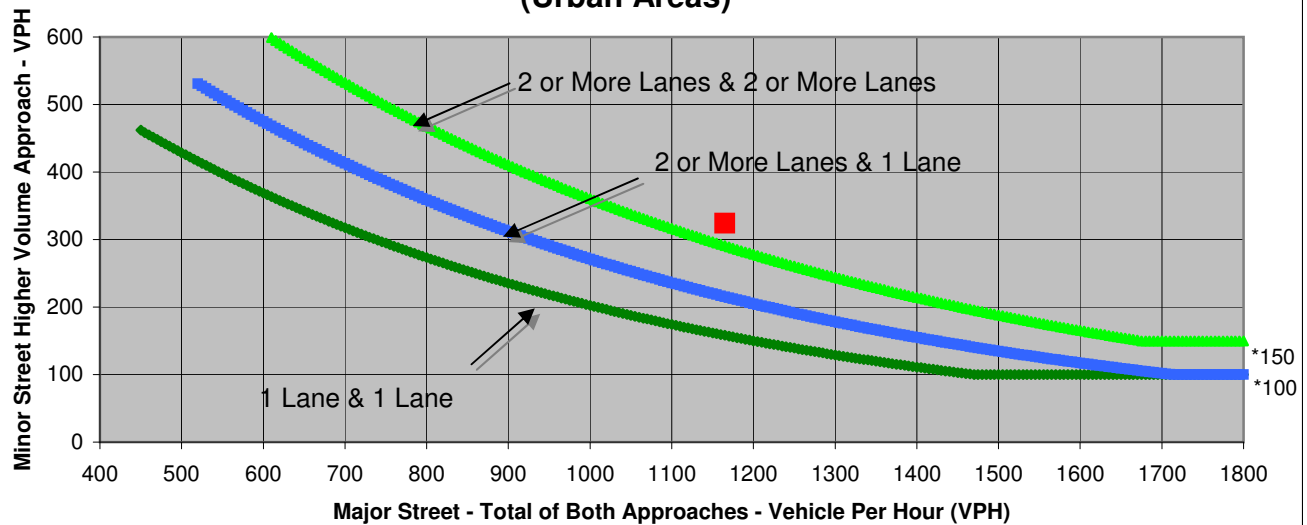
Turn Movement Volumes

	NB	SB	EB	WB
Left	46	13	0	101
Through	528	413	0	0
Right	0	165	0	223
Total	574	591	0	324

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street SR 99 WB	<u>Warrant Met</u>
Number of Approach Lanes	2	1	<u>YES</u>
Traffic Volume (VPH) *	1,165	324	

* 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 Airport Way
 Minor Street Wawona Street

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour PM

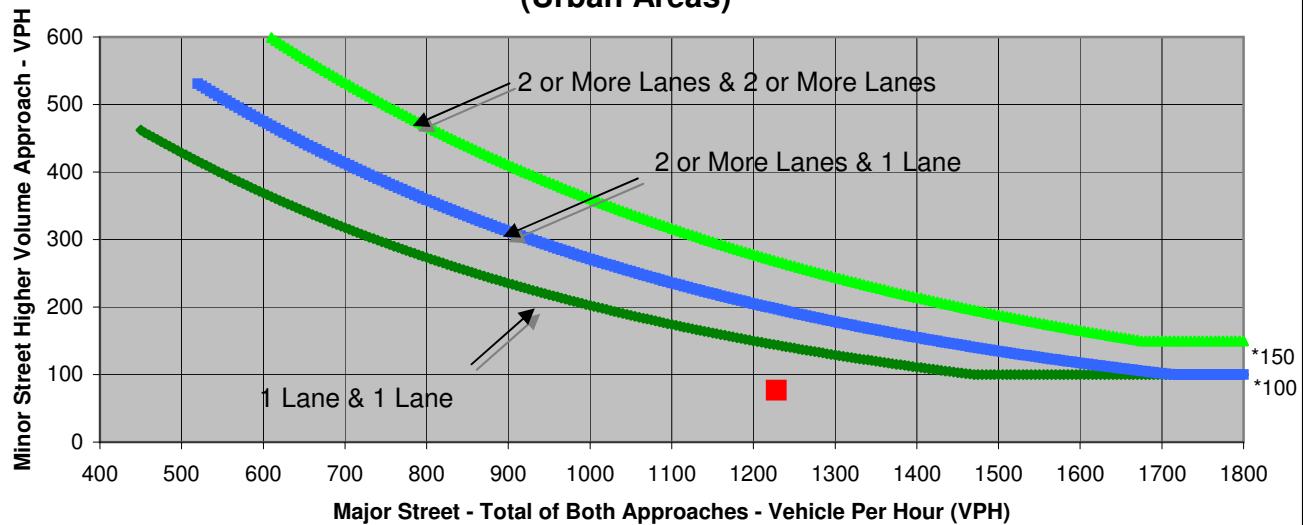
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	76	0	46
Through	506	577	0	0
Right	69	0	0	31
Total	575	653	0	77

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Wawona Street	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	1,228	77	

* 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 Airport Way
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour PM

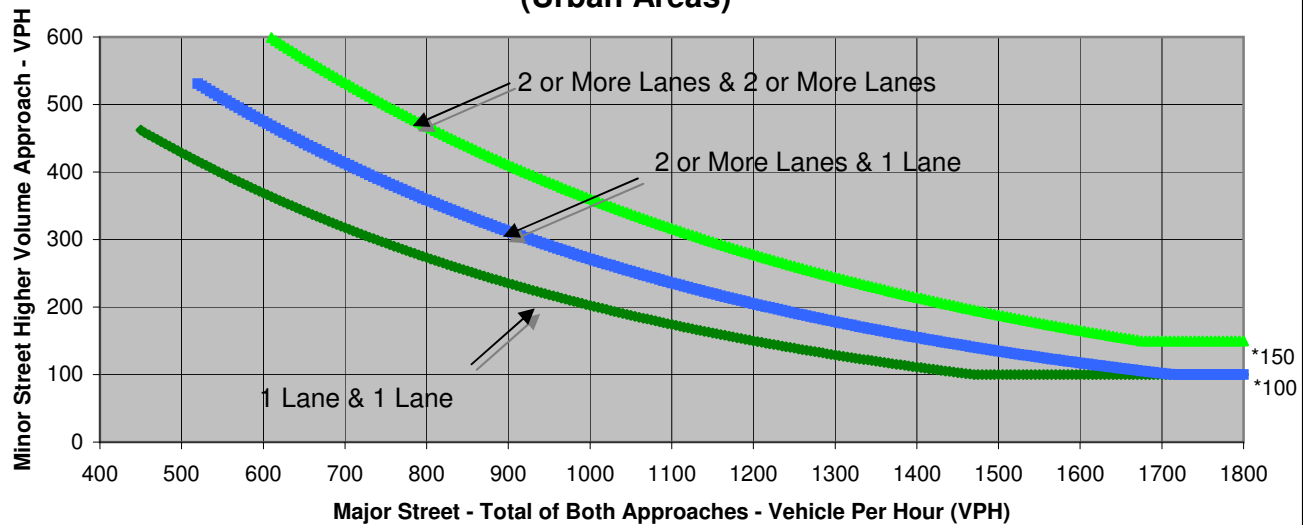
Turn Movement Volumes

	NB	SB	EB	WB
Left	7	55	36	3
Through	82	199	27	27
Right	5	43	4	45
Total	94	297	67	75

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Woodward Avenue	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	391	75	

* 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 Main Street
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour PM

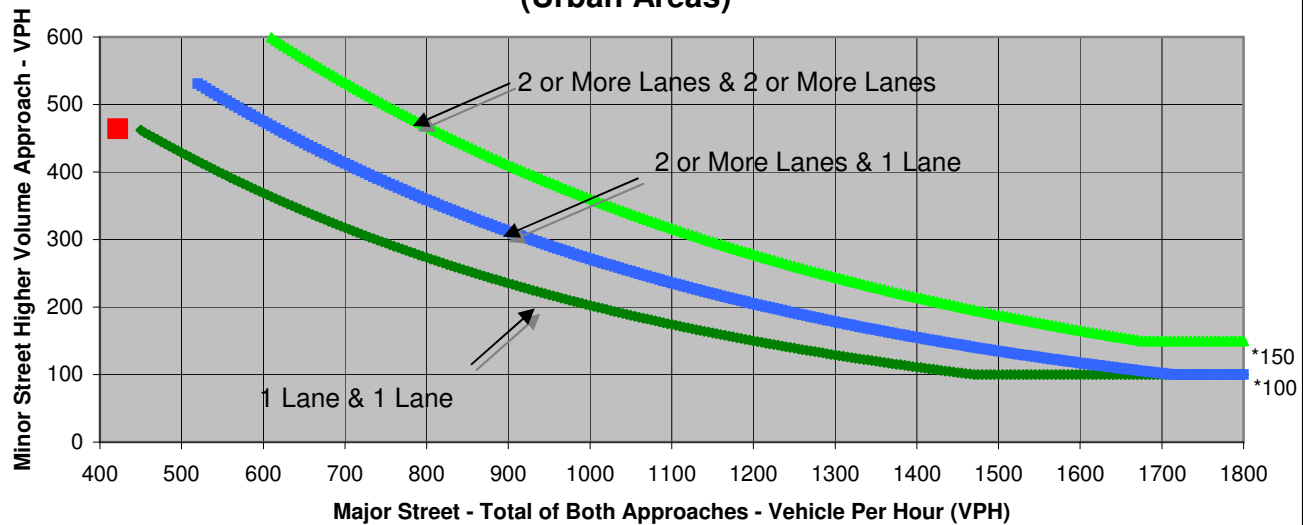
Turn Movement Volumes

	NB	SB	EB	WB
Left	23	209	22	20
Through	160	223	138	86
Right	16	32	49	107
Total	199	464	209	213

Major Street Direction

	North/South
x	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Main Street	Woodward Avenue	
Number of Approach Lanes	2	3	<u>NO</u>
Traffic Volume (VPH) *	422	464	

* 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 Union Road
 Minor Street Project Access

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing Plus Project
 Peak Hour PM

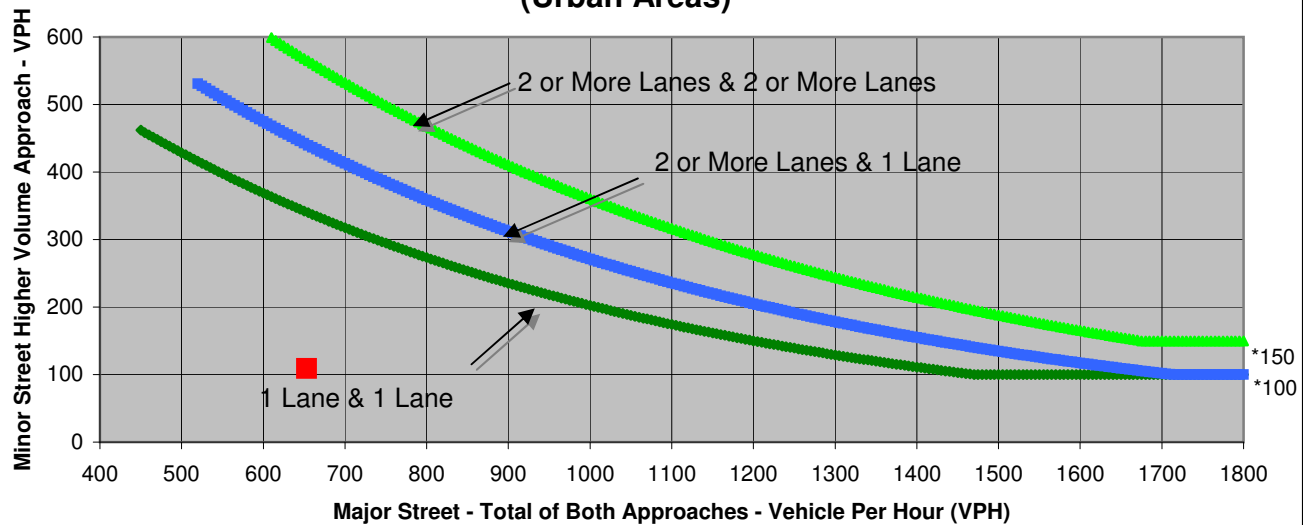
Turn Movement Volumes

	NB	SB	EB	WB
Left	31	0	98	0
Through	219	333	0	0
Right	0	70	11	0
Total	250	403	109	0

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Union Road	Project Access	
Number of Approach Lanes	2	1	<u>NO</u>
Traffic Volume (VPH) *	653	109	

* 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 Union Road
 Minor Street Atherton Drive

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour PM

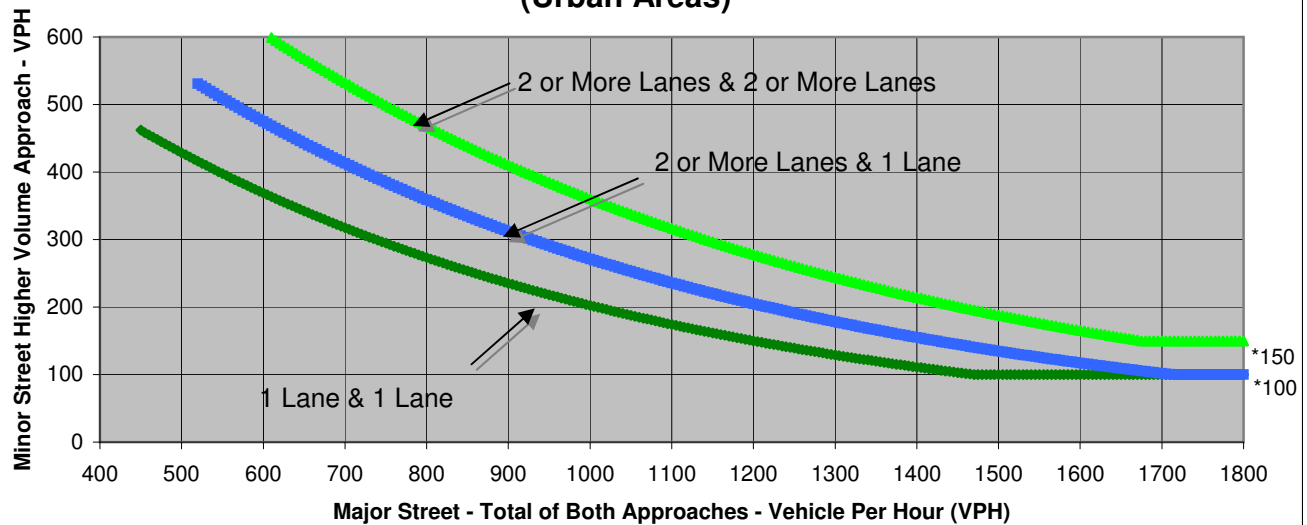
Turn Movement Volumes

	NB	SB	EB	WB
Left	108	31	810	1
Through	183	535	21	20
Right	2	133	43	44
Total	293	699	874	65

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Union Road	Minor Street Atherton Drive	<u>Warrant Met</u>
Number of Approach Lanes	3	3	<u>YES</u>
Traffic Volume (VPH) *	992	874	

* 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 Union Road
 Minor Street Daniels Street

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour PM

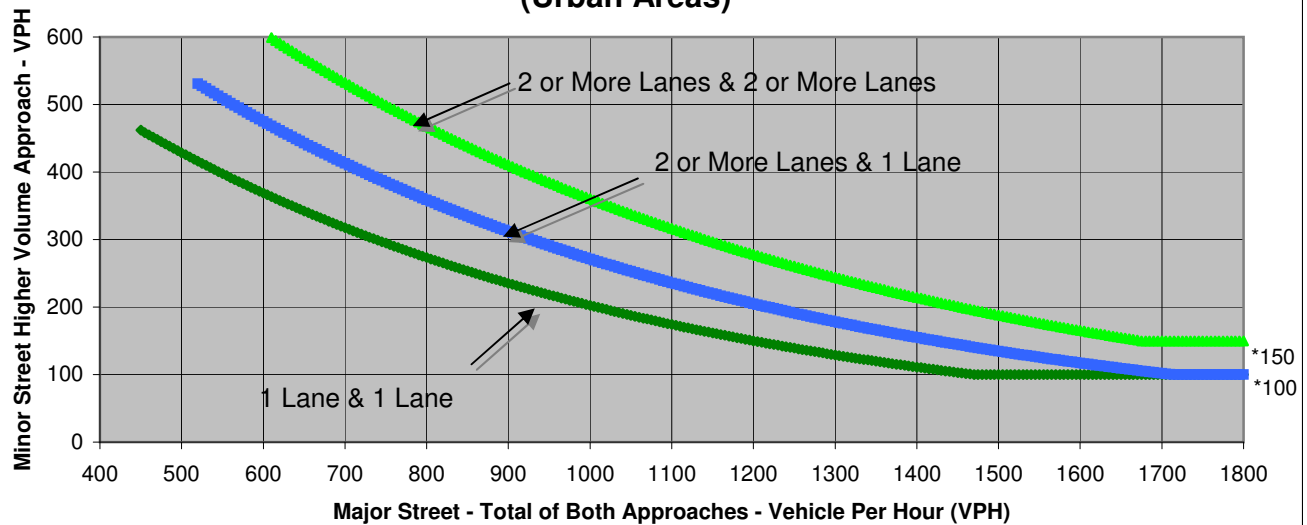
Turn Movement Volumes

	NB	SB	EB	WB
Left	115	0	0	35
Through	1,130	749	0	0
Right	0	35	0	92
Total	1,245	784	0	127

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Union Road	Minor Street Daniels Street	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	2,029	127	

* 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 Union Road
 Minor Street SR 120 EB

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour PM

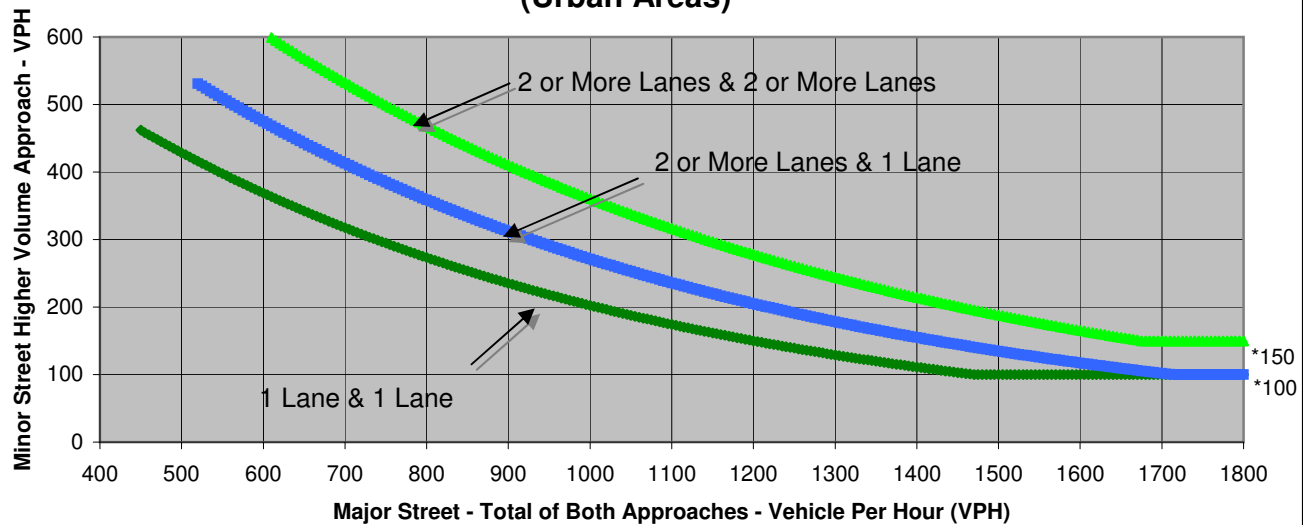
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	250	455	0
Through	752	715	0	0
Right	321	0	277	0
Total	1,073	965	732	0

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Union Road	SR 120 EB	
Number of Approach Lanes	2	1	<u>YES</u>
Traffic Volume (VPH) *	2,038	732	

* 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 Union Road
 Minor Street SR 120 EB

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour PM

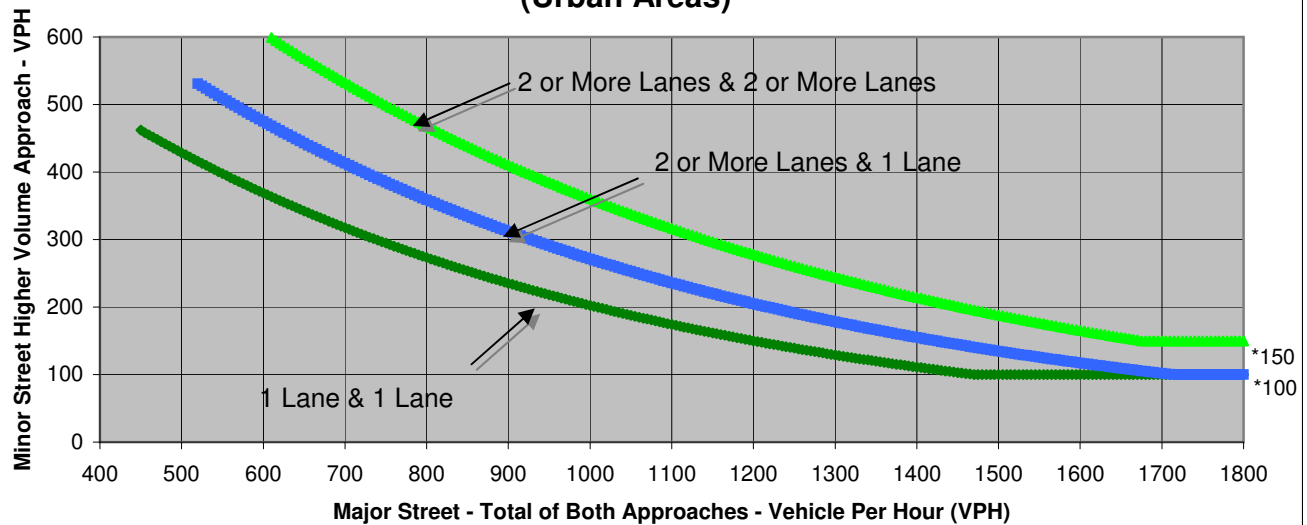
Turn Movement Volumes

	NB	SB	EB	WB
Left	235	0	0	274
Through	972	691	0	0
Right	0	150	0	335
Total	1,207	841	0	609

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Union Road	SR 120 EB	
Number of Approach Lanes	2	2	<u>YES</u>
Traffic Volume (VPH) *	2,048	609	

* 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 Union Road
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Existing + Project
 Peak Hour PM

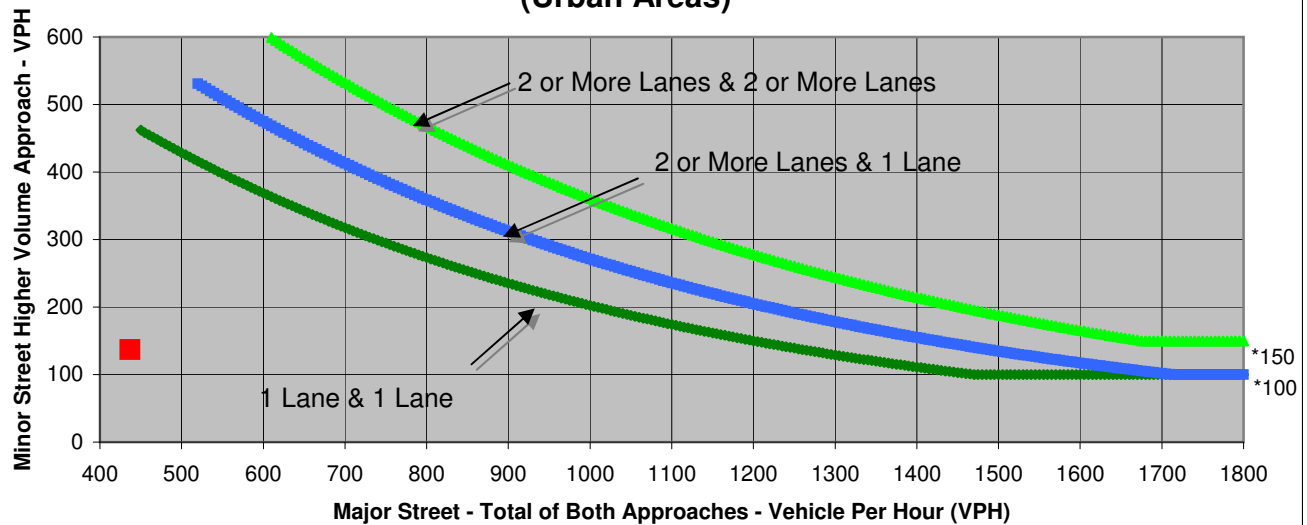
Turn Movement Volumes

	NB	SB	EB	WB
Left	9	144	26	8
Through	124	127	75	37
Right	12	21	3	92
Total	145	292	104	137

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Union Road	Woodward Avenue	
Number of Approach Lanes	2	3	<u>NO</u>
Traffic Volume (VPH) *	437	137	

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

HCM Signalized Intersection Capacity Analysis

1: Yosemite Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.92		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3389		1770	3248		1770	1827	1583	1770	1803	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3389		1770	3248		1770	1827	1583	1770	1803	
Volume (vph)	87	257	101	249	187	227	48	316	173	220	304	34
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	95	279	110	271	203	247	53	351	192	232	320	36
RTOR Reduction (vph)	0	39	0	0	182	0	0	0	114	0	3	0
Lane Group Flow (vph)	95	350	0	271	268	0	53	351	78	232	353	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	7.8	15.7		17.3	25.2		6.9	29.9	29.9	17.3	40.3	
Effective Green, g (s)	7.8	15.7		17.3	25.2		6.9	29.9	29.9	17.3	40.3	
Actuated g/C Ratio	0.08	0.16		0.18	0.26		0.07	0.31	0.31	0.18	0.42	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	144	553		318	851		127	568	492	318	755	
v/s Ratio Prot	0.05	c0.10		c0.15	0.08		0.03	c0.19		c0.13	0.20	
v/s Ratio Perm									0.05			
v/c Ratio	0.66	0.63		0.85	0.31		0.42	0.62	0.16	0.73	0.47	
Uniform Delay, d1	42.9	37.6		38.2	28.6		42.7	28.3	24.0	37.2	20.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	10.4	2.4		19.2	0.2		2.2	5.0	0.7	8.1	2.1	
Delay (s)	53.3	39.9		57.5	28.8		44.9	33.3	24.7	45.4	22.3	
Level of Service	D	D		E	C		D	C	C	D	C	
Approach Delay (s)		42.6			39.5			31.5			31.4	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM Average Control Delay			36.1			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.70									
Actuated Cycle Length (s)			96.2			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			66.3%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Wawona St. & Airport Way

1/5/2009

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Volume (veh/h)	46	31	506	69	76	577			
Peak Hour Factor	0.85	0.85	0.90	0.90	0.95	0.95			
Hourly flow rate (vph)	54	36	562	77	80	607			
Pedestrians	2					2			
Lane Width (ft)	12.0					12.0			
Walking Speed (ft/s)	4.0					4.0			
Percent Blockage	0					0			
Right turn flare (veh)									
Median type	None								
Median storage veh									
Upstream signal (ft)	1313								
pX, platoon unblocked	0.81	0.81			0.81				
vC, conflicting volume	1370	605			641				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	1454	514			559				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	49	92			90				
cM capacity (veh/h)	105	455			823				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	91	639	687						
Volume Left	54	0	80						
Volume Right	36	77	0						
cSH	152	1700	823						
Volume to Capacity	0.59	0.38	0.10						
Queue Length 95th (ft)	78	0	8						
Control Delay (s)	58.4	0.0	2.5						
Lane LOS	F		A						
Approach Delay (s)	58.4	0.0	2.5						
Approach LOS	F								
Intersection Summary									
Average Delay	4.9								
Intersection Capacity Utilization	80.5%		ICU Level of Service		D				
Analysis Period (min)	15								

HCM Signalized Intersection Capacity Analysis

3: Daniels Street & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1564	3433	1863	1562	1770	3471	1548	1770	1827	1548
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1564	3433	1863	1562	1770	3471	1548	1770	1827	1548
Volume (vph)	77	39	127	54	36	8	181	490	80	22	410	191
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	91	46	149	64	42	9	201	544	89	23	432	201
RTOR Reduction (vph)	0	0	105	0	0	7	0	0	46	0	0	129
Lane Group Flow (vph)	91	46	44	64	42	2	201	544	43	23	432	72
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	pm+ov		Prot	Perm		Prot	Perm		Prot	Perm	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	6.4	11.1	19.8	7.1	11.8	11.8	8.7	31.9	31.9	0.7	23.9	23.9
Effective Green, g (s)	6.4	11.1	19.8	7.1	11.8	11.8	8.7	31.9	31.9	0.7	23.9	23.9
Actuated g/C Ratio	0.10	0.17	0.30	0.11	0.18	0.18	0.13	0.48	0.48	0.01	0.36	0.36
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	329	310	557	365	329	276	231	1658	739	19	654	554
v/s Ratio Prot	c0.03	c0.02	0.01	0.02	0.02		c0.11	0.16		0.01	c0.24	
v/s Ratio Perm			0.02			0.00			0.03			0.05
v/c Ratio	0.28	0.15	0.08	0.18	0.13	0.01	0.87	0.33	0.06	1.21	0.66	0.13
Uniform Delay, d1	28.0	23.8	16.9	27.2	23.2	22.7	28.5	10.8	9.4	33.0	18.0	14.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.91	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.2	0.1	0.2	0.2	0.0	28.0	0.1	0.0	279.4	2.5	0.1
Delay (s)	28.5	24.0	17.0	27.4	23.3	22.7	56.6	10.8	8.6	312.5	20.5	14.6
Level of Service	C	C	B	C	C	C	E	B	A	F	C	B
Approach Delay (s)		21.8			25.6			21.6			28.9	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			24.4				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.53									
Actuated Cycle Length (s)			66.8				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			52.3%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

4: SR 120 WB & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	0	0	0	101	0	223	46	528	0	0	426	165
Peak Hour Factor	0.25	0.25	0.25	0.65	0.65	0.65	0.80	0.80	0.80	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	0	155	0	343	58	660	0	0	473	183
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)											494	
pX, platoon unblocked	0.80	0.80	0.80	0.80	0.80		0.80					
vC, conflicting volume	1683	1340	565	1340	1432	660	657				660	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1857	1427	454	1427	1542	660	569				660	
tC, single (s)	7.1	6.5	6.2	*6.4	6.5	6.3	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2				2.2	
p0 queue free %	100	100	100	0	100	24	93				100	
cM capacity (veh/h)	10	100	483	113	85	453	800				928	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1								
Volume Total	498	58	660	657								
Volume Left	155	58	0	0								
Volume Right	343	0	0	183								
cSH	234	800	1700	1700								
Volume to Capacity	2.13	0.07	0.39	0.39								
Queue Length 95th (ft)	950	6	0	0								
Control Delay (s)	556.9	9.9	0.0	0.0								
Lane LOS	F	A										
Approach Delay (s)	556.9	0.8		0.0								
Approach LOS	F											
Intersection Summary												
Average Delay	148.5											
Intersection Capacity Utilization	65.1%			ICU Level of Service			C					
Analysis Period (min)	15											

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

5: SR 120 EB & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	340	0	119	0	0	0	0	234	54	231	296	0
Peak Hour Factor	0.90	0.90	0.90	0.25	0.25	0.25	0.90	0.90	0.90	0.80	0.80	0.80
Hourly flow rate (vph)	378	0	132	0	0	0	0	260	60	289	370	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1238	1268	370	1370	1238	290	370			320		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1238	1268	370	1370	1238	290	370			320		
tC, single (s)	*6.5	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	0	100	80	100	100	100	100			76		
cM capacity (veh/h)	153	128	676	81	134	749	1189			1207		
Direction, Lane #	EB 1	NB 1	SB 1	SB 2								
Volume Total	510	320	289	370								
Volume Left	378	0	289	0								
Volume Right	132	60	0	0								
cSH	191	1700	1207	1700								
Volume to Capacity	2.67	0.19	0.24	0.22								
Queue Length 95th (ft)	1105	0	23	0								
Control Delay (s)	803.4	0.0	8.9	0.0								
Lane LOS	F		A									
Approach Delay (s)	803.4	0.0	3.9									
Approach LOS	F											
Intersection Summary												
Average Delay		277.0										
Intersection Capacity Utilization		65.1%		ICU Level of Service				C				
Analysis Period (min)		15										

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

6: Atherton Dr & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	87	7	13	11	3	61	10	140	13	92	272	51
Peak Hour Factor	0.85	0.85	0.85	0.75	0.75	0.75	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	102	8	15	15	4	81	12	175	16	115	340	64
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)				14			14					
Median type	None			None								
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	813	786	340	782	834	175	404			191		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	813	786	340	782	834	175	404			191		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	59	97	98	95	99	91	99			92		
cM capacity (veh/h)	247	294	702	277	276	868	1155			1382		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3			
Volume Total	126	15	85	12	175	16	115	340	64			
Volume Left	102	15	0	12	0	0	115	0	0			
Volume Right	15	0	81	0	0	16	0	0	64			
cSH	286	277	911	1155	1700	1700	1382	1700	1700			
Volume to Capacity	0.44	0.05	0.09	0.01	0.10	0.01	0.08	0.20	0.04			
Queue Length 95th (ft)	53	4	8	1	0	0	7	0	0			
Control Delay (s)	27.8	18.7	10.0	8.2	0.0	0.0	7.8	0.0	0.0			
Lane LOS	D	C	A	A			A					
Approach Delay (s)	27.8	11.3		0.5			1.7					
Approach LOS	D	B										
Intersection Summary												
Average Delay	5.9											
Intersection Capacity Utilization	39.5%			ICU Level of Service					A			
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

7: Woodward Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop				Stop			Stop			Stop	
Volume (vph)	36	29	4	3	29	45	7	82	5	55	199	43
Peak Hour Factor	0.60	0.60	0.60	0.65	0.65	0.65	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	60	48	7	5	45	69	8	96	6	65	234	51
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	115	118	111	349								
Volume Left (vph)	60	5	8	65								
Volume Right (vph)	7	69	6	51								
Hadj (s)	0.10	-0.31	0.02	-0.02								
Departure Headway (s)	5.3	4.9	5.0	4.6								
Degree Utilization, x	0.17	0.16	0.15	0.45								
Capacity (veh/h)	615	661	670	740								
Control Delay (s)	9.4	8.8	8.9	11.4								
Approach Delay (s)	9.4	8.8	8.9	11.4								
Approach LOS	A	A	A	B								
Intersection Summary												
Delay			10.2									
HCM Level of Service			B									
Intersection Capacity Utilization			39.9%	ICU Level of Service		A						
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

8: Yosemite Avenue & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.98		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	3407		1770	3294		1770	3377	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	1770	3407		1770	3294		1770	3377	
Volume (vph)	287	419	277	108	326	108	242	550	99	116	505	222
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.85	0.85	0.85	0.90	0.90	0.90
Adj. Flow (vph)	312	455	301	117	354	117	285	647	116	129	561	247
RTOR Reduction (vph)	0	0	217	0	42	0	0	18	0	0	62	0
Lane Group Flow (vph)	312	455	84	117	429	0	285	745	0	129	746	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	10.0	21.8	21.8	6.0	17.8		13.0	26.2		7.8	21.0	
Effective Green, g (s)	10.0	21.8	21.8	6.0	17.8		13.0	26.2		7.8	21.0	
Actuated g/C Ratio	0.13	0.28	0.28	0.08	0.23		0.17	0.34		0.10	0.27	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	228	522	444	137	779		296	1109		177	912	
v/s Ratio Prot	c0.18	c0.24		0.07	0.13		c0.16	0.23		0.07	c0.22	
v/s Ratio Perm			0.05									
v/c Ratio	1.37	0.87	0.19	0.85	0.55		0.96	0.67		0.73	0.82	
Uniform Delay, d1	33.9	26.7	21.3	35.5	26.5		32.2	22.1		34.0	26.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	191.2	14.8	0.2	37.3	0.8		42.0	3.3		13.9	8.1	
Delay (s)	225.1	41.4	21.5	72.7	27.3		74.2	25.4		47.9	34.7	
Level of Service	F	D	C	E	C		E	C		D	C	
Approach Delay (s)		89.5			36.4			38.6			36.5	
Approach LOS		F			D			D			D	
Intersection Summary												
HCM Average Control Delay			52.6			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			77.8			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			76.2%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: Wawona St. & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.93		1.00	0.91		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1735		1770	1704		1770	3287		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1735		1770	1704		1770	3287		1770	1863	1583
Volume (vph)	45	95	80	95	95	125	115	795	169	155	565	70
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.90	0.90	0.90
Adj. Flow (vph)	53	112	94	112	112	147	135	935	199	172	628	78
RTOR Reduction (vph)	0	49	0	0	77	0	0	24	0	0	0	71
Lane Group Flow (vph)	53	157	0	112	182	0	135	1110	0	172	628	7
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot			Prot			Prot			Prot		Over
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												
Actuated Green, G (s)	4.5	11.0		5.3	11.8		6.1	19.6		8.1	21.6	4.5
Effective Green, g (s)	4.5	11.0		5.3	11.8		6.1	19.6		8.1	21.6	4.5
Actuated g/C Ratio	0.08	0.18		0.09	0.20		0.10	0.33		0.13	0.36	0.08
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	133	318		156	335		180	1074		239	671	119
v/s Ratio Prot	0.03	0.09		c0.06	c0.11		0.08	c0.34		c0.10	0.34	0.00
v/s Ratio Perm												
v/c Ratio	0.40	0.49		0.72	0.54		0.75	1.03		0.72	0.94	0.06
Uniform Delay, d1	26.5	22.0		26.6	21.7		26.2	20.2		24.9	18.5	25.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.0	1.2		14.6	1.8		16.0	36.6		9.9	22.2	0.2
Delay (s)	28.4	23.2		41.2	23.5		42.2	56.8		34.8	40.7	26.0
Level of Service	C	C		D	C		D	E		C	D	C
Approach Delay (s)		24.3			28.8			55.2			38.2	
Approach LOS		C			C			E			D	
Intersection Summary												
HCM Average Control Delay			43.4			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.75									
Actuated Cycle Length (s)			60.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			65.4%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

10: Daniels Street & Union Road

1/5/2009



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	35	92	115	1155	749	35
Peak Hour Factor	0.92	0.92	0.85	0.85	0.90	0.90
Hourly flow rate (vph)	38	100	135	1359	832	39
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2481	852	871			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2481	852	871			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	72	83			
cM capacity (veh/h)	27	360	774			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	138	1494	871			
Volume Left	38	135	0			
Volume Right	100	0	39			
cSH	82	774	1700			
Volume to Capacity	1.69	0.17	0.51			
Queue Length 95th (ft)	289	16	0			
Control Delay (s)	445.3	9.4	0.0			
Lane LOS	F	A				
Approach Delay (s)	445.3	9.4	0.0			
Approach LOS	F					
Intersection Summary						
Average Delay			30.2			
Intersection Capacity Utilization	126.3%			ICU Level of Service	H	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

11: SR 120 WB Ramps & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	0	0	0	274	0	335	235	935	0	0	691	150
Peak Hour Factor	0.25	0.25	0.25	0.90	0.90	0.90	0.85	0.85	0.85	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	0	304	0	372	276	1100	0	0	768	167
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2876	2504	851	2504	2587	1100	934				1100	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2876	2504	851	2504	2587	1100	934				1100	
tC, single (s)	7.1	6.5	6.2	*6.5	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.0	3.3	2.2				2.2	
p0 queue free %	0	100	100	0	100	0	62				100	
cM capacity (veh/h)	0	18	360	21	16	258	733				635	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1								
Volume Total	677	276	1100	934								
Volume Left	304	276	0	0								
Volume Right	372	0	0	167								
cSH	42	733	1700	1700								
Volume to Capacity	15.95	0.38	0.65	0.55								
Queue Length 95th (ft)	Err	44	0	0								
Control Delay (s)	Err	12.9	0.0	0.0								
Lane LOS	F	B										
Approach Delay (s)	Err	2.6		0.0								
Approach LOS	F											
Intersection Summary												
Average Delay	2265.9											
Intersection Capacity Utilization	123.2%			ICU Level of Service			H					
Analysis Period (min)	15											

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

12: SR 120 EB Ramps & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	455	0	277	0	0	0	0	715	321	250	715	0
Peak Hour Factor	0.90	0.90	0.90	0.25	0.25	0.25	0.90	0.90	0.90	0.85	0.85	0.85
Hourly flow rate (vph)	506	0	308	0	0	0	0	794	357	294	841	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)								859				
pX, platoon unblocked	0.94	0.94		0.94	0.94	0.94				0.94		
vC, conflicting volume	2402	2581	841	2710	2402	973	841			1151		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2494	2684	841	2822	2494	971	841			1161		
tC, single (s)	*6.4	6.5	6.3	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	13	100	100	100	100			48		
cM capacity (veh/h)	18	10	356	1	13	288	794			565		
Direction, Lane #	EB 1	NB 1	SB 1	SB 2								
Volume Total	813	1151	294	841								
Volume Left	506	0	294	0								
Volume Right	308	357	0	0								
cSH	28	1700	565	1700								
Volume to Capacity	29.06	0.68	0.52	0.49								
Queue Length 95th (ft)	Err	0	75	0								
Control Delay (s)	Err	0.0	18.1	0.0								
Lane LOS	F		C									
Approach Delay (s)	Err	0.0	4.7									
Approach LOS	F											
Intersection Summary												
Average Delay		2625.3										
Intersection Capacity Utilization		123.2%		ICU Level of Service		H						
Analysis Period (min)		15										

* User Entered Value

HCM Signalized Intersection Capacity Analysis

13: Atherton Dr. & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	0.88	0.97	0.95	0.88	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	2787	3433	3539	2787	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	2787	3433	3539	2787	3433	3539	1583
Volume (vph)	769	18	63	7	13	44	81	225	5	31	472	174
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	836	20	68	8	14	48	88	245	5	34	513	189
RTOR Reduction (vph)	0	0	45	0	0	44	0	0	3	0	0	107
Lane Group Flow (vph)	836	20	23	8	14	4	88	245	2	34	513	82
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	30.2	38.0	38.0	1.3	9.1	9.1	7.0	50.5	50.5	4.2	47.7	47.7
Effective Green, g (s)	30.2	38.0	38.0	1.3	9.1	9.1	7.0	50.5	50.5	4.2	47.7	47.7
Actuated g/C Ratio	0.27	0.35	0.35	0.01	0.08	0.08	0.06	0.46	0.46	0.04	0.43	0.43
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	943	1223	547	41	293	231	218	1625	1279	131	1535	686
v/s Ratio Prot	c0.24	0.01		0.00	0.00		c0.03	c0.07		0.01	c0.14	
v/s Ratio Perm			c0.01			0.00			0.00			0.05
v/c Ratio	0.89	0.02	0.04	0.20	0.05	0.02	0.40	0.15	0.00	0.26	0.33	0.12
Uniform Delay, d1	38.3	23.7	23.9	53.8	46.5	46.3	49.5	17.3	16.1	51.4	20.6	18.6
Progression Factor	0.94	0.69	0.55	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.90
Incremental Delay, d2	8.3	0.0	0.0	2.3	0.1	0.0	1.2	0.2	0.0	1.1	0.6	0.4
Delay (s)	44.1	16.4	13.1	56.2	46.5	46.4	50.7	17.5	16.1	52.4	21.1	17.2
Level of Service	D	B	B	E	D	D	D	B	B	D	C	B
Approach Delay (s)		41.3			47.5			26.1			21.5	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM Average Control Delay			32.0				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			110.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			55.0%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

HCM Signalized Intersection Capacity Analysis

15: SR 120 WB Ramp & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00
Frpb, ped/bikes					1.00	0.98	1.00	1.00			1.00	0.98
Flpb, ped/bikes					1.00	1.00	1.00	1.00			1.00	1.00
Frt					1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1736	1492	1736	1792			1792	1490
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1736	1492	1736	1792			1792	1490
Volume (vph)	0	0	0	37	0	249	66	676	0	0	472	443
Peak-hour factor, PHF	0.25	0.25	0.25	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	41	0	277	73	751	0	0	524	492
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	144
Lane Group Flow (vph)	0	0	0	0	41	277	73	751	0	0	524	348
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	2%	2%	2%	4%	2%	6%	4%	6%	2%	2%	6%	6%
Turn Type				Split		Free	Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases						Free						6
Actuated Green, G (s)					3.7	71.8	6.8	60.1			49.3	49.3
Effective Green, g (s)					3.7	71.8	6.8	60.1			49.3	49.3
Actuated g/C Ratio					0.05	1.00	0.09	0.84			0.69	0.69
Clearance Time (s)					4.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)					3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					89	1492	164	1500			1230	1023
v/s Ratio Prot					c0.02		0.04	c0.42			0.29	
v/s Ratio Perm						0.19						0.23
v/c Ratio					0.46	0.19	0.45	0.50			0.43	0.34
Uniform Delay, d1					33.1	0.0	30.7	1.6			5.0	4.6
Progression Factor					1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2					3.7	0.3	1.9	0.3			0.2	0.2
Delay (s)					36.8	0.3	32.6	1.9			5.2	4.8
Level of Service					D	A	C	A			A	A
Approach Delay (s)		0.0			5.0			4.6			5.0	
Approach LOS		A			A			A			A	
Intersection Summary												
HCM Average Control Delay			4.9									
HCM Volume to Capacity ratio			0.50									
Actuated Cycle Length (s)			71.8									
Intersection Capacity Utilization			64.7%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

16: SR 120 EB Ramps & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.98					1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00					1.00		1.00	1.00	
Frt		1.00	0.85					0.99		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1703	1518					1800		1703	1827	
Flt Permitted		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (perm)		1703	1518					1800		1703	1827	
Volume (vph)	480	0	183	0	0	0	0	262	27	228	281	0
Peak-hour factor, PHF	0.80	0.80	0.80	0.25	0.25	0.25	0.95	0.95	0.95	0.85	0.85	0.85
Adj. Flow (vph)	600	0	229	0	0	0	0	276	28	268	331	0
RTOR Reduction (vph)	0	0	105	0	0	0	0	4	0	0	0	0
Lane Group Flow (vph)	0	600	124	0	0	0	0	300	0	268	331	0
Confl. Peds. (#/hr)			2				2			2		2
Heavy Vehicles (%)	6%	2%	4%	2%	2%	2%	2%	4%	4%	6%	4%	2%
Turn Type	Split		Perm							Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases			4									
Actuated Green, G (s)		40.8	40.8					20.2		18.9	43.1	
Effective Green, g (s)		40.8	40.8					20.2		18.9	43.1	
Actuated g/C Ratio		0.44	0.44					0.22		0.21	0.47	
Clearance Time (s)		4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)		756	674					396		350	857	
v/s Ratio Prot		c0.35						c0.17		c0.16	0.18	
v/s Ratio Perm			0.08									
v/c Ratio		0.79	0.18					0.76		0.77	0.39	
Uniform Delay, d1		21.9	15.5					33.6		34.4	15.8	
Progression Factor		1.00	1.00					1.00		1.00	1.00	
Incremental Delay, d2		5.7	0.1					8.1		9.6	0.3	
Delay (s)		27.7	15.6					41.6		44.0	16.1	
Level of Service		C	B					D		D	B	
Approach Delay (s)		24.3			0.0			41.6			28.6	
Approach LOS		C			A			D			C	
Intersection Summary												
HCM Average Control Delay			28.9									HCM Level of Service C
HCM Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			91.9							12.0		
Intersection Capacity Utilization			64.7%									ICU Level of Service C
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

17: Atherton Drive & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	0	0	0	0	0	289	0	0	464	0
Peak Hour Factor	0.25	0.25	0.25	0.25	0.25	0.25	0.95	0.95	0.95	0.85	0.85	0.85
Hourly flow rate (vph)	0	0	0	0	0	0	0	304	0	0	546	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)											640	
pX, platoon unblocked	0.89	0.89	0.89	0.89	0.89		0.89					
vC, conflicting volume	850	850	546	850	850	304	546			304		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	832	832	492	832	832	304	492			304		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	100	100			100		
cM capacity (veh/h)	258	272	515	258	272	736	957			1257		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	0	0	304	546								
Volume Left	0	0	0	0								
Volume Right	0	0	0	0								
cSH	1700	1700	957	1257								
Volume to Capacity	0.00	0.00	0.00	0.00								
Queue Length 95th (ft)	0	0	0	0								
Control Delay (s)	0.0	0.0	0.0	0.0								
Lane LOS	A	A										
Approach Delay (s)	0.0	0.0	0.0	0.0								
Approach LOS	A	A										
Intersection Summary												
Average Delay			0.0									
Intersection Capacity Utilization			27.8%	ICU Level of Service						A		
Analysis Period (min)			15									

Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

HCM Unsignalized Intersection Capacity Analysis

19: Union Road &

1/5/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↗↗	↗↗	
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	0	0	1037	677	316
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	1127	736	343
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)	370					
pX, platoon unblocked	0.97					
vC, conflicting volume	1471	540	1079			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1456	540	1079			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	117	486	642			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	0	564	564	491	589	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	343	
cSH	1700	1700	1700	1700	1700	
Volume to Capacity	0.00	0.33	0.33	0.29	0.35	
Queue Length 95th (ft)	0	0	0	0	0	
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	
Lane LOS	A					
Approach Delay (s)	0.0	0.0		0.0		
Approach LOS	A					
Intersection Summary						
Average Delay		0.0				
Intersection Capacity Utilization		32.2%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

20: Union Road &

1/5/2009

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↗↘	↗↘	
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	34	0	317	368	174
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	37	0	345	400	189
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)					310	
pX, platoon unblocked	0.91	0.91	0.91			
vC, conflicting volume	667	295	589			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	530	120	445			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	96	100			
cM capacity (veh/h)	434	825	1009			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	37	172	172	267	322	
Volume Left	0	0	0	0	0	
Volume Right	37	0	0	0	189	
cSH	825	1700	1700	1700	1700	
Volume to Capacity	0.04	0.10	0.10	0.16	0.19	
Queue Length 95th (ft)	4	0	0	0	0	
Control Delay (s)	9.6	0.0	0.0	0.0	0.0	
Lane LOS	A					
Approach Delay (s)	9.6	0.0		0.0		
Approach LOS	A					
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization			25.7%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

21: Union Road &

1/5/2009

							
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Sign Control	Stop			Free	Free		
Grade	0%			0%	0%		
Volume (veh/h)	98	11	31	219	333	70	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	107	12	34	238	362	76	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None						
Median storage veh							
Upstream signal (ft)					530		
pX, platoon unblocked	0.96	0.96	0.96				
vC, conflicting volume	586	219	438				
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	531	150	377				
tC, single (s)	6.8	6.9	4.1				
tC, 2 stage (s)							
tF (s)	3.5	3.3	2.2				
p0 queue free %	76	99	97				
cM capacity (veh/h)	446	837	1134				
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	107	12	34	119	119	241	197
Volume Left	107	0	34	0	0	0	0
Volume Right	0	12	0	0	0	0	76
cSH	446	837	1134	1700	1700	1700	1700
Volume to Capacity	0.24	0.01	0.03	0.07	0.07	0.14	0.12
Queue Length 95th (ft)	23	1	2	0	0	0	0
Control Delay (s)	15.6	9.4	8.3	0.0	0.0	0.0	0.0
Lane LOS	C	A	A				
Approach Delay (s)	15.0		1.0			0.0	
Approach LOS	B						
Intersection Summary							
Average Delay			2.5				
Intersection Capacity Utilization			30.2%		ICU Level of Service		A
Analysis Period (min)			15				

HCM Unsignalized Intersection Capacity Analysis

22: Union Road &

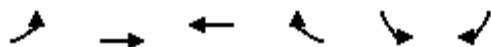
1/5/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	11	0	250	295	50
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	12	0	272	321	54
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)				720		
pX, platoon unblocked						
vC, conflicting volume	484	188	375			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	484	188	375			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	512	823	1180			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	12	136	136	214	161	
Volume Left	0	0	0	0	0	
Volume Right	12	0	0	0	54	
cSH	823	1700	1700	1700	1700	
Volume to Capacity	0.01	0.08	0.08	0.13	0.09	
Queue Length 95th (ft)	1	0	0	0	0	
Control Delay (s)	9.4	0.0	0.0	0.0	0.0	
Lane LOS	A					
Approach Delay (s)	9.4	0.0		0.0		
Approach LOS	A					
Intersection Summary						
Average Delay		0.2				
Intersection Capacity Utilization		19.7%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

23: Woodward Avenue &

1/5/2009

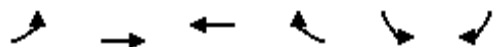


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	110	66	16	0	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	120	72	17	0	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	89				140	45
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	89				140	45
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1504				838	1016
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	60	60	48	41	3	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	17	3	
cSH	1700	1700	1700	1700	1016	
Volume to Capacity	0.04	0.04	0.03	0.02	0.00	
Queue Length 95th (ft)	0	0	0	0	0	
Control Delay (s)	0.0	0.0	0.0	0.0	8.6	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		8.6	
Approach LOS					A	
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			13.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

24: Int

1/5/2009



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↑	↑
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	0	0	23	52	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	25	57	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)			451			
pX, platoon unblocked						
vC, conflicting volume	25				12	12
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	25				12	12
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				94	100
cM capacity (veh/h)	1588				1005	1065
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	0	0	0	25	57	0
Volume Left	0	0	0	0	57	0
Volume Right	0	0	0	25	0	0
cSH	1700	1700	1700	1700	1005	1700
Volume to Capacity	0.00	0.00	0.00	0.01	0.06	0.00
Queue Length 95th (ft)	0	0	0	0	4	0
Control Delay (s)	0.0	0.0	0.0	0.0	8.8	0.0
Lane LOS					A	A
Approach Delay (s)	0.0		0.0		8.8	
Approach LOS					A	
Intersection Summary						
Average Delay			6.1			
Intersection Capacity Utilization			13.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Int

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↵	↑↑				↵			↵
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	52	0	18	23	32	0	0	15	110	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	57	0	20	25	35	0	0	16	120	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None						None					
Median storage veh												
Upstream signal (ft)	249											
pX, platoon unblocked												
vC, conflicting volume	60			57			108	155	28	126	138	30
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	60			57			108	155	28	126	138	30
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	100	98	85	100	100
cM capacity (veh/h)	1542			1546			851	726	1040	814	742	1038
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1					
Volume Total	28	28	20	17	43	16	120					
Volume Left	0	0	20	0	0	0	120					
Volume Right	0	0	0	0	35	16	0					
cSH	1700	1700	1546	1700	1700	1040	814					
Volume to Capacity	0.02	0.02	0.01	0.01	0.03	0.02	0.15					
Queue Length 95th (ft)	0	0	1	0	0	1	13					
Control Delay (s)	0.0	0.0	7.4	0.0	0.0	8.5	10.2					
Lane LOS			A			A	B					
Approach Delay (s)	0.0		1.8			8.5	10.2					
Approach LOS						A	B					
Intersection Summary												
Average Delay			5.5									
Intersection Capacity Utilization			Err%		ICU Level of Service				H			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

26: Int

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		0.95		0.97	0.95			1.00	1.00		1.00	
Frt		1.00		1.00	0.92			1.00	0.85		1.00	
Flt Protected		1.00		0.95	1.00			1.00	1.00		0.96	
Satd. Flow (prot)		3539		3433	3240			1863	1583		1794	
Flt Permitted		1.00		0.95	1.00			1.00	1.00		0.96	
Satd. Flow (perm)		3539		3433	3240			1863	1583		1794	
Volume (vph)	0	176	0	98	74	95	0	107	326	346	109	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	191	0	107	80	103	0	116	354	376	118	0
RTOR Reduction (vph)	0	0	0	0	75	0	0	0	277	0	0	0
Lane Group Flow (vph)	0	191	0	107	108	0	0	116	77	0	494	0
Turn Type	Prot			Prot			Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases									2			6
Actuated Green, G (s)		11.5		14.5	30.0			24.0	24.0		44.0	
Effective Green, g (s)		11.5		14.5	30.0			24.0	24.0		44.0	
Actuated g/C Ratio		0.10		0.13	0.27			0.22	0.22		0.40	
Clearance Time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		370		453	884			406	345		718	
v/s Ratio Prot		c0.05		c0.03	0.03			c0.06			c0.28	
v/s Ratio Perm									0.05			
v/c Ratio		0.52		0.24	0.12			0.29	0.22		0.69	
Uniform Delay, d1		46.6		42.8	30.1			35.9	35.3		27.3	
Progression Factor		1.00		0.98	1.08			1.00	1.00		1.00	
Incremental Delay, d2		1.2		1.2	0.1			1.8	1.5		5.3	
Delay (s)		47.8		43.3	32.6			37.6	36.8		32.6	
Level of Service		D		D	C			D	D		C	
Approach Delay (s)		47.8			36.5			37.0			32.6	
Approach LOS		D			D			D			C	
Intersection Summary												
HCM Average Control Delay			36.9			HCM Level of Service			D			
HCM Volume to Capacity ratio			0.49									
Actuated Cycle Length (s)			110.0			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			59.9%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

Level Of Service Computation Report

2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #14

Cycle (sec): 100 Critical Vol./Cap.(X): 0.252

Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 9.8

Optimal Cycle: 0 Level Of Service: A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0	1	0	1	0	1	0	1	0	1	0

Volume Module:

Base Vol:	2	114	12	102	127	9	12	75	3	8	37	49
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	2	114	12	102	127	9	12	75	3	8	37	49
Added Vol:	0	13	0	42	14	14	20	0	0	0	0	39
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	2	127	12	144	141	23	32	75	3	8	37	88
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	2	127	12	144	141	23	32	75	3	8	37	88
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	2	127	12	144	141	23	32	75	3	8	37	88
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	2	127	12	144	141	23	32	75	3	8	37	88

Saturation Flow Module:

Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	531	577	645	571	619	701	511	552	616	514	554	623

Capacity Analysis Module:

Vol/Sat:	0.00	0.22	0.02	0.25	0.23	0.03	0.06	0.14	0.00	0.02	0.07	0.14
Crit Moves:	****			****			****			****		
Delay/Veh:	9.1	10.2	8.0	10.7	9.8	7.7	9.7	9.7	8.1	9.4	9.2	8.9
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	9.1	10.2	8.0	10.7	9.8	7.7	9.7	9.7	8.1	9.4	9.2	8.9
LOS by Move:	A	B	A	B	A	A	A	A	A	A	A	A
ApproachDel:	10.0			10.1			9.7			9.0		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	10.0			10.1			9.7			9.0		
LOS by Appr:	A			B			A			A		
AllWayAvgQ:	0.0	0.2	0.0	0.3	0.3	0.0	0.1	0.1	0.0	0.0	0.1	0.1

Note: Queue reported is the number of cars per lane.

Level Of Service Detailed Computation Report
2000 HCM 4-Way Stop Method
Future Volume Alternative

Intersection #14

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R	
----- ----- ----- ----- -----																
Time Period:	0.25 hour															
HevVeh:	0%				0%				0%				0%			
Alpha Value:	0.01															
----- ----- ----- ----- -----																
GroupType:	6				6				6				6			
P[C1]:	0.38				0.51				0.36				0.36			
P[C2]:	0.28				0.15				0.09				0.08			
P[C3]:	0.18				0.24				0.37				0.38			
P[C4]:	0.15				0.10				0.17				0.16			
P[C5]:	0.02				0.01				0.02				0.02			
Padj[C1]:	0.012				0.009				0.014				0.014			
Padj[C2]:	0.002				0.003				0.007				0.007			
Padj[C3]:	-0.003				-0.006				-0.009				-0.009			
Padj[C4]:	-0.009				-0.006				-0.010				-0.010			
Padj[C5]:	-0.002				-0.001				-0.002				-0.002			
----- ----- ----- ----- -----																
Lanes:	L1		L2		L1		L2		L1		L2		L1		L2	
LaneType:	LEFT		RITE		LEFT		RITE		LEFT		RITE		LEFT		RITE	
----- ----- ----- ----- -----																
HeadwayAdj:	0.500		-0.700		0.500		-0.700		0.500		-0.700		0.500		-0.700	
Volume:	2		12		144		23		32		3		8		88	
Capacity:	531		645		571		701		511		616		514		623	
DegOfUtil:	0.00		0.02		0.24		0.03		0.06		0.00		0.01		0.13	
DepHeadway:	6.43		5.23		6.09		4.89		6.60		5.40		6.58		5.38	
ServiceTime:	4.1		2.9		3.8		2.6		4.3		3.1		4.3		3.1	
Delay:	9.1		8.0		10.7		7.7		9.7		8.1		9.4		8.9	
Queue:	0.0		0.0		0.3		0.0		0.1		0.0		0.0		0.1	
----- ----- ----- ----- -----																
Lane:	L3				L3				L3				L3			
LaneType:	THRU				THRU				THRU				THRU			
----- ----- ----- ----- -----																
HeadwayAdj:	0.000				0.000				0.000				0.000			
Volume:	127				141				75				37			
Capacity:	577				619				552				554			
DegOfUtil:	0.21				0.22				0.13				0.06			
DepHeadway:	5.93				5.59				6.10				6.08			
ServiceTime:	3.6				3.3				3.8				3.8			
Delay:	10.2				9.8				9.7				9.2			
Queue:	0.2				0.3				0.1				0.1			
----- ----- ----- ----- -----																
Approach:	North Bound				South Bound				East Bound				West Bound			
----- ----- ----- ----- -----																
ApproachDel:	10.0				10.1				9.7				9.0			
Delay Adj:	1.00				1.00				1.00				1.00			
ApprAdjDel:	10.0				10.1				9.7				9.0			
LOS by Appr:	A				B				A				A			

OverallDel:	9.8
OverallLOS:	A

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #14

Future Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound	South Bound	East Bound	West Bound
Movement:	L - T - R	L - T - R	L - T - R	L - T - R
Control:	Stop Sign	Stop Sign	Stop Sign	Stop Sign
Lanes:	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1
Initial Vol:	2 127 12	144 141 23	32 75 3	8 37 88
Major Street Volume:	449			
Minor Approach Volume:	133			
Minor Approach Volume Threshold:	718			

SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

Level Of Service Computation Report

2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #18

Cycle (sec): 100 Critical Vol./Cap.(X): 0.419

Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 12.4

Optimal Cycle: 0 Level Of Service: B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0	1	0	1	0	1	0	1	0	1	0

Volume Module:	North Bound			South Bound			East Bound			West Bound		
Base Vol:	23	160	16	209	223	32	22	117	49	20	66	107
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	23	160	16	209	223	32	22	117	49	20	66	107
Added Vol:	0	0	0	0	0	0	0	21	0	0	20	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	23	160	16	209	223	32	22	138	49	20	86	107
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	23	160	16	209	223	32	22	138	49	20	86	107
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	23	160	16	209	223	32	22	138	49	20	86	107
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	23	160	16	209	223	32	22	138	49	20	86	107

Saturation Flow Module:	North Bound			South Bound			East Bound			West Bound		
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	448	483	526	499	536	590	442	475	519	441	472	520

Capacity Analysis Module:	North Bound			South Bound			East Bound			West Bound		
Vol/Sat:	0.05	0.33	0.03	0.42	0.42	0.05	0.05	0.29	0.09	0.05	0.18	0.21
Crit Moves:	****			****			****			****		
Delay/Veh:	10.6	12.9	9.2	14.4	13.5	8.8	10.7	12.5	9.7	10.7	11.3	10.6
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	10.6	12.9	9.2	14.4	13.5	8.8	10.7	12.5	9.7	10.7	11.3	10.6
LOS by Move:	B	B	A	B	B	A	B	B	A	B	B	B
ApproachDel:	12.3			13.5			11.6			10.9		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	12.3			13.5			11.6			10.9		
LOS by Appr:	B			B			B			B		
AllWayAvgQ:	0.0	0.4	0.0	0.6	0.6	0.1	0.0	0.3	0.1	0.0	0.2	0.2

Note: Queue reported is the number of cars per lane.

Level Of Service Detailed Computation Report
2000 HCM 4-Way Stop Method
Future Volume Alternative

Intersection #18

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R

Time Period: 0.25 hour

HevVeh: 0% 0% 0% 0%

Alpha Value: 0.01

GroupType:	6			6			6			6		
P[C1]:	0.14			0.26			0.14			0.14		
P[C2]:	0.27			0.15			0.08			0.08		
P[C3]:	0.16			0.29			0.35			0.34		
P[C4]:	0.35			0.25			0.35			0.35		
P[C5]:	0.09			0.05			0.09			0.09		
Padj[C1]:	0.020			0.017			0.022			0.022		
Padj[C2]:	0.008			0.008			0.012			0.012		
Padj[C3]:	0.001			-0.005			-0.005			-0.005		
Padj[C4]:	-0.020			-0.015			-0.020			-0.020		
Padj[C5]:	-0.009			-0.005			-0.009			-0.009		

Lanes:	L1		L2		L1		L2		L1		L2		L1		L2	
LaneType:	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE
HeadwayAdj:	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700
Volume:	23	16	209	32	22	49	20	107								
Capacity:	448	526	499	590	442	519	441	520								
DegOfUtil:	0.05	0.03	0.41	0.05	0.05	0.09	0.04	0.19								
DepHeadway:	7.53	6.33	6.98	5.78	7.62	6.42	7.63	6.43								
ServiceTime:	5.2	4.0	4.7	3.5	5.3	4.1	5.3	4.1								
Delay:	10.6	9.2	14.4	8.8	10.7	9.7	10.7	10.6								
Queue:	0.0	0.0	0.6	0.1	0.0	0.1	0.0	0.2								

Lane:	L3		L3		L3		L3	
LaneType:	THRU	THRU	THRU	THRU	THRU	THRU	THRU	THRU
HeadwayAdj:	0.000		0.000		0.000		0.000	
Volume:	160		223		138		86	
Capacity:	483		536		475		472	
DegOfUtil:	0.31		0.40		0.27		0.17	
DepHeadway:	7.03		6.48		7.12		7.13	
ServiceTime:	4.7		4.2		4.8		4.8	
Delay:	12.9		13.5		12.5		11.3	
Queue:	0.4		0.6		0.3		0.2	

Approach:	North Bound		South Bound		East Bound		West Bound	
ApproachDel:	12.3		13.5		11.6		10.9	
Delay Adj:	1.00		1.00		1.00		1.00	
ApprAdjDel:	12.3		13.5		11.6		10.9	
LOS by Appr:	B		B		B		B	

OverallDel:	12.4
OverallLOS:	B

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #18

Future Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound			South Bound			East Bound			West Bound					
Movement:	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign					
Lanes:	1	0	1	0	1	1	0	1	0	1	1	0	1	0	1
Initial Vol:	23	160		16	209	223	32	22	138	49	20	86	107		
Major Street Volume:				663											
Minor Approach Volume:				213											
Minor Approach Volume Threshold:				551											

SIGNAL WARRANT DISCLAIMER

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The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

Cumulative, No Project, AM

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: I-5 to Yosemite
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4754	veh/h
Peak-hour factor, PHF	0.97	
Peak 15-min volume, v15	1225	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1748	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1748	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.3	mi/h
Number of lanes, N	3	
Density, D	27.2	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Yosemite to Aiport
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3517	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	956	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1338	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1338	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	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Yosemite to Airport
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Commercial EIR

Flow Inputs and Adjustments

Volume, V	8106	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	2203	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	3084	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	3084	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Airport to Union
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3867	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1051	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1471	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1471	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	22.6	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Union to Main
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3792	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1030	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1443	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1443	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	22.2	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Main to SR 99
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3447	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	937	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1311	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1311	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	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: SR 99 to Main
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	5025	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1365	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1912	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1912	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.7	mi/h
Number of lanes, N	3	
Density, D	30.5	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Main to Union
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	5940	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1614	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2260	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2260	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	55.3	mi/h
Number of lanes, N	3	
Density, D	40.9	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Union to Airport
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	6840	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1859	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2602	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2602	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: _____ Fax: _____
 E-mail: _____

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: SR 120 Westbound
 From/To: Airport to Yosemite
 Jurisdiction: City of Manteca
 Analysis Year: Cumulative Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	7055	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1917	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2684	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2684	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Yosemite to I-5
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	6894	veh/h
Peak-hour factor, PHF	0.93	
Peak 15-min volume, v15	1853	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2595	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2595	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Northbound
From/To: Jack Tone to Austin
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	7067	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1963	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2801	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2801	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Northbound
From/To: Austin to SR-120
Jurisdiction:
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	6321	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1756	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2505	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2505	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: _____ Fax: _____
 E-mail: _____

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: SR-99 Northbound
 From/To: Yosemite to Louise
 Jurisdiction: City of Manteca
 Analysis Year: Cumulative Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4276	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1188	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2542	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2542	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: Louise to Yosemite
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4109	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1141	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2443	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2443	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Northbound
From/To: SR-120 to Yosemite
Jurisdiction:
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3701	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1028	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1467	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1467	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	22.6	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: Yosemite to SR-120
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4692	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1303	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2789	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2789	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: SR-120 to Austin
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	5735	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1593	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2273	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2273	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	54.9	mi/h
Number of lanes, N	3	
Density, D	41.4	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: Austin to Jack Tone
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	5643	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1568	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2236	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2236	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	56.0	mi/h
Number of lanes, N	3	
Density, D	39.9	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: AM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3517	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	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
Volume, V (vph)	3517	740	vph
Peak-hour factor, PHF	0.92	0.80	
Peak 15-min volume, v15	956	231	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4014	948	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.616 Using Equation 5

$$v = v + (v - v) P = 2837 \text{ pc/h}$$

$$12 \quad R \quad F \quad R \quad FD$$

Capacity Checks

$v = v$	Actual	Maximum	LOS F?
$F_i \quad F$	4014	7050	No
$v = v - v$	3066	7050	No
$FO \quad F \quad R$			
v	948	2000	No
R			
$v \quad v$	1177 pc/h	(Equation 25-15 or 25-16)	
3 or av_{34}			
Is $v \quad v > 2700 \text{ pc/h?}$		No	
3 or av_{34}			
Is $v \quad v > 1.5 \quad v / 2$		No	
3 or av_{34}	12		
If yes, $v =$		(Equation 25-18)	
12A			

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v	2837	4600	No
12			!

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 \quad v - 0.009 \quad L = 27.3 \text{ pc/mi/ln}$

$$R \quad 12 \quad D$$

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

Speed Estimation

Intermediate speed variable,	$D = 0.513$
S	
Space mean speed in ramp influence area,	$S = 53.2 \text{ mph}$
R	
Space mean speed in outer lanes,	$S = 70.6 \text{ mph}$
0	
Space mean speed for all vehicles,	$S = 57.3 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/2008
Analysis time period: AM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2777	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	1090	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	2777	1090	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	755	296	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3169	1214	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.591 Using Equation 1

$$v_F = v_{FM} (P_F) = 1874 \text{ pc/h}$$

Capacity Checks

v_F	Actual	Maximum	LOS F?
FO	4383	7050	No
v_F	1295 pc/h (Equation 25-4 or 25-5)		
3 or av_{34}			
Is v_F	$v_F > 2700 \text{ pc/h?}$	No	
3 or av_{34}			
Is v_F	$v_F > 1.5 v_F / 2$	No	
3 or av_{34}	12		
If yes, v_F	(Equation 25-8)		
12A			

Flow Entering Merge Influence Area

v_F	Actual	Max Desirable	Violation?
12	1874	4400	No
			!

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_F + 0.0078 v_F - 0.00627 L = 25.9 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M = 0.372$
Space mean speed in ramp influence area,	$S_R = 56.5 \text{ mph}$
Space mean speed in outer lanes,	$S_0 = 62.1 \text{ mph}$
Space mean speed for all vehicles,	$S = 58.0 \text{ mph}$

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: AM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Union Road
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3867	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	575	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
Volume, V (vph)	3867	575	vph
Peak-hour factor, PHF	0.92	0.80	
Peak 15-min volume, v15	1051	180	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4413	737	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.616 Using Equation 5

$$v = v_R + (v_F - v_R) P = 3001 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	4413	7050	No
v = v - v FO F R	3676	7050	No
v R	737	2000	No
v v 3 or av34	1412 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h?	No		
Is v v > 1.5 v /2 3 or av34	No		
If yes, v = 12A	(Equation 25-18)		

Flow Entering Diverge Influence Area

v	Actual 3001	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 4.252 + 0.0086 v_R - 0.009 L = 28.7 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$D = 0.494$
Space mean speed in ramp influence area, S_R	$S = 53.6 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 69.7 \text{ mph}$
Space mean speed for all vehicles, S	$S = 57.9 \text{ mph}$

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/2008
Analysis time period: AM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Union Road
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3292	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	500	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	3292	500	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	895	136	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3757	557	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.591 Using Equation 1

$$v_{12} = v_{FM} (P_{FM}) = 2222 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4314	7050	No
$v_{3 \text{ or } av34}$	1535 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34} > 2700 \text{ pc/h?}$		No	
Is $v_{3 \text{ or } av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} =$		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2222	4400	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 23.8 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$M = 0.349$
Space mean speed in ramp influence area, S_R	$S = 57.0 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 61.3 \text{ mph}$
Space mean speed for all vehicles, S	$S = 58.4 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: _____ Fax: _____
E-mail: _____

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: AM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6840	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	1615	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
Volume, V (vph)	6840	1615	vph
Peak-hour factor, PHF	0.92	0.95	
Peak 15-min volume, v15	1859	425	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	7807	1742	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.485 Using Equation 5

$$v = v_R + (v_F - v_R) P = 4682 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	7807	7050	Yes
v = v - v FO F R	6065	7050	No
v R	1742	2000	No
v v 3 or av34	3125 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h? 3 or av34		Yes	
Is v v > 1.5 v /2 3 or av34	12	No	
If yes, v = 5107 12A		(Equation 25-18)	

Flow Entering Diverge Influence Area

v	Actual 5107	Max Desirable 4600	Violation? No
12A			

Level of Service Determination (if not F)

$$\text{Density, } D = 4.252 + 0.0086 v_R - 0.009 L = 46.8 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$D = 0.585$
Space mean speed in ramp influence area, S_R	$S = 51.6 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 64.7 \text{ mph}$
Space mean speed for all vehicles, S	$S = 55.4 \text{ mph}$

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: AM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	5225	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	1830	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	5225	1830	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	1420	497	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5963	2039	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.591 Using Equation 1

$$v_{12} = v_{FM} (P_{FM}) = 3527 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v	8002	7050	Yes
FO			
v			
3 or av34	2436 pc/h	(Equation 25-4 or 25-5)	
Is v			
3 or av34			
v > 2700 pc/h?		No	
Is v			
3 or av34			
v > 1.5 v /2		No	
3 or av34	12		
If yes, v =			(Equation 25-8)
12A			

Flow Entering Merge Influence Area

v_{12}	Actual 3527	Max Desirable 4400	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 44.8 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$M = 1.305$
Space mean speed in ramp influence area, S_R	$S = 35.0 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 57.7 \text{ mph}$
Space mean speed for all vehicles, S	$S = 39.7 \text{ mph}$

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: AM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Union Road
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge
Number of lanes in freeway	3
Free-flow speed on freeway	65.0 mph
Volume on freeway	5385 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	1455 vph
Length of first accel/decel lane	500 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)	5385	1455	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	1463	395	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6146	1621	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.591 Using Equation 1

$$v_{12} = v_{FM} (P_{FM}) = 3635 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	7767	7050	Yes
$v_{3 \text{ or } av34}$	2511 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34} > 2700 \text{ pc/h?}$		No	
Is $v_{3 \text{ or } av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} =$		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3635	4400	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 42.6 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M = 1.034$
Space mean speed in ramp influence area,	$S_R = 41.2 \text{ mph}$
Space mean speed in outer lanes,	$S_0 = 57.2 \text{ mph}$
Space mean speed for all vehicles,	$S = 45.3 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: AM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Union Road
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	5940	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	555	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
Volume, V (vph)	5940	555	vph
Peak-hour factor, PHF	0.92	0.95	
Peak 15-min volume, v15	1614	146	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6779	599	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.563 Using Equation 5

$$v_{12R} = v_F + (v_R - v_F) P_{FD} = 4078 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	6779	7050	No
v = v - v FO F R	6180	7050	No
v R	599	2000	No
v v 3 or av34	2701 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h? 3 or av34		Yes	
Is v v > 1.5 v /2 3 or av34	12	No	
If yes, v _A = 4079 12A		(Equation 25-18)	

Flow Entering Diverge Influence Area

v_{12A}	Actual 4079	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 4.252 + 0.0086 v_{12R} - 0.009 L = 38.0 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$D = 0.482$
Space mean speed in ramp influence area, S_R	$S = 53.9 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 64.7 \text{ mph}$
Space mean speed for all vehicles, S	$S = 57.7 \text{ mph}$

Leisch Method for Weaving Analysis

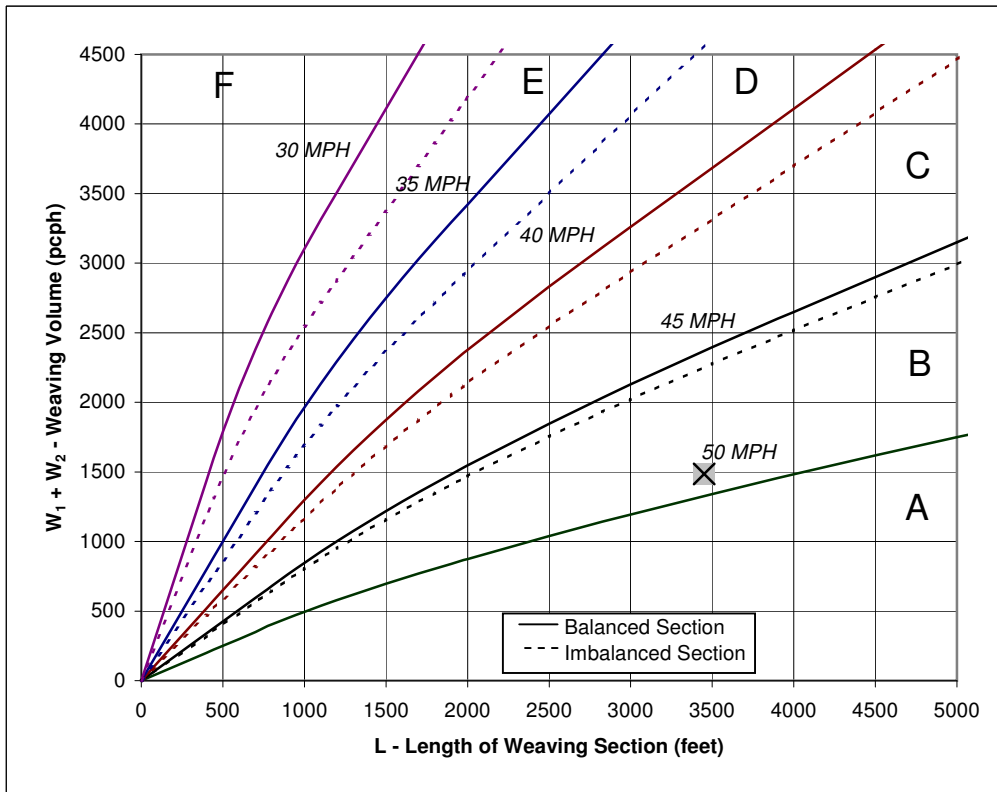
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,450

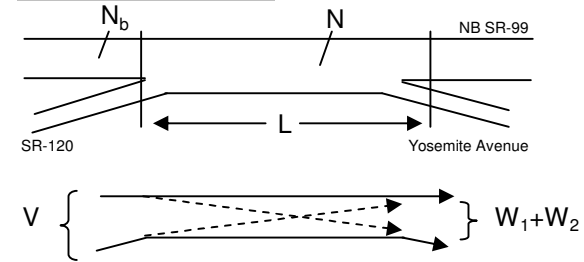
Project Information

Project	Union Crossing
Scenario	Cumulative NO PROJECT - AM
Freeway	NB SR-99
On-ramp	SR-120
Off-ramp	Yosemite Avenue

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	3,009	Volume (vph)*	275	Volume (vph)*	357
Truck Percentage	14%	Truck Percentage	10%	Truck Percentage	6%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	3,701	Volume (pcph)	835	Volume (pcph)	650



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? Y
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

45 mph and 50 mph

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

- Interpolated Weaving Speed (S_w , mph) 49.2
- Weaving Intensity Factor (k) 1.32
- Service Volume (SV, pcph)
 $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$ 1,303
- Level of Service (LOS) D

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Leisch Method for Weaving Analysis

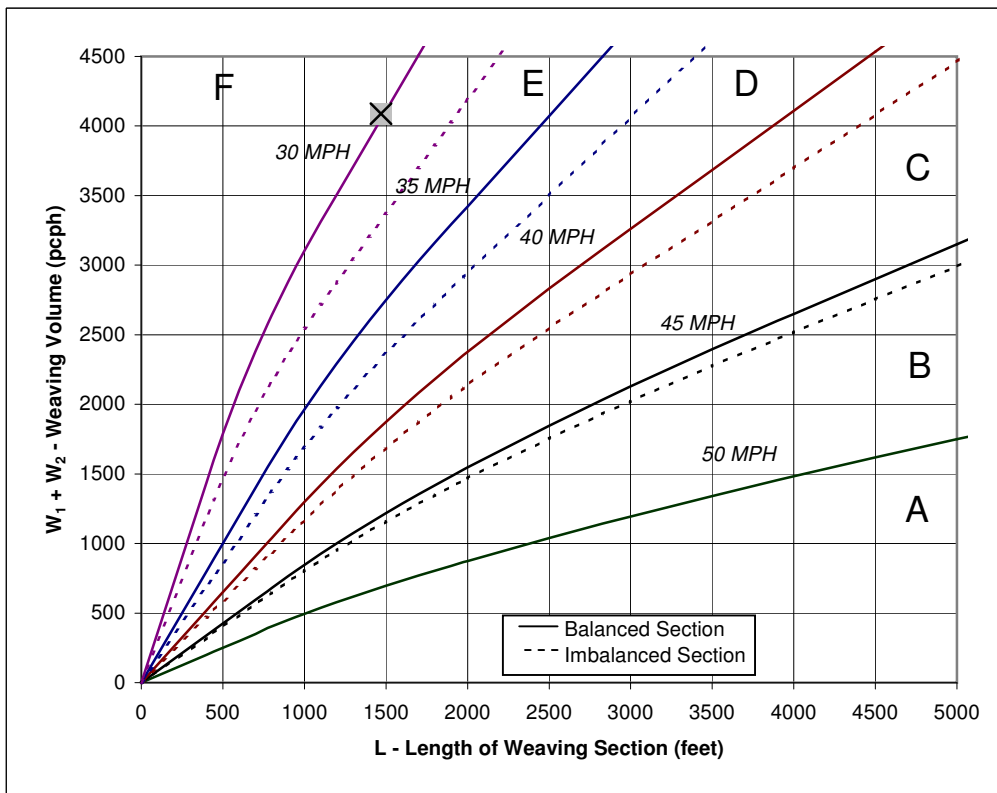
Data Input

Number of Entering Mainline Lanes	N_b	3
Number of Lanes in Weaving Section	N	4
Length of Weaving Section (feet)	L	1,470

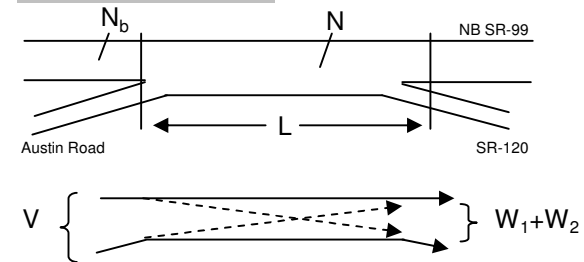
Project Information

Project	Union Crossing
Scenario	Cumulative NO PROJECT - AM
Freeway	NB SR-99
On-ramp	Austin Road
Off-ramp	SR-120

Total Weaving Section (V)	On-ramp to Mainline (W_1)	Mainline to Off-ramp (W_2)
Volume (vph)*	Volume (vph)*	Volume (vph)*
Truck Percentage	Truck Percentage	Truck Percentage
PCE for Trucks	PCE for Trucks	PCE for Trucks
Volume (pcph)	Volume (pcph)	Volume (pcph)



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? Y
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

35 MPH and 40 MPH

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

3. Interpolated Weaving Speed (S_w , mph)	27.0
4. Weaving Intensity Factor (k)	3.00
5. Service Volume (SV, pcph) $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	1,819
6. Level of Service (LOS)	E

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Leisch Method for Weaving Analysis

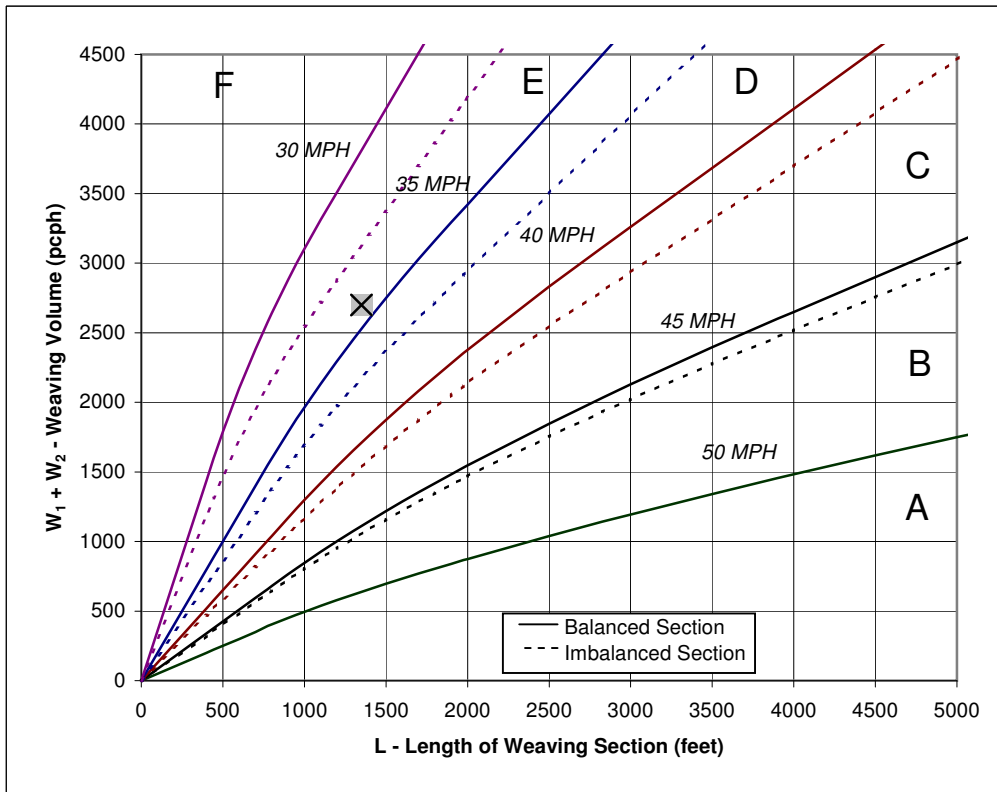
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	1,350

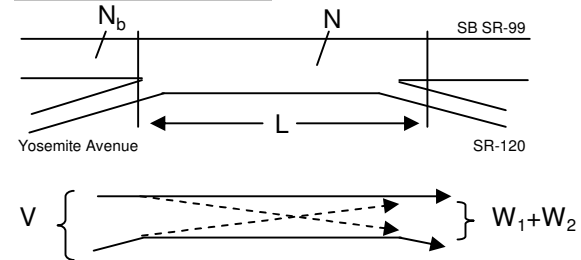
Project Information

Project	Union Crossing
Scenario	Cumulative NO PROJECT - AM
Freeway	SB SR-99
On-ramp	Yosemite Avenue
Off-ramp	SR-120

Total Weaving Section (V)	On-ramp to Mainline (W_1)	Mainline to Off-ramp (W_2)
Volume (vph)*	Volume (vph)*	Volume (vph)*
Truck Percentage	Truck Percentage	Truck Percentage
PCE for Trucks	PCE for Trucks	PCE for Trucks
Volume (pcph)	Volume (pcph)	Volume (pcph)



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? n
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

40 mph and 45 mph

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

- Interpolated Weaving Speed (S_w , mph) 28.0
- Weaving Intensity Factor (k) 3.00
- Service Volume (SV, pcph)
 $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$ 2,420
- Level of Service (LOS) F

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Major Street Airport Way
 Minor Street Atherton Drive

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative No Project
 Peak Hour AM

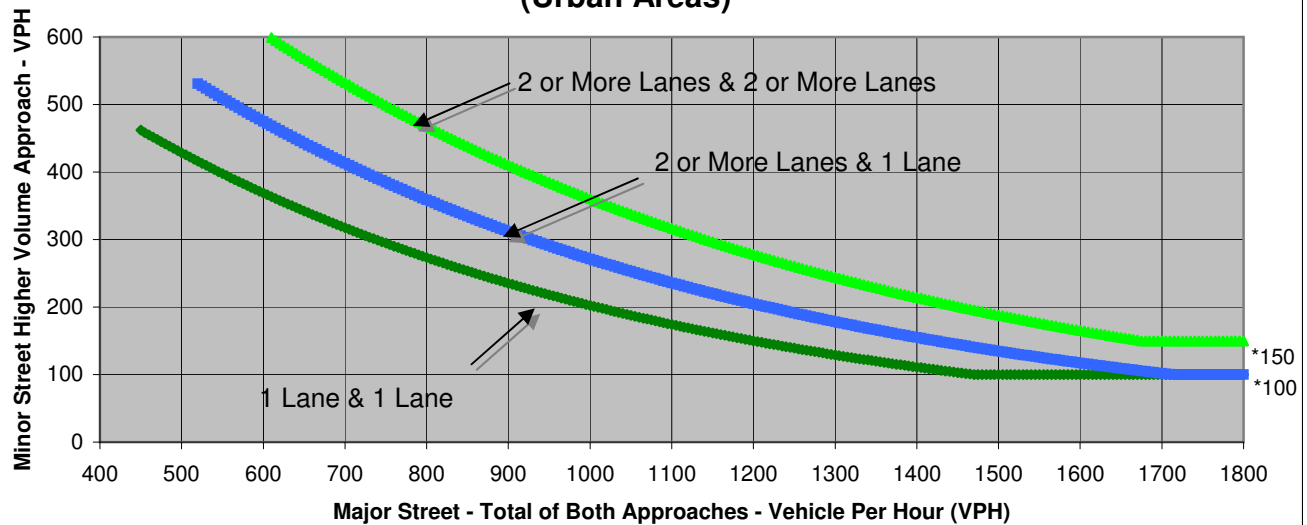
Turn Movement Volumes

	NB	SB	EB	WB
Left	40	370	470	125
Through	1,415	995	40	35
Right	180	675	15	670
Total	1,635	2,040	525	830

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Atherton Drive	<u>Warrant Met</u>
Number of Approach Lanes	3	3	<u>YES</u>
Traffic Volume (VPH) *	3,675	830	

* 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 Airport Way
 Minor Street Wawona Street

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative No Project
 Peak Hour AM

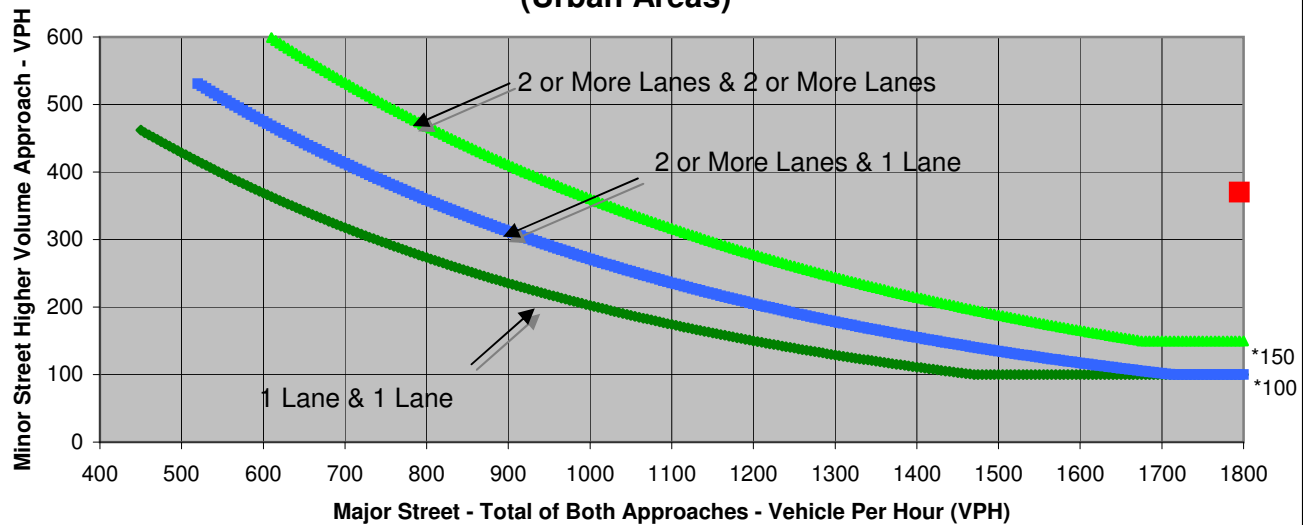
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	40	0	320
Through	715	945	0	0
Right	95	0	0	50
Total	810	985	0	370

Major Street Direction

<u>x</u>	North/South
	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Wawona Street	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,795	370	

* 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 Airport Way
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative No Project
 Peak Hour AM

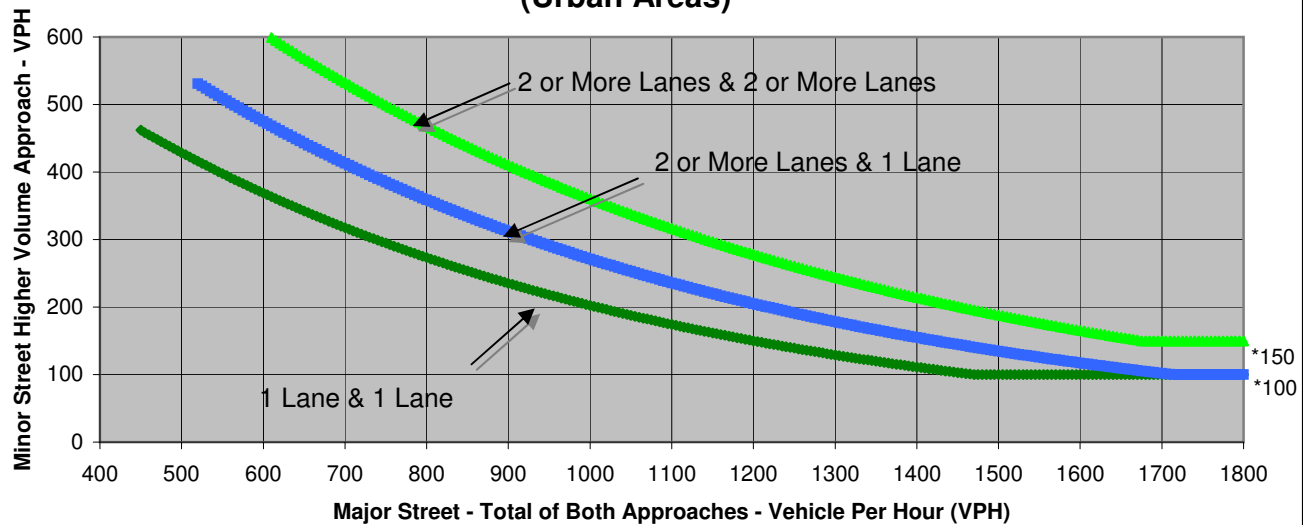
Turn Movement Volumes

	NB	SB	EB	WB
Left	20	130	200	80
Through	925	315	300	530
Right	25	690	40	510
Total	970	1,135	540	1,120

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Woodward Avenue	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	2,105	1,120	

* 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 Main Street
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative No Project
 Peak Hour AM

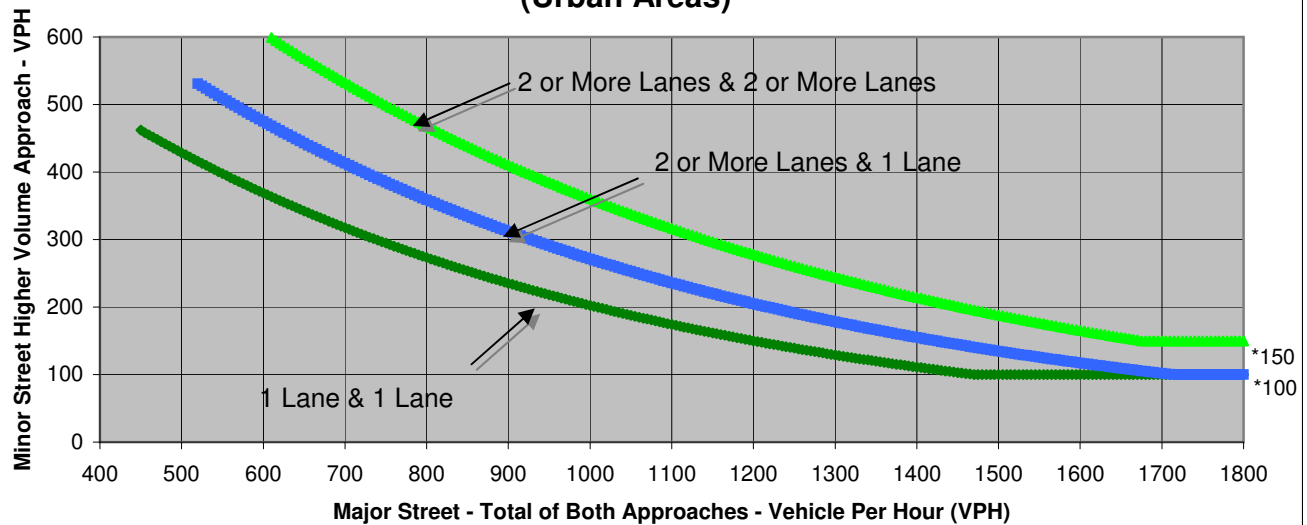
Turn Movement Volumes

	NB	SB	EB	WB
Left	110	245	380	40
Through	550	270	220	525
Right	80	145	55	600
Total	740	660	655	1,165

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Main Street	Woodward Avenue	
Number of Approach Lanes	2	2	<u>YES</u>
Traffic Volume (VPH) *	1,400	1,165	
* Note: Traffic Volume for Major Street is Total Volume of Both Approches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Major Street Union Road
 Minor Street Daniels Street

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative No Project
 Peak Hour AM

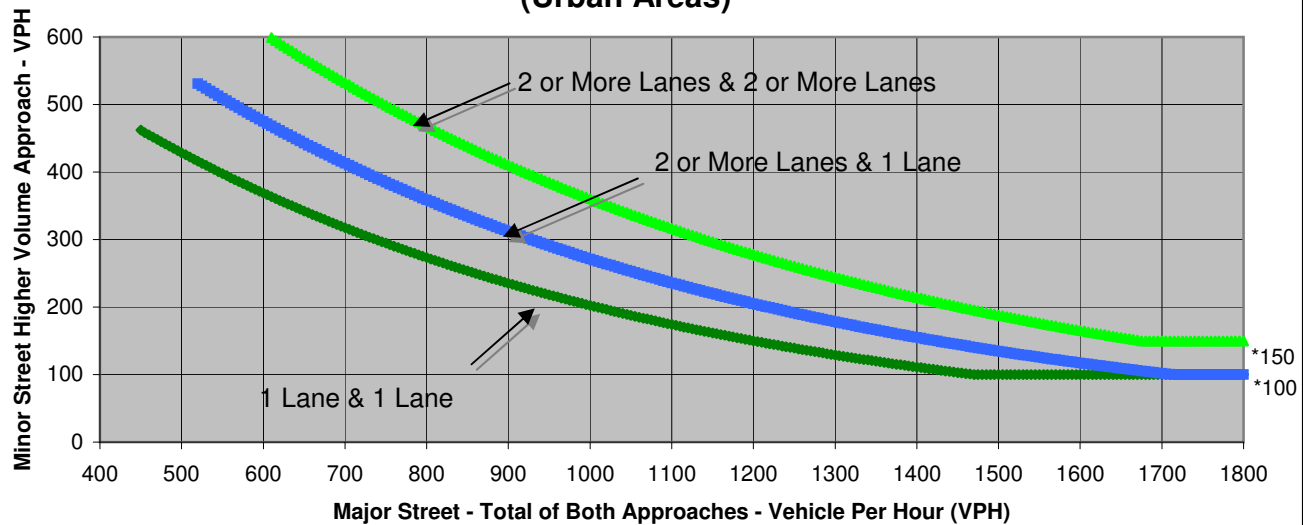
Turn Movement Volumes

	NB	SB	EB	WB
Left	90	0	40	0
Through	1,070	1,260	0	0
Right	0	30	140	0
Total	1,160	1,290	180	0

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Union Road	Minor Street Daniels Street	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	2,450	180	

* 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 Union Road
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative No Project
 Peak Hour AM

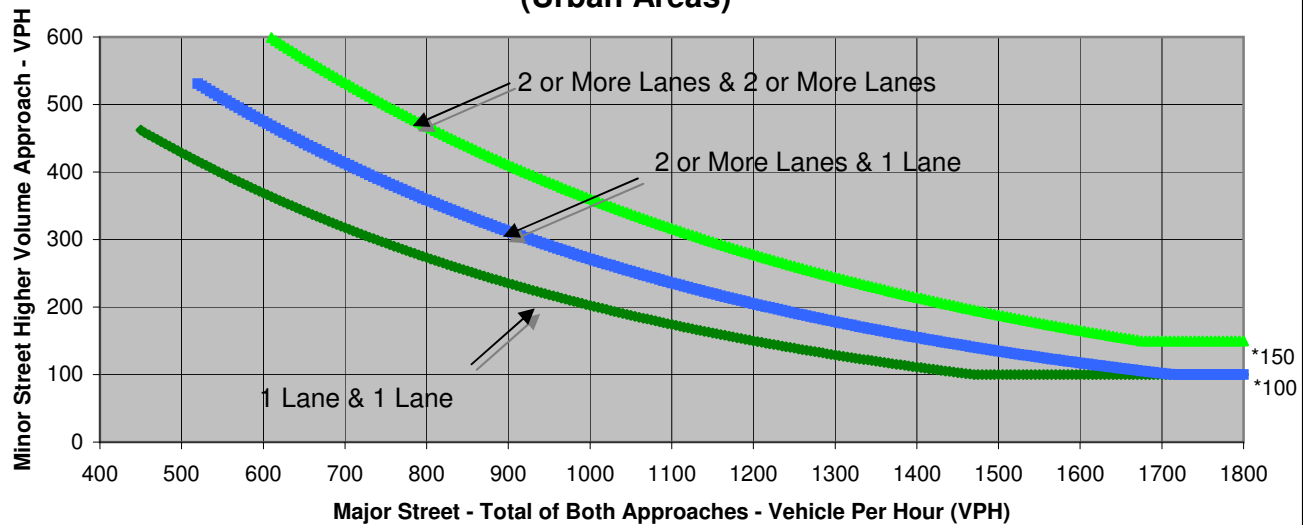
Turn Movement Volumes

	NB	SB	EB	WB
Left	250	85	165	50
Through	1,110	350	275	570
Right	40	140	70	170
Total	1,400	575	510	790

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Union Road	Woodward Avenue	
Number of Approach Lanes	2	2	<u>YES</u>
Traffic Volume (VPH) *	1,975	790	

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

HCM Signalized Intersection Capacity Analysis

1: Yosemite Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	0.93		1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3419		1770	3308		1770	1827	1583	1770	1719	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3419		1770	3308		1770	1827	1583	1770	1719	
Volume (vph)	240	430	125	200	220	170	110	535	120	355	660	540
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	253	453	132	211	232	179	116	563	126	374	695	568
RTOR Reduction (vph)	0	25	0	0	132	0	0	0	50	0	24	0
Lane Group Flow (vph)	253	560	0	211	279	0	116	563	76	374	1239	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	11.1	20.0		15.7	24.6		9.9	28.3	28.3	24.4	42.8	
Effective Green, g (s)	11.1	20.0		15.7	24.6		9.9	28.3	28.3	24.4	42.8	
Actuated g/C Ratio	0.11	0.19		0.15	0.24		0.09	0.27	0.27	0.23	0.41	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	188	655		266	779		168	495	429	414	705	
v/s Ratio Prot	c0.14	c0.16		c0.12	0.08		0.07	0.31		c0.21	c0.72	
v/s Ratio Perm									0.05			
v/c Ratio	1.35	0.85		0.79	0.36		0.69	1.14	0.18	0.90	1.76	
Uniform Delay, d1	46.7	40.8		42.8	33.3		45.8	38.1	29.1	38.9	30.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	186.6	10.6		14.9	0.3		11.6	84.0	0.9	22.5	346.6	
Delay (s)	233.3	51.4		57.7	33.6		57.3	122.0	30.1	61.4	377.4	
Level of Service	F	D		E	C		E	F	C	E	F	
Approach Delay (s)		106.3			41.8			98.3			305.2	
Approach LOS		F			D			F			F	
Intersection Summary												
HCM Average Control Delay			177.8			HCM Level of Service				F		
HCM Volume to Capacity ratio			1.36									
Actuated Cycle Length (s)			104.4			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			114.1%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Wawona St. & Airport Way

1/5/2009

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Volume (veh/h)	320	50	715	95	40	945			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95			
Hourly flow rate (vph)	337	53	753	100	42	995			
Pedestrians	2					2			
Lane Width (ft)	12.0					12.0			
Walking Speed (ft/s)	4.0					4.0			
Percent Blockage	0					0			
Right turn flare (veh)									
Median type	None								
Median storage veh									
Upstream signal (ft)	1313								
pX, platoon unblocked	0.74	0.74			0.74				
vC, conflicting volume	1884	807			855				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	2196	738			803				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	0	83			93				
cM capacity (veh/h)	34	308			605				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	389	853	1037						
Volume Left	337	0	42						
Volume Right	53	100	0						
cSH	39	1700	605						
Volume to Capacity	10.09	0.50	0.07						
Queue Length 95th (ft)	Err	0	6						
Control Delay (s)	Err	0.0	2.3						
Lane LOS	F		A						
Approach Delay (s)	Err	0.0	2.3						
Approach LOS	F								
Intersection Summary									
Average Delay	1709.9								
Intersection Capacity Utilization	109.7%		ICU Level of Service		H				
Analysis Period (min)	15								

HCM Signalized Intersection Capacity Analysis

3: Daniels Street & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1562	3433	1863	1561	3433	3471	1545	1770	3471	1561
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1562	3433	1863	1561	3433	3471	1545	1770	3471	1561
Volume (vph)	30	10	180	210	30	50	415	730	240	90	1045	130
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	11	189	221	32	53	437	768	253	95	1100	137
RTOR Reduction (vph)	0	0	168	0	0	45	0	0	105	0	0	61
Lane Group Flow (vph)	32	11	21	221	32	8	437	768	148	95	1100	77
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	6.6	13.1	13.1	12.0	18.5	18.5	24.9	65.6	65.6	13.3	54.0	54.0
Effective Green, g (s)	6.6	13.1	13.1	12.0	18.5	18.5	24.9	65.6	65.6	13.3	54.0	54.0
Actuated g/C Ratio	0.05	0.11	0.11	0.10	0.15	0.15	0.21	0.55	0.55	0.11	0.45	0.45
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	189	203	171	343	287	241	712	1897	845	196	1562	702
v/s Ratio Prot	0.01	0.01		c0.06	c0.02		c0.13	0.22		0.05	c0.32	
v/s Ratio Perm			0.01			0.01			0.10			0.05
v/c Ratio	0.17	0.05	0.12	0.64	0.11	0.03	0.61	0.40	0.18	0.48	0.70	0.11
Uniform Delay, d1	54.1	47.9	48.3	51.9	43.7	43.2	43.2	15.8	13.6	50.1	26.6	19.1
Progression Factor	1.00	1.00	1.00	1.03	1.04	1.20	1.04	0.98	0.81	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.1	0.3	4.1	0.2	0.1	0.6	0.3	0.2	1.9	2.7	0.3
Delay (s)	54.5	48.0	48.6	57.4	45.5	52.0	45.3	15.8	11.3	52.0	29.3	19.4
Level of Service	D	D	D	E	D	D	D	B	B	D	C	B
Approach Delay (s)		49.4			55.2			23.9			29.9	
Approach LOS		D			E			C			C	
Intersection Summary												
HCM Average Control Delay			30.9				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			64.2%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: SR 120 WB & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00
Frt					1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1770	1495	1770	1759			1759	1495
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1770	1495	1770	1759			1759	1495
Volume (vph)	0	0	0	1110	0	505	1160	880	0	0	765	670
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	1168	0	532	1221	926	0	0	805	705
RTOR Reduction (vph)	0	0	0	0	0	73	0	0	0	0	0	289
Lane Group Flow (vph)	0	0	0	0	1168	459	1221	926	0	0	805	416
Heavy Vehicles (%)	0%	2%	2%	2%	2%	8%	2%	8%	2%	2%	8%	8%
Turn Type				Perm		Perm	Prot					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8						6
Actuated Green, G (s)					46.0	46.0	14.0	66.0			48.0	48.0
Effective Green, g (s)					46.0	46.0	14.0	66.0			48.0	48.0
Actuated g/C Ratio					0.38	0.38	0.12	0.55			0.40	0.40
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					679	573	207	967			704	598
v/s Ratio Prot							c0.69	0.53			c0.46	
v/s Ratio Perm					0.66	0.31						0.28
v/c Ratio					1.72	0.80	5.90	0.96			1.14	0.70
Uniform Delay, d1					37.0	32.9	53.0	25.7			36.0	29.9
Progression Factor					1.00	1.00	1.27	0.31			0.70	1.19
Incremental Delay, d2					330.3	7.9	2205.3	3.2			77.0	4.8
Delay (s)					367.3	40.9	2272.6	11.3			102.4	40.3
Level of Service					F	D	F	B			F	D
Approach Delay (s)		0.0			265.1			1297.3			73.4	
Approach LOS		A			F			F			E	
Intersection Summary												
HCM Average Control Delay			624.8				HCM Level of Service				F	
HCM Volume to Capacity ratio			2.01									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			177.2%				ICU Level of Service			H		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

5: SR 120 EB & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00	1.00	1.00	1.00	
Frt		1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1671	1583					1863	1583	1671	1863	
Flt Permitted		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1671	1583					1863	1583	1671	1863	
Volume (vph)	290	0	450	0	0	0	0	1750	805	285	1590	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	305	0	474	0	0	0	0	1842	847	300	1674	0
RTOR Reduction (vph)	0	0	12	0	0	0	0	0	179	0	0	0
Lane Group Flow (vph)	0	305	462	0	0	0	0	1842	668	300	1674	0
Heavy Vehicles (%)	8%	2%	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%
Turn Type	Perm		Perm						Perm		Prot	
Protected Phases		4						2		1	6	
Permitted Phases	4		4						2			
Actuated Green, G (s)		38.4	38.4					46.0	46.0	23.6	73.6	
Effective Green, g (s)		38.4	38.4					46.0	46.0	23.6	73.6	
Actuated g/C Ratio		0.32	0.32					0.38	0.38	0.20	0.61	
Clearance Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		535	507					714	607	329	1143	
v/s Ratio Prot								c0.99		0.18	c0.90	
v/s Ratio Perm		0.18	c0.29						0.42			
v/c Ratio		0.57	0.91					2.58	1.10	0.91	1.46	
Uniform Delay, d1		33.9	39.2					37.0	37.0	47.2	23.2	
Progression Factor		1.00	1.00					1.00	1.00	0.25	0.44	
Incremental Delay, d2		1.5	20.5					715.0	66.8	4.0	209.5	
Delay (s)		35.4	59.7					752.0	103.8	15.6	219.7	
Level of Service		D	E					F	F	B	F	
Approach Delay (s)		50.2			0.0			547.9			188.7	
Approach LOS		D			A			F			F	
Intersection Summary												
HCM Average Control Delay			346.3					HCM Level of Service			F	
HCM Volume to Capacity ratio			1.76									
Actuated Cycle Length (s)			120.0					Sum of lost time (s)		12.0		
Intersection Capacity Utilization			177.2%					ICU Level of Service		H		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

6: Atherton Dr & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	470	40	15	125	35	670	40	1415	180	370	995	675
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	495	42	16	132	37	705	42	1489	189	389	1047	711
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			14				14					
Median type	None						None					
Median storage veh												
Upstream signal (ft)											720	
pX, platoon unblocked	0.43	0.43	0.43	0.43	0.43		0.43					
vC, conflicting volume	3771	3589	1047	3429	4111	1489	1758				1679	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	7423	7002	1110	6630	8210	1489	2757				1679	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	0	0	86	0	0	0	32				0	
cM capacity (veh/h)	0	0	110	0	0	152	62				381	
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3			
Volume Total	553	132	742	42	1489	189	389	1047	711			
Volume Left	495	132	0	42	0	0	389	0	0			
Volume Right	16	0	705	0	0	189	0	0	711			
cSH	0	0	0	62	1700	1700	381	1700	1700			
Volume to Capacity	Err	Err	Err	0.68	0.88	0.11	1.02	0.62	0.42			
Queue Length 95th (ft)	Err	Err	Err	73	0	0	315	0	0			
Control Delay (s)	Err	Err	Err	142.1	0.0	0.0	85.3	0.0	0.0			
Lane LOS	F	F	F	F			F					
Approach Delay (s)	Err	Err		3.5			15.5					
Approach LOS	F	F										
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization			154.1%		ICU Level of Service				H			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

7: Woodward Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	200	300	40	80	530	510	20	925	25	130	315	690
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	211	316	42	84	558	537	21	974	26	137	332	726
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	568	1179	1021	1195								
Volume Left (vph)	211	84	21	137								
Volume Right (vph)	42	537	26	726								
Hadj (s)	0.06	-0.22	0.02	-0.31								
Departure Headway (s)	9.6	9.3	9.6	9.3								
Degree Utilization, x	1.52	3.06	2.72	3.07								
Capacity (veh/h)	386	398	386	401								
Control Delay (s)	272.1	952.5	801.1	958.4								
Approach Delay (s)	272.1	952.5	801.1	958.4								
Approach LOS	F	F	F	F								
Intersection Summary												
Delay			817.7									
HCM Level of Service			F									
Intersection Capacity Utilization			215.8%	ICU Level of Service		H						
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

8: Yosemite Avenue & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.97		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	3384		1770	3270		1770	3365	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	1770	3384		1770	3270		1770	3365	
Volume (vph)	150	400	185	295	170	70	190	540	160	70	470	230
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	158	421	195	311	179	74	200	568	168	74	495	242
RTOR Reduction (vph)	0	0	143	0	57	0	0	32	0	0	72	0
Lane Group Flow (vph)	158	421	52	311	196	0	200	704	0	74	665	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	9.4	20.5	20.5	6.0	17.1		11.7	27.8		6.0	22.1	
Effective Green, g (s)	9.4	20.5	20.5	6.0	17.1		11.7	27.8		6.0	22.1	
Actuated g/C Ratio	0.12	0.27	0.27	0.08	0.22		0.15	0.36		0.08	0.29	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	218	501	425	139	758		271	1191		139	975	
v/s Ratio Prot	0.09	c0.23		c0.18	0.06		c0.11	0.22		0.04	c0.20	
v/s Ratio Perm			0.03									
v/c Ratio	0.72	0.84	0.12	2.24	0.26		0.74	0.59		0.53	0.68	
Uniform Delay, d1	32.2	26.4	21.1	35.1	24.4		30.8	19.6		33.8	24.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	11.3	12.0	0.1	579.3	0.2		10.0	2.2		3.9	3.9	
Delay (s)	43.5	38.4	21.2	614.5	24.6		40.9	21.8		37.7	27.9	
Level of Service	D	D	C	F	C		D	C		D	C	
Approach Delay (s)		35.1			349.9			25.9			28.7	
Approach LOS		D			F			C			C	
Intersection Summary												
HCM Average Control Delay			88.2			HCM Level of Service				F		
HCM Volume to Capacity ratio			0.90									
Actuated Cycle Length (s)			76.3			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			81.6%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: Wawona St. & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.90		1.00	0.93		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1669		1770	1732		1770	3304		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1669		1770	1732		1770	3304		1770	1863	1583
Volume (vph)	80	90	205	205	90	80	155	800	110	120	900	20
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	84	95	216	216	95	84	163	842	116	126	947	21
RTOR Reduction (vph)	0	132	0	0	50	0	0	14	0	0	0	13
Lane Group Flow (vph)	84	179	0	216	129	0	163	944	0	126	947	8
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot			Prot			Prot			Prot		Over
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												
Actuated Green, G (s)	4.7	12.4		6.0	13.7		6.0	22.8		6.3	23.1	4.7
Effective Green, g (s)	4.7	12.4		6.0	13.7		6.0	22.8		6.3	23.1	4.7
Actuated g/C Ratio	0.07	0.20		0.09	0.22		0.09	0.36		0.10	0.36	0.07
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	131	326		167	374		167	1186		176	678	117
v/s Ratio Prot	0.05	c0.11		c0.12	0.07		c0.09	0.29		0.07	c0.51	0.01
v/s Ratio Perm												
v/c Ratio	0.64	0.55		1.29	0.34		0.98	0.80		0.72	1.40	0.07
Uniform Delay, d1	28.6	23.0		28.8	21.1		28.7	18.3		27.7	20.2	27.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	10.3	1.9		169.1	0.6		62.0	5.6		13.0	187.4	0.2
Delay (s)	38.8	24.9		197.9	21.7		90.6	23.8		40.7	207.6	27.6
Level of Service	D	C		F	C		F	C		D	F	C
Approach Delay (s)		27.9			118.0			33.6			185.0	
Approach LOS		C			F			C			F	
Intersection Summary												
HCM Average Control Delay			99.0			HCM Level of Service				F		
HCM Volume to Capacity ratio			1.02									
Actuated Cycle Length (s)			63.5			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			98.0%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

10: Daniels Street & Union Road

1/5/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	40	140	90	1070	1260	30
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	42	147	95	1126	1326	32
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)				306		
pX, platoon unblocked	0.76					
vC, conflicting volume	2658	1342	1358			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3168	1342	1358			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	21	81			
cM capacity (veh/h)	7	186	506			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	189	1221	1358			
Volume Left	42	95	0			
Volume Right	147	0	32			
cSH	29	506	1700			
Volume to Capacity	6.60	0.19	0.80			
Queue Length 95th (ft)	Err	17	0			
Control Delay (s)	Err	8.1	0.0			
Lane LOS	F	A				
Approach Delay (s)	Err	8.1	0.0			
Approach LOS	F					
Intersection Summary						
Average Delay		687.9				
Intersection Capacity Utilization		148.2%		ICU Level of Service		H
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

11: SR 120 WB Ramps & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↰	↱	↰	↱			↱	↰
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00
Frt					1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1671	1583	1770	1759			1863	1583
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1671	1583	1770	1759			1863	1583
Volume (vph)	0	0	0	205	0	350	795	810	0	0	740	660
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	216	0	368	837	853	0	0	779	695
RTOR Reduction (vph)	0	0	0	0	0	205	0	0	0	0	0	267
Lane Group Flow (vph)	0	0	0	0	216	163	837	853	0	0	779	428
Heavy Vehicles (%)	2%	2%	2%	8%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type				Perm		Perm	Prot					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8						6
Actuated Green, G (s)					19.3	19.3	29.8	92.7			58.9	58.9
Effective Green, g (s)					19.3	19.3	29.8	92.7			58.9	58.9
Actuated g/C Ratio					0.16	0.16	0.25	0.77			0.49	0.49
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					269	255	440	1359			914	777
v/s Ratio Prot							c0.47	0.48			c0.42	
v/s Ratio Perm					0.13	0.10						0.27
v/c Ratio					0.80	0.64	1.90	0.63			0.85	0.55
Uniform Delay, d1					48.5	47.1	45.1	6.0			26.7	21.3
Progression Factor					1.00	1.00	0.87	0.22			1.00	1.00
Incremental Delay, d2					15.7	5.4	406.8	0.2			9.9	2.8
Delay (s)					64.3	52.5	446.1	1.5			36.6	24.1
Level of Service					E	D	F	A			D	C
Approach Delay (s)		0.0			56.9			221.7			30.7	
Approach LOS		A			E			F			C	
Intersection Summary												
HCM Average Control Delay			120.9				HCM Level of Service			F		
HCM Volume to Capacity ratio			1.13									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)		12.0			
Intersection Capacity Utilization			110.0%				ICU Level of Service		H			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

12: SR 120 EB Ramps & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00	1.00	1.00	1.00	
Frt		1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1770	1495					1759	1495	1770	1863	
Flt Permitted		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1770	1495					1759	1495	1770	1863	
Volume (vph)	220	0	355	0	0	0	0	1385	230	270	675	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	232	0	374	0	0	0	0	1458	242	284	711	0
RTOR Reduction (vph)	0	0	156	0	0	0	0	0	55	0	0	0
Lane Group Flow (vph)	0	232	218	0	0	0	0	1458	187	284	711	0
Heavy Vehicles (%)	2%	2%	8%	2%	2%	2%	2%	8%	8%	2%	2%	8%
Turn Type	Perm		Perm						Perm		Prot	
Protected Phases		4						2		1	6	
Permitted Phases	4		4						2			
Actuated Green, G (s)		21.7	21.7					49.0	49.0	37.3	90.3	
Effective Green, g (s)		21.7	21.7					49.0	49.0	37.3	90.3	
Actuated g/C Ratio		0.18	0.18					0.41	0.41	0.31	0.75	
Clearance Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		320	270					718	610	550	1402	
v/s Ratio Prot								c0.83		0.16	c0.38	
v/s Ratio Perm		0.13	c0.15						0.13			
v/c Ratio		0.72	0.81					2.03	0.31	0.52	0.51	
Uniform Delay, d1		46.3	47.2					35.5	24.0	33.9	5.9	
Progression Factor		1.00	1.00					1.00	1.00	0.76	0.05	
Incremental Delay, d2		7.9	16.1					468.7	1.3	0.4	0.7	
Delay (s)		54.3	63.3					504.2	25.3	26.4	1.0	
Level of Service		D	E					F	C	C	A	
Approach Delay (s)		59.8			0.0			436.0			8.2	
Approach LOS		E			A			F			A	
Intersection Summary												
HCM Average Control Delay		238.0						HCM Level of Service		F		
HCM Volume to Capacity ratio		1.27										
Actuated Cycle Length (s)		120.0						Sum of lost time (s)		12.0		
Intersection Capacity Utilization		110.0%						ICU Level of Service		H		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

13: Atherton Dr. & Union Road

1/5/2009

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.88	0.95	0.88	0.97	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	2787	3539	2787	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	2787	3539	2787	3433	3539
Volume (vph)	80	295	1320	125	535	495
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	84	311	1389	132	563	521
RTOR Reduction (vph)	0	280	0	55	0	0
Lane Group Flow (vph)	84	31	1389	77	563	521
Turn Type	Perm		Perm		Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	8.8	8.8	49.0	49.0	17.2	70.2
Effective Green, g (s)	8.8	8.8	49.0	49.0	17.2	70.2
Actuated g/C Ratio	0.10	0.10	0.56	0.56	0.20	0.81
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	347	282	1993	1570	679	2856
v/s Ratio Prot	c0.02		c0.39		c0.16	0.15
v/s Ratio Perm		0.01		0.03		
v/c Ratio	0.24	0.11	0.70	0.05	0.83	0.18
Uniform Delay, d1	36.0	35.5	13.7	8.5	33.5	1.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.2	2.0	0.1	8.3	0.1
Delay (s)	36.4	35.7	15.7	8.6	41.8	2.0
Level of Service	D	D	B	A	D	A
Approach Delay (s)	35.9		15.1			22.7
Approach LOS	D		B			C
Intersection Summary						
HCM Average Control Delay			20.6		HCM Level of Service	C
HCM Volume to Capacity ratio			0.67			
Actuated Cycle Length (s)			87.0		Sum of lost time (s)	12.0
Intersection Capacity Utilization			65.1%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

HCM Signalized Intersection Capacity Analysis

15: SR 120 WB Ramp & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00
Frpb, ped/bikes					1.00	0.98	1.00	1.00			1.00	0.98
Flpb, ped/bikes					1.00	1.00	1.00	1.00			1.00	1.00
Frt					1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1736	1492	1736	1792			1792	1488
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1736	1492	1736	1792			1792	1488
Volume (vph)	0	0	0	260	0	310	520	935	0	0	410	965
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	274	0	326	547	984	0	0	432	1016
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	452
Lane Group Flow (vph)	0	0	0	0	274	326	547	984	0	0	432	564
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	2%	2%	2%	4%	2%	6%	4%	6%	2%	2%	6%	6%
Turn Type				Split		Free	Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases						Free						6
Actuated Green, G (s)					22.7	120.0	46.3	89.3			39.0	39.0
Effective Green, g (s)					22.7	120.0	46.3	89.3			39.0	39.0
Actuated g/C Ratio					0.19	1.00	0.39	0.74			0.32	0.32
Clearance Time (s)					4.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)					3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					328	1492	670	1334			582	484
v/s Ratio Prot					c0.16		c0.32	0.55			0.24	
v/s Ratio Perm						0.22						c0.38
v/c Ratio					0.84	0.22	0.82	0.74			0.74	1.16
Uniform Delay, d1					46.9	0.0	33.0	8.7			36.0	40.5
Progression Factor					1.00	1.00	0.06	0.20			1.00	1.00
Incremental Delay, d2					16.6	0.3	0.7	0.3			8.3	94.7
Delay (s)					63.4	0.3	2.6	2.1			44.3	135.2
Level of Service					E	A	A	A			D	F
Approach Delay (s)		0.0			29.1			2.3			108.1	
Approach LOS		A			C			A			F	
Intersection Summary												
HCM Average Control Delay			49.6									
HCM Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			120.0						12.0			
Intersection Capacity Utilization			125.5%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

16: SR 120 EB Ramps & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.98					0.99		1.00	1.00	
Flpb, ped/bikes		1.00	1.00					1.00		1.00	1.00	
Frt		1.00	0.85					0.96		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1703	1517					1731		1703	1827	
Flt Permitted		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (perm)		1703	1517					1731		1703	1827	
Volume (vph)	515	0	460	0	0	0	0	940	460	170	500	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	542	0	484	0	0	0	0	989	484	179	526	0
RTOR Reduction (vph)	0	0	189	0	0	0	0	13	0	0	0	0
Lane Group Flow (vph)	0	542	295	0	0	0	0	1460	0	179	526	0
Confl. Peds. (#/hr)			2				2			2		2
Heavy Vehicles (%)	6%	2%	4%	2%	2%	2%	2%	4%	4%	6%	4%	2%
Turn Type	Split		Perm							Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases			4									
Actuated Green, G (s)		39.4	39.4					48.8		19.8	72.6	
Effective Green, g (s)		39.4	39.4					48.8		19.8	72.6	
Actuated g/C Ratio		0.33	0.33					0.41		0.17	0.60	
Clearance Time (s)		4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)		559	498					704		281	1105	
v/s Ratio Prot		c0.32						c0.84		c0.11	0.29	
v/s Ratio Perm			0.19									
v/c Ratio		0.97	0.59					2.07		0.64	0.48	
Uniform Delay, d1		39.7	33.6					35.6		46.7	13.1	
Progression Factor		1.00	1.00					1.00		1.35	0.23	
Incremental Delay, d2		30.1	1.9					488.1		3.1	0.9	
Delay (s)		69.8	35.5					523.7		66.0	3.9	
Level of Service		E	D					F		E	A	
Approach Delay (s)		53.6			0.0			523.7			19.7	
Approach LOS		D			A			F			B	
Intersection Summary												
HCM Average Control Delay		262.3						HCM Level of Service		F		
HCM Volume to Capacity ratio		1.41										
Actuated Cycle Length (s)		120.0						Sum of lost time (s)		12.0		
Intersection Capacity Utilization		125.5%						ICU Level of Service		H		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

17: Atherton Drive & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	120	0	70	0	0	0	250	1280	0	0	590	370
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	126	0	74	0	0	0	263	1347	0	0	621	389
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)											640	
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93		0.93					
vC, conflicting volume	2495	2495	621	2568	2884	1347	1011			1347		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2616	2616	590	2695	3037	1347	1011			1347		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	84	100	100	100	59			100		
cM capacity (veh/h)	10	13	469	7	7	185	634			511		
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2					
Volume Total	126	74	0	263	1347	621	389					
Volume Left	126	0	0	263	0	0	0					
Volume Right	0	74	0	0	0	0	389					
cSH	10	469	1700	634	1700	1700	1700					
Volume to Capacity	12.57	0.16	0.00	0.41	0.79	0.37	0.23					
Queue Length 95th (ft)	Err	14	0	51	0	0	0					
Control Delay (s)	Err	14.1	0.0	14.6	0.0	0.0	0.0					
Lane LOS	F	B	A	B								
Approach Delay (s)	6320.4		0.0	2.4	0.0							
Approach LOS	F		A									
Intersection Summary												
Average Delay	449.5											
Intersection Capacity Utilization	80.7%			ICU Level of Service				D				
Analysis Period (min)	15											

Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

Level Of Service Computation Report

2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #14

Cycle (sec): 100 Critical Vol./Cap.(X): 3.455

Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 480.9

Optimal Cycle: 0 Level Of Service: F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0	1	0	1	0	1	0	1	0	1	0

Volume Module:	North Bound			South Bound			East Bound			West Bound		
Base Vol:	250	1110	40	85	350	140	165	275	70	50	570	170
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	250	1110	40	85	350	140	165	275	70	50	570	170
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	250	1110	40	85	350	140	165	275	70	50	570	170
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	250	1110	40	85	350	140	165	275	70	50	570	170
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	250	1110	40	85	350	140	165	275	70	50	570	170
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	250	1110	40	85	350	140	165	275	70	50	570	170

Saturation Flow Module:	North Bound			South Bound			East Bound			West Bound		
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	306	321	336	296	315	330	298	312	329	296	315	331

Capacity Analysis Module:	North Bound			South Bound			East Bound			West Bound		
Vol/Sat:	0.82	3.45	0.12	0.29	1.11	0.42	0.55	0.88	0.21	0.17	1.81	0.51
Crit Moves:	****			****			****			****		
Delay/Veh:	50.1	1134	14.6	19.2	118	20.9	28.4	59.7	16.4	17.0	403	24.0
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	50.1	1134	14.6	19.2	118	20.9	28.4	59.7	16.4	17.0	403	24.0
LOS by Move:	F	F	B	C	F	C	D	F	C	C	F	C
ApproachDel:	908.6			80.0			43.6			297.1		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	908.6			80.0			43.6			297.1		
LOS by Appr:	F			F			E			F		
AllWayAvgQ:	3.0	100	0.1	0.4	9.1	0.7	1.1	3.9	0.3	0.2	34.0	1.0

Note: Queue reported is the number of cars per lane.

Level Of Service Detailed Computation Report
2000 HCM 4-Way Stop Method
Future Volume Alternative

Intersection #14

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R

Time Period: 0.25 hour

HevVeh: 0% 0% 0% 0%

Alpha Value: 0.01

GroupType:	6			6			6			6		
P[C1]:	0.0000			0.0000			0.0000			0.0000		
P[C2]:	0.0000			0.0000			0.0000			0.0000		
P[C3]:	0.0000			0.0000			0.0000			0.0000		
P[C4]:	0.0432			0.0432			0.0000			0.0432		
P[C5]:	0.9568			0.9568			1.0000			0.9568		
Padj[C1]:	0.03957			0.03957			0.04000			0.03957		
Padj[C2]:	0.02957			0.02957			0.03000			0.02957		
Padj[C3]:	0.01957			0.01957			0.02000			0.01957		
Padj[C4]:	0.00698			0.00698			0.01000			0.00698		
Padj[C5]:	-0.09568			-0.09568			-0.10000			-0.09568		

Lanes:	L1		L2		L1		L2		L1		L2		L1		L2	
LaneType:	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE
HeadwayAdj:	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700
Volume:	250	40	85	140	165	70	50	170								
Capacity:	306	336	296	330	298	329	296	331								
DegOfUtil:	0.81	0.12	0.28	0.42	0.55	0.21	0.17	0.51								
DepHeadway:	11.71	10.51	11.92	10.72	12.00	10.80	11.94	10.74								
ServiceTime:	9.4	8.2	9.6	8.4	9.7	8.5	9.6	8.4								
Delay:	50.1	14.6	19.2	20.9	28.4	16.4	17.0	24.0								
Queue:	3.0	0.1	0.4	0.7	1.1	0.3	0.2	1.0								

Lane:	L3		L3		L3		L3	
LaneType:	THRU	THRU	THRU	THRU	THRU	THRU	THRU	THRU
HeadwayAdj:	0.000		0.000		0.000		0.000	
Volume:	1110		350		275		570	
Capacity:	321		315		312		315	
DegOfUtil:	3.45		1.11		0.88		1.81	
DepHeadway:	11.21		11.42		11.50		11.44	
ServiceTime:	8.9		9.1		9.2		9.1	
Delay:	1134.2		118.5		59.7		403.2	
Queue:	100.0		9.1		3.9		34.0	

Approach:	North Bound			South Bound			East Bound			West Bound		
ApproachDel:	908.6			80.0			43.6			297.1		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	908.6			80.0			43.6			297.1		
LOS by Appr:	F			F			E			F		

OverallDel:	480.9
OverallLOS:	F

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #14

Future Volume Alternative: Peak Hour Warrant Met

Approach:	North Bound	South Bound	East Bound	West Bound
Movement:	L - T - R	L - T - R	L - T - R	L - T - R
Control:	Stop Sign	Stop Sign	Stop Sign	Stop Sign
Lanes:	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1
Initial Vol:	250 1110 40	85 350 140	165 275 70	50 570 170
Major Street Volume:	1975			
Minor Approach Volume:	790			
Minor Approach Volume Threshold:	81 [less than minimum of 150]			

SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

Level Of Service Computation Report

2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #18

Cycle (sec): 100 Critical Vol./Cap.(X): 1.879

Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 252.7

Optimal Cycle: 0 Level Of Service: F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0	1	0	1	0	1	0	1	0	1	0

Volume Module:	North Bound			South Bound			East Bound			West Bound		
Base Vol:	110	550	80	245	270	145	380	220	55	40	525	600
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	110	550	80	245	270	145	380	220	55	40	525	600
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	110	550	80	245	270	145	380	220	55	40	525	600
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	110	550	80	245	270	145	380	220	55	40	525	600
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	110	550	80	245	270	145	380	220	55	40	525	600
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	110	550	80	245	270	145	380	220	55	40	525	600

Saturation Flow Module:	North Bound			South Bound			East Bound			West Bound		
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	279	293	307	290	303	321	286	297	313	287	303	322

Capacity Analysis Module:	North Bound			South Bound			East Bound			West Bound		
Vol/Sat:	0.39	1.88	0.26	0.84	0.89	0.45	1.33	0.74	0.18	0.14	1.73	1.86
Crit Moves:	****			****			****			****		
Delay/Veh:	23.5	435	18.3	56.5	63.0	22.7	202.5	42.3	16.4	17.0	369	424.1
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	23.5	435	18.3	56.5	63.0	22.7	202.5	42.3	16.4	17.0	369	424.1
LOS by Move:	C	F	C	F	F	C	F	E	C	C	F	F
ApproachDel:	328.8			51.7			133.0			385.4		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	328.8			51.7			133.0			385.4		
LOS by Appr:	F			F			F			F		
AllWayAvgQ:	0.6	34.2	0.3	3.3	4.1	0.8	14.9	2.3	0.2	0.2	29.9	36.7

Note: Queue reported is the number of cars per lane.

Level Of Service Detailed Computation Report
2000 HCM 4-Way Stop Method
Future Volume Alternative

Intersection #18

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R

Time Period: 0.25 hour

HevVeh: 0% 0% 0% 0%

Alpha Value: 0.01

GroupType:	6			6			6			6		
P[C1]:	0.0000			0.0000			0.0000			0.0000		
P[C2]:	0.0000			0.0000			0.0000			0.0000		
P[C3]:	0.0000			0.0000			0.0000			0.0000		
P[C4]:	0.0097			0.0000			0.0097			0.0097		
P[C5]:	0.9903			1.0000			0.9903			0.9903		
Padj[C1]:	0.03990			0.04000			0.03990			0.03990		
Padj[C2]:	0.02990			0.03000			0.02990			0.02990		
Padj[C3]:	0.01990			0.02000			0.01990			0.01990		
Padj[C4]:	0.00932			0.01000			0.00932			0.00932		
Padj[C5]:	-0.09903			-0.10000			-0.09903			-0.09903		

Lanes:	L1		L2		L1		L2		L1		L2		L1		L2	
LaneType:	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE
HeadwayAdj:	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700
Volume:	110	80	245	145	380	55	40	600								
Capacity:	279	307	290	321	286	313	287	322								
DegOfUtil:	0.39	0.26	0.84	0.45	1.33	0.17	0.14	1.86								
DepHeadway:	12.80	11.60	12.36	11.16	12.57	11.37	12.37	11.17								
ServiceTime:	10.5	9.3	10.1	8.9	10.3	9.1	10.1	8.9								
Delay:	23.5	18.3	56.5	22.7	202.5	16.4	17.0	424.1								
Queue:	0.6	0.3	3.3	0.8	14.9	0.2	0.2	36.7								

Lane:	L3		L3		L3		L3	
LaneType:	THRU	THRU	THRU	THRU	THRU	THRU	THRU	
HeadwayAdj:	0.000		0.000		0.000		0.000	
Volume:	550		270		220		525	
Capacity:	293		303		297		303	
DegOfUtil:	1.88		0.89		0.74		1.73	
DepHeadway:	12.30		11.86		12.07		11.87	
ServiceTime:	10.0		9.6		9.8		9.6	
Delay:	435.1		63.0		42.3		369.3	
Queue:	34.2		4.1		2.3		29.9	

Approach:	North Bound		South Bound		East Bound		West Bound	
ApproachDel:	328.8		51.7		133.0		385.4	
Delay Adj:	1.00		1.00		1.00		1.00	
ApprAdjDel:	328.8		51.7		133.0		385.4	
LOS by Appr:	F		F		F		F	

OverallDel:	252.7
OverallLOS:	F

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #18

Future Volume Alternative: Peak Hour Warrant Met

Approach:	North Bound	South Bound	East Bound	West Bound
Movement:	L - T - R	L - T - R	L - T - R	L - T - R
Control:	Stop Sign	Stop Sign	Stop Sign	Stop Sign
Lanes:	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1
Initial Vol:	110 550 80	245 270 145	380 220 55	40 525 600
Major Street Volume:	1820			
Minor Approach Volume:	740			
Minor Approach Volume Threshold:	117 [less than minimum of 150]			

SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

Cumulative, No Project, PM

HCS+: Basic Freeway Segments Release 5.21

Phone: _____ Fax: _____
 E-mail: _____

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR 120 Eastbound
 From/To: I-5 to Yosemite
 Jurisdiction: City of Manteca
 Analysis Year: Cumulative Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	7004	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1903	v
Trucks and buses	7	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.966	
Driver population factor, fp	1.00	
Flow rate, vp	2626	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2626	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Yosemite to Airport
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Commercial EIR

Flow Inputs and Adjustments

Volume, V	8106	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	2203	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	3084	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	3084	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: _____ Fax: _____
 E-mail: _____

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR 120 Eastbound
 From/To: Airport to Union
 Jurisdiction: City of Manteca
 Analysis Year: Cumulative Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	7576	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	2059	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2882	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2882	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Union to Main
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	6456	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1754	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2456	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2456	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Main to SR 99
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	5141	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1397	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1956	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1956	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.1	mi/h
Number of lanes, N	3	
Density, D	31.5	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

 Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR 120 Westbound
 From/To: SR 99 to Main
 Jurisdiction: City of Manteca
 Analysis Year: Cumulative Conditions
 Description: Union Crossing EIR

 Flow Inputs and Adjustments

Volume, V	4343	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1180	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1652	pc/h/ln

 Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

 LOS and Performance Measures

Flow rate, vp	1652	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.7	mi/h
Number of lanes, N	3	
Density, D	25.5	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Main to Union
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4393	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1194	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1671	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1671	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	25.8	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: _____ Fax: _____
 E-mail: _____

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR 120 Westbound
 From/To: Union to Airport
 Jurisdiction: City of Manteca
 Analysis Year: Cumulative Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4518	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1228	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1719	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1719	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	26.7	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Airport to Yosemite
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4398	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1195	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1673	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1673	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	25.9	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Yosemite to I-5
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4848	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	1289	v
Trucks and buses	7	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.966	
Driver population factor, fp	1.00	
Flow rate, vp	1779	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1779	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.1	mi/h
Number of lanes, N	3	
Density, D	27.8	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR-99 Northbound
From/To: Jack Tone to Austin
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	6163	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	1622	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2314	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2314	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	53.5	mi/h
Number of lanes, N	3	
Density, D	43.2	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: _____ Fax: _____
 E-mail: _____

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR-99 Northbound
 From/To: Yosemite to Louise
 Jurisdiction: City of Manteca
 Analysis Year: Cumulative Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4115	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	1083	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2317	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2317	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	53.4	mi/h
Number of lanes, N	2	
Density, D	43.4	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: _____ Fax: _____
 E-mail: _____

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR-99 Southbound
 From/To: Louise to Yosemite
 Jurisdiction: City of Manteca
 Analysis Year: Cumulative Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	6272	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	1651	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	3532	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	3532	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: _____ Fax: _____
 E-mail: _____

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR-99 Southbound
 From/To: SR-120 to Austin
 Jurisdiction: City of Manteca
 Analysis Year: Cumulative Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	8231	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	2166	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	3090	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	3090	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: Austin to Jack Tone
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	8729	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	2297	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	3277	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	3277	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/2008
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6046	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	1530	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	6046	1530	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	1643	416	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6900	1705	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.591 Using Equation 1

$$v_{12F} = v_{FM} (P_{12F}) = 4081 \text{ pc/h}$$

Capacity Checks

v_{FO}	Actual 8605	Maximum 7050	LOS F? Yes
$v_{3 \text{ or } av34}$	2819 pc/h (Equation 25-4 or 25-5)		
Is $v_{3 \text{ or } av34} > 2700 \text{ pc/h?}$	Yes		
Is $v_{3 \text{ or } av34} > 1.5 v_{12} / 2$	No		
If yes, $v_{12A} = 4200$	(Equation 25-8)		

Flow Entering Merge Influence Area

v_{12A}	Actual 4200	Max Desirable 4400	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_{12R} + 0.0078 v_{12A} - 0.00627 L = 47.6 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$M = 1.717$
Space mean speed in ramp influence area, S_R	$S = 25.5 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 56.1 \text{ mph}$
Space mean speed for all vehicles, S	$S = 30.8 \text{ mph}$

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	8106	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	2060	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
Volume, V (vph)	8106	2060	vph
Peak-hour factor, PHF	0.92	0.80	
Peak 15-min volume, v15	2203	644	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	9251	2639	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.407 Using Equation 5

$$v = v_R + (v_F - v_R) P = 5332 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	9251	7050	Yes
v = v - v FO F R	6612	7050	No
v R	2639	2000	Yes
v v 3 or av34	3919 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h?		Yes	
3 or av34			
Is v v > 1.5 v /2		No	
3 or av34	12		
If yes, v = 6551		(Equation 25-18)	
12A			

Flow Entering Diverge Influence Area

v	Actual 6551	Max Desirable 4600	Violation? No
12A			

Level of Service Determination (if not F)

$$\text{Density, } D = 4.252 + 0.0086 v_R - 0.009 L = 59.2 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$D = 0.666$
Space mean speed in ramp influence area, S_R	$S = 49.7 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 64.7 \text{ mph}$
Space mean speed for all vehicles, S	$S = 53.3 \text{ mph}$

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Phone: _____ Fax: _____
E-mail: _____

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Union Road
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	7576	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	1510	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
Volume, V (vph)	7576	1510	vph
Peak-hour factor, PHF	0.92	0.80	
Peak 15-min volume, v15	2059	472	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	8647	1935	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.455 Using Equation 5

$$v = v + (v - v) P = 4988 \text{ pc/h}$$

$$12 \text{ R} \quad \text{F} \quad \text{R} \quad \text{FD}$$

Capacity Checks

$v = v$	Actual	Maximum	LOS F?
$F_i \text{ F}$	8647	7050	Yes
$v = v - v$	6712	7050	No
$F O \text{ F} \text{ R}$			
v	1935	2000	No
R			
$v \text{ v}$	3659 pc/h	(Equation 25-15 or 25-16)	
$3 \text{ or } av34$			
Is $v \text{ v} > 2700 \text{ pc/h?}$	Yes		
$3 \text{ or } av34$			
Is $v \text{ v} > 1.5 v / 2$	No		
$3 \text{ or } av34$	12		
If yes, $v = 5947$	(Equation 25-18)		
12A			

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v	5947	4600	No
12A			!

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v - 0.009 L = 54.0 \text{ pc/mi/ln}$

$$R \quad 12 \quad D$$

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

Speed Estimation

Intermediate speed variable,	$D = 0.602$
S	
Space mean speed in ramp influence area,	$S = 51.2 \text{ mph}$
R	
Space mean speed in outer lanes,	$S = 64.7 \text{ mph}$
O	
Space mean speed for all vehicles,	$S = 54.7 \text{ mph}$

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/2008
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Union Road
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6066	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	390	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	6066	390	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	1648	106	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6923	435	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.591 Using Equation 1

$$v_{12F} = v_{FM} (P_{FM}) = 4095 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v FO	7358	7050	Yes
v v 3 or av34	2828 pc/h	(Equation 25-4 or 25-5)	
Is v v 3 or av34 > 2700 pc/h?		Yes	
Is v v 3 or av34 > 1.5 v /2		No	
If yes, v 12A = 4223		(Equation 25-8)	

Flow Entering Merge Influence Area

v_{12A}	Actual 4223	Max Desirable 4400	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_{12R} + 0.0078 v_{12A} - 0.00627 L = 38.5 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S_0	$M = 0.697$
Space mean speed in ramp influence area, S_R	$S = 49.0 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 56.1 \text{ mph}$
Space mean speed for all vehicles, S_0	$S = 51.4 \text{ mph}$

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Phone: _____ Fax: _____
E-mail: _____

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3198	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	1200	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	3198	1200	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	869	326	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3650	1337	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.591 Using Equation 1

$$v_F = v_F(P) = 2159 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_F	4987	7050	No
FO			
v_F	1491 pc/h	(Equation 25-4 or 25-5)	
3 or av_{34}			
Is $v_F > 2700$ pc/h?	No		
3 or av_{34}			
Is $v_F > 1.5 v_F / 2$	No		
3 or av_{34}	12		
If yes, $v_F =$	(Equation 25-8)		
12A			

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_F	2159	4400	No
12			!

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_F + 0.0078 v_F - 0.00627 L = 29.0 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M = 0.415$
Space mean speed in ramp influence area,	$S_R = 55.5 \text{ mph}$
Space mean speed in outer lanes,	$S_0 = 61.4 \text{ mph}$
Space mean speed for all vehicles,	$S = 57.1 \text{ mph}$

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4518	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	1320	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
Volume, V (vph)	4518	1320	vph
Peak-hour factor, PHF	0.92	0.95	
Peak 15-min volume, v15	1228	347	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5156	1424	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.566 Using Equation 5

$$v = v_R + (v_F - v_R) P = 3535 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	5156	7050	No
v = v - v FO F R	3732	7050	No
v R	1424	2000	No
v v 3 or av34	1621 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h? 3 or av34		No	
Is v v > 1.5 v /2 3 or av34	12	No	
If yes, v = 12A		(Equation 25-18)	

Flow Entering Diverge Influence Area

v_{12}	Actual 3535	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D = 33.3 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable, S_D	$D = 0.556$
Space mean speed in ramp influence area, S_R	$S = 52.2 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 68.9 \text{ mph}$
Space mean speed for all vehicles, S	$S = 56.5 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Union Road
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3798	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	720	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	3798	720	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	1032	196	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4335	802	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.591 Using Equation 1

$$v_{12} = v_{FM} (P_{FM}) = 2564 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v FO	5137	7050	No
v v 3 or av34	1771 pc/h	(Equation 25-4 or 25-5)	
Is v v 3 or av34 > 2700 pc/h?		No	
Is v v 3 or av34 > 1.5 v / 2	12	No	
If yes, v = 12A		(Equation 25-8)	

Flow Entering Merge Influence Area

v_{12}	Actual 2564	Max Desirable 4400	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_{12} + 0.0078 v_A - 0.00627 L = 28.2 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$M = 0.399$
Space mean speed in ramp influence area, S_R	$S = 55.8 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 60.4 \text{ mph}$
Space mean speed for all vehicles, S	$S = 57.3 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: _____ Fax: _____
E-mail: _____

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Union Road
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4393	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	595	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
Volume, V (vph)	4393	595	vph
Peak-hour factor, PHF	0.92	0.95	
Peak 15-min volume, v15	1194	157	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5014	642	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.605 Using Equation 5

$$v = v_R + (v_F - v_R) P = 3288 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	5014	7050	No
v = v - v FO F R	4372	7050	No
v R	642	2000	No
v v 3 or av34	1726 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h? 3 or av34		No	
Is v v > 1.5 v /2 3 or av34	12	No	
If yes, v = 12A		(Equation 25-18)	

Flow Entering Diverge Influence Area

v_{12}	Actual 3288	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D = 31.2 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable, S_D	$D = 0.486$
Space mean speed in ramp influence area, S_R	$S = 53.8 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 68.5 \text{ mph}$
Space mean speed for all vehicles, S	$S = 58.1 \text{ mph}$

Leisch Method for Weaving Analysis

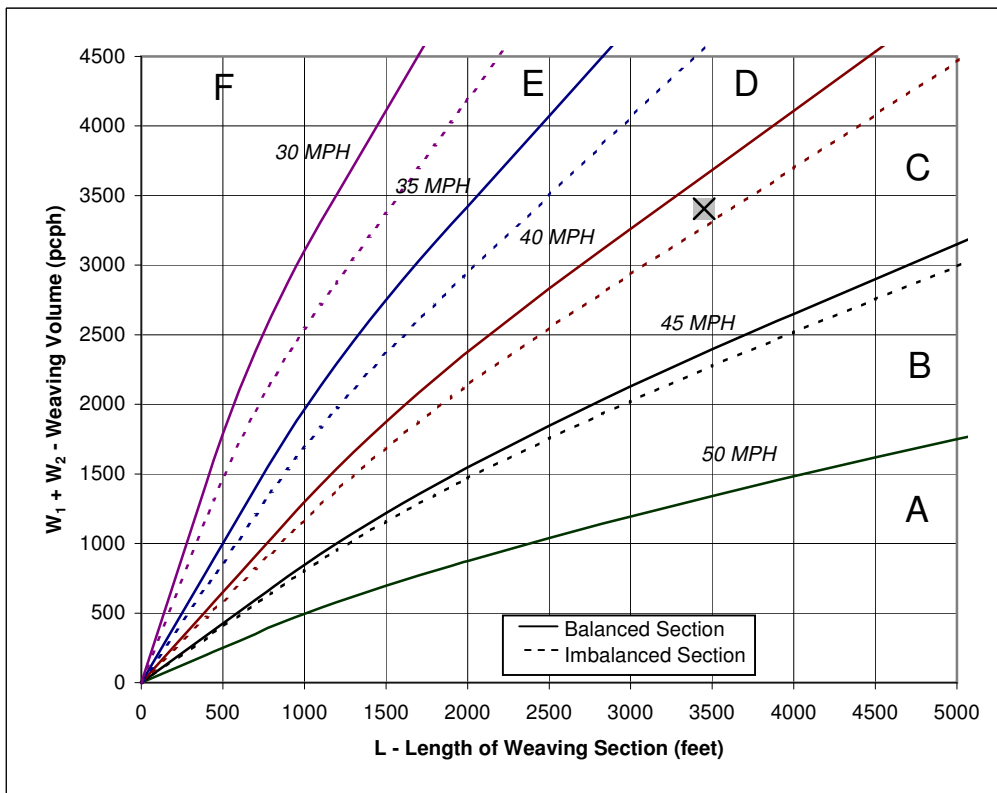
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,450

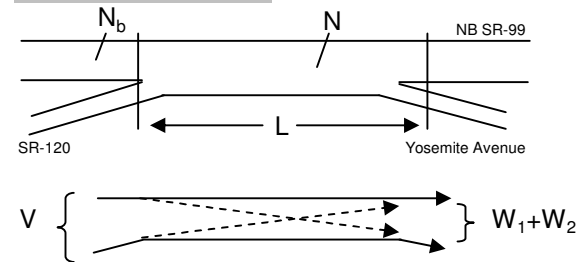
Project Information

Project	Union Crossing
Scenario	Cumulative NO PROJECT - PM
Freeway	NB SR-99
On-ramp	SR-120
Off-ramp	Yosemite Avenue

Total Weaving Section (V)	On-ramp to Mainline (W_1)	Mainline to Off-ramp (W_2)
Volume (vph)*	Volume (vph)*	Volume (vph)*
Truck Percentage	Truck Percentage	Truck Percentage
PCE for Trucks	PCE for Trucks	PCE for Trucks
Volume (pcph)	Volume (pcph)	Volume (pcph)



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? Y
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

45 mph and 50 mph

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

3. Interpolated Weaving Speed (S_w , mph)	40.0
4. Weaving Intensity Factor (k)	2.54
5. Service Volume (SV, pcph) $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	2,424
6. Level of Service (LOS)	F

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Leisch Method for Weaving Analysis

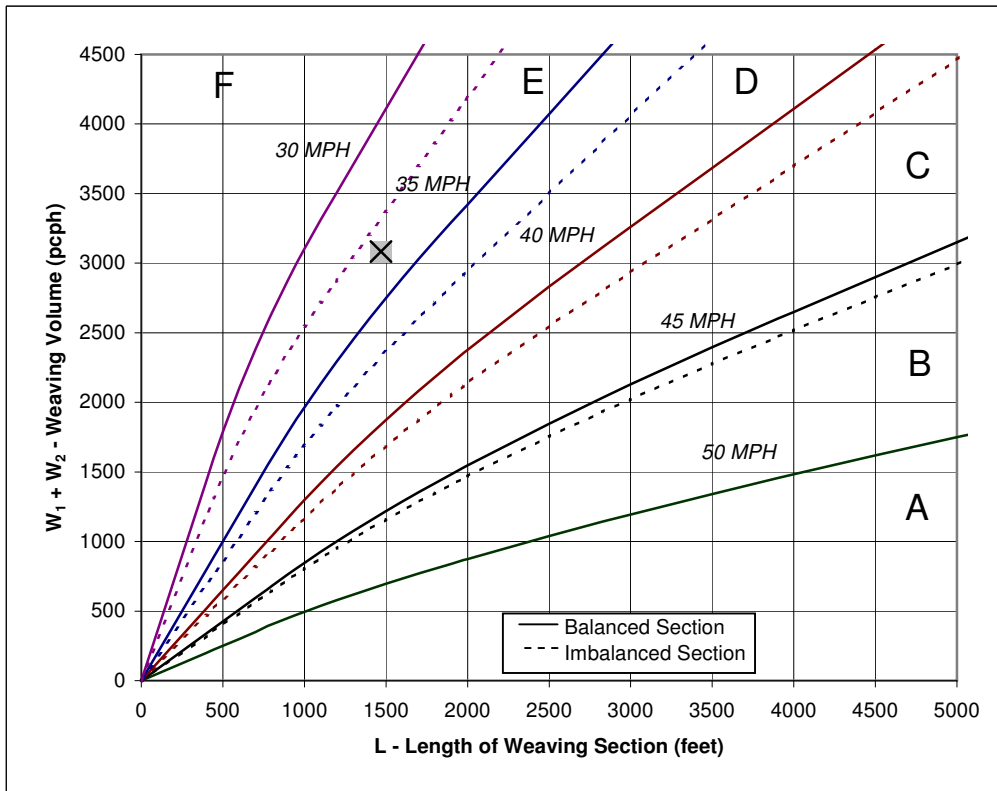
Data Input

Number of Entering Mainline Lanes	N_b	3
Number of Lanes in Weaving Section	N	4
Length of Weaving Section (feet)	L	1,470

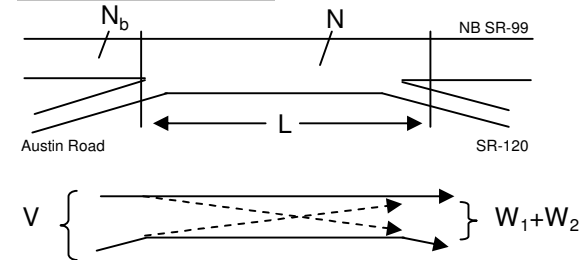
Project Information

Project	Union Crossing
Scenario	Cumulative NO PROJECT - PM
Freeway	NB SR-99
On-ramp	Austin Road
Off-ramp	SR-120

Total Weaving Section (V)	On-ramp to Mainline (W_1)	Mainline to Off-ramp (W_2)
Volume (vph)*	Volume (vph)*	Volume (vph)*
Truck Percentage	Truck Percentage	Truck Percentage
PCE for Trucks	PCE for Trucks	PCE for Trucks
Volume (pcph)	Volume (pcph)	Volume (pcph)



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? Y
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

35 MPH and 40 MPH

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

3. Interpolated Weaving Speed (S_w , mph)	32.8
4. Weaving Intensity Factor (k)	3.00
5. Service Volume (SV, pcph) $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	1,836
6. Level of Service (LOS)	E

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Leisch Method for Weaving Analysis

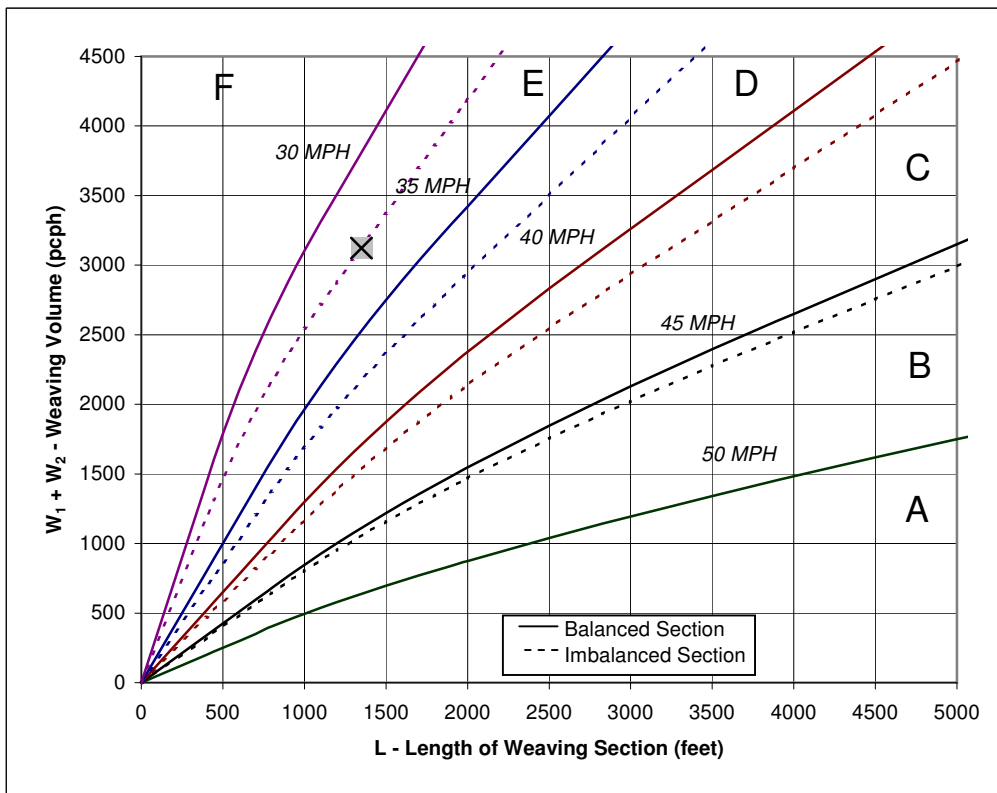
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	1,350

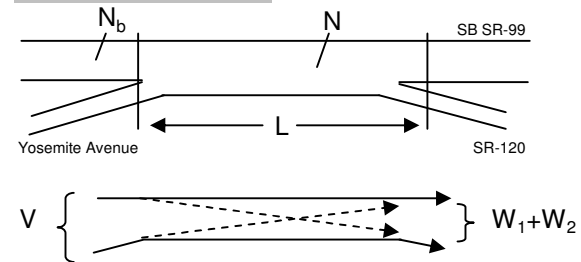
Project Information

Project	Union Crossing
Scenario	Cumulative NO PROJECT - PM
Freeway	SB SR-99
On-ramp	Yosemite Avenue
Off-ramp	SR-120

Total Weaving Section (V)	On-ramp to Mainline (W_1)	Mainline to Off-ramp (W_2)
Volume (vph)*	Volume (vph)*	Volume (vph)*
Truck Percentage	Truck Percentage	Truck Percentage
PCE for Trucks	PCE for Trucks	PCE for Trucks
Volume (pcph)	Volume (pcph)	Volume (pcph)



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? n
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

40 mph and 45 mph

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

3. Interpolated Weaving Speed (S_w , mph)	23.6
4. Weaving Intensity Factor (k)	3.00
5. Service Volume (SV, pcph) $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	3,239
6. Level of Service (LOS)	F

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Major Street Airport Way
 Minor Street Atherton Drive

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative No Project
 Peak Hour PM

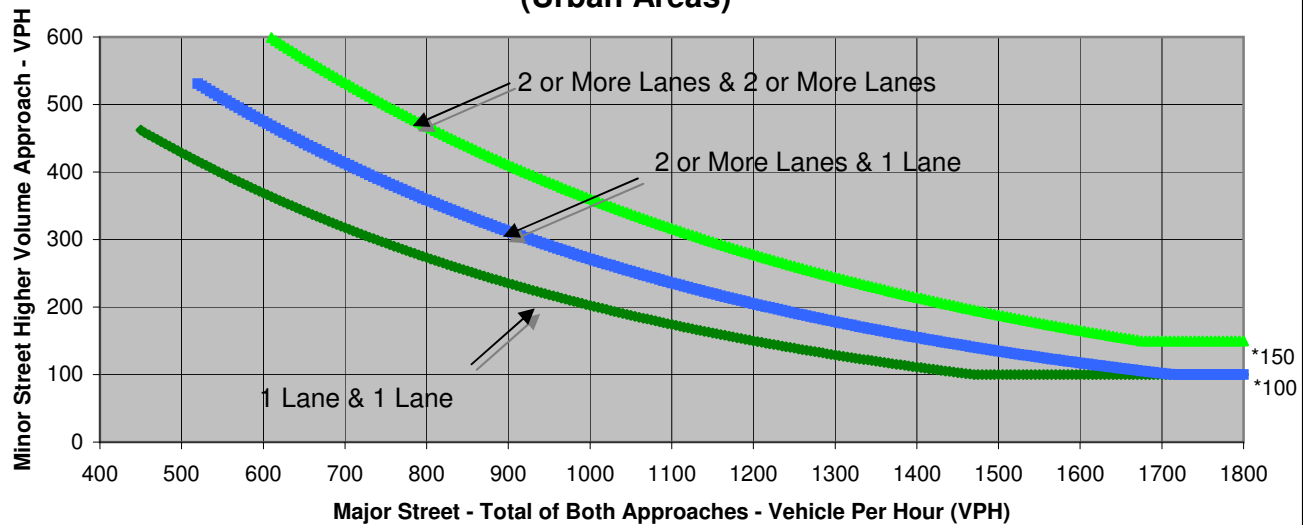
Turn Movement Volumes

	NB	SB	EB	WB
Left	40	370	470	125
Through	1,415	995	40	35
Right	180	675	15	670
Total	1,635	2,040	525	830

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Atherton Drive	<u>Warrant Met</u>
Number of Approach Lanes	3	3	<u>YES</u>
Traffic Volume (VPH) *	3,675	830	

* 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 Airport Way
 Minor Street Wawona Street

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative No Project
 Peak Hour PM

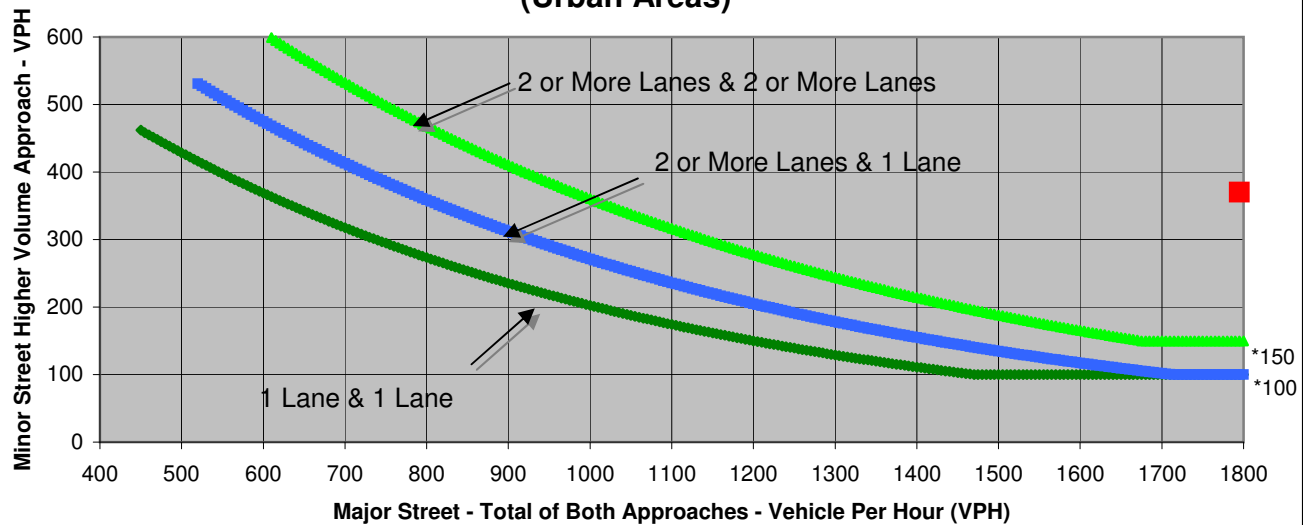
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	40	0	320
Through	715	945	0	0
Right	95	0	0	50
Total	810	985	0	370

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Wawona Street	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,795	370	

* 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 Airport Way
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative No Project
 Peak Hour PM

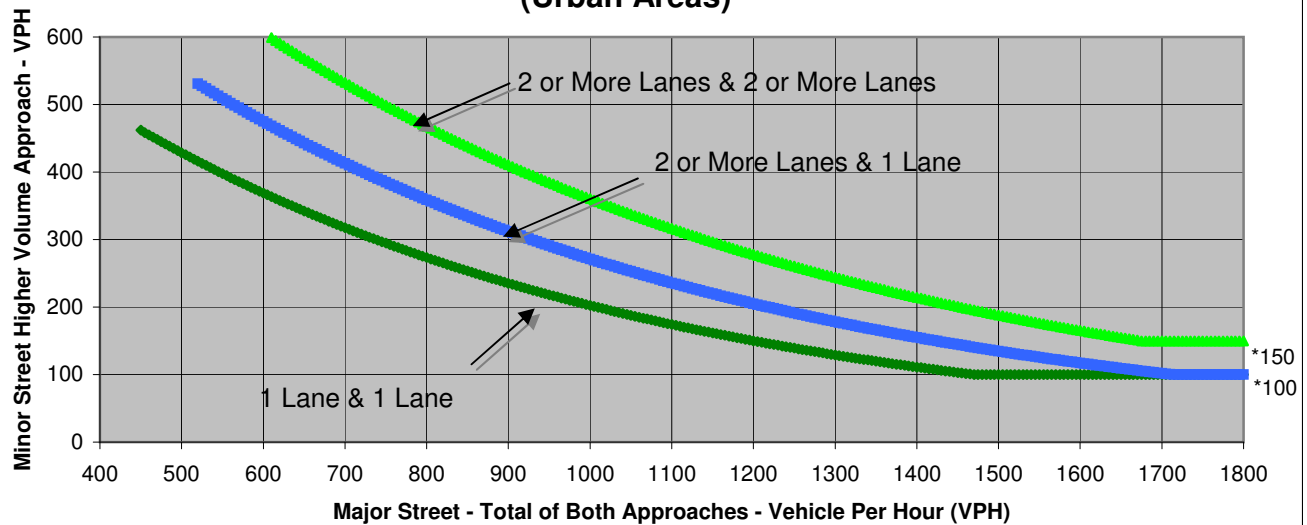
Turn Movement Volumes

	NB	SB	EB	WB
Left	20	130	200	80
Through	925	315	300	530
Right	25	690	40	510
Total	970	1,135	540	1,120

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Woodward Avenue	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	2,105	1,120	

* 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 Main Street
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative No Project
 Peak Hour PM

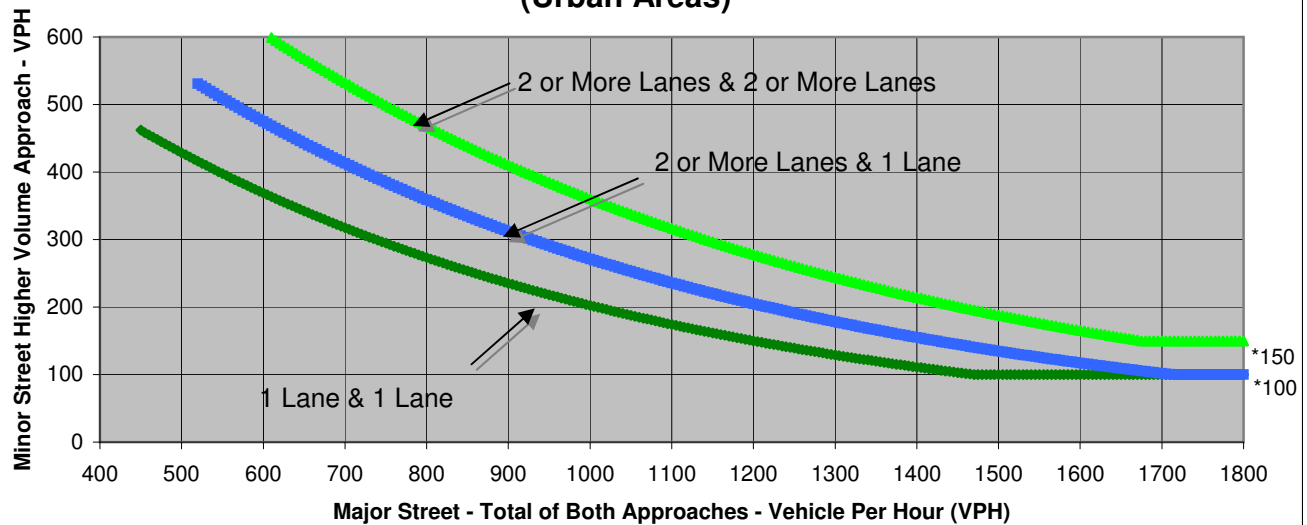
Turn Movement Volumes

	NB	SB	EB	WB
Left	110	245	380	40
Through	550	270	220	525
Right	80	145	55	600
Total	740	660	655	1,165

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Main Street	Woodward Avenue	
Number of Approach Lanes	2	2	<u>YES</u>
Traffic Volume (VPH) *	1,400	1,165	

* 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 Union Road
 Minor Street Daniels Street

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative No Project
 Peak Hour PM

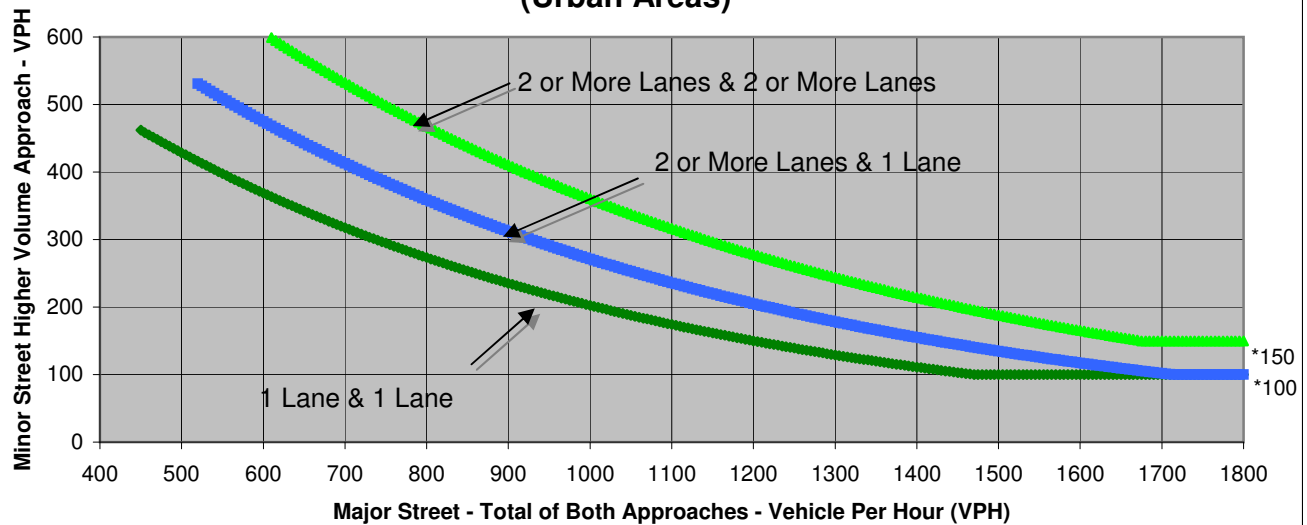
Turn Movement Volumes

	NB	SB	EB	WB
Left	90	0	40	0
Through	1,070	1,260	0	0
Right	0	30	140	0
Total	1,160	1,290	180	0

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Union Road	Minor Street Daniels Street	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	2,450	180	

* 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 Union Road
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative No Project
 Peak Hour PM

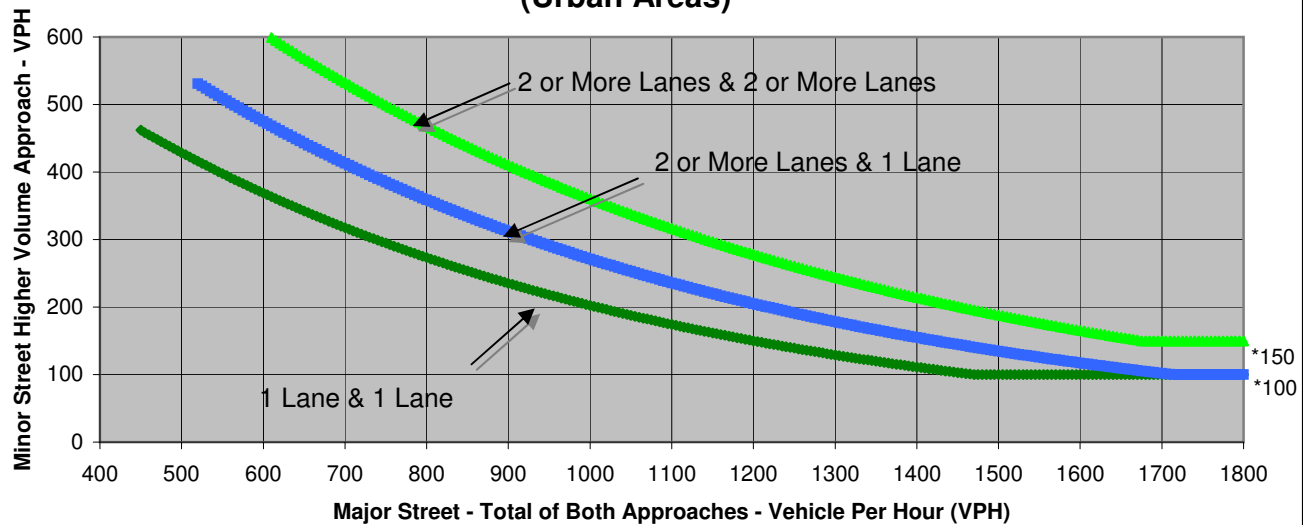
Turn Movement Volumes

	NB	SB	EB	WB
Left	250	85	165	50
Through	1,110	350	275	570
Right	40	140	70	170
Total	1,400	575	510	790

Major Street Direction

x	North/South
	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Union Road	Woodward Avenue	
Number of Approach Lanes	2	2	<u>YES</u>
Traffic Volume (VPH) *	1,975	790	

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

HCM Signalized Intersection Capacity Analysis

1: Yosemite Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.95		1.00	0.93		1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3357		1770	3284		1770	1827	1583	1770	1745	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3357		1770	3284		1770	1827	1583	1770	1745	
Volume (vph)	560	345	180	275	345	320	215	1175	280	270	625	320
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	589	363	189	289	363	337	226	1237	295	284	658	337
RTOR Reduction (vph)	0	62	0	0	157	0	0	0	50	0	17	0
Lane Group Flow (vph)	589	490	0	289	543	0	226	1237	245	284	978	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot			Prot			Prot		Perm		Prot	
Protected Phases	7	4		3	8		5	2			1	6
Permitted Phases									2			
Actuated Green, G (s)	11.0	19.4		18.0	26.4		15.0	32.5	32.5	21.6	39.1	
Effective Green, g (s)	11.0	19.4		18.0	26.4		15.0	32.5	32.5	21.6	39.1	
Actuated g/C Ratio	0.10	0.18		0.17	0.25		0.14	0.30	0.30	0.20	0.36	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	181	606		296	806		247	552	479	356	635	
v/s Ratio Prot	c0.33	c0.15		c0.16	0.17		c0.13	c0.68		0.16	c0.56	
v/s Ratio Perm									0.15			
v/c Ratio	3.25	0.81		0.98	0.67		0.91	2.24	0.51	0.80	1.54	
Uniform Delay, d1	48.2	42.3		44.5	36.7		45.6	37.5	30.9	40.9	34.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1028.5	7.8		45.4	2.2		35.0	564.3	3.9	11.8	251.2	
Delay (s)	1076.8	50.1		89.9	38.9		80.7	601.8	34.8	52.6	285.4	
Level of Service	F	D		F	D		F	F	C	D	F	
Approach Delay (s)		580.1			53.8			439.6			233.7	
Approach LOS		F			D			F			F	
Intersection Summary												
HCM Average Control Delay		345.8					HCM Level of Service		F			
HCM Volume to Capacity ratio		1.71										
Actuated Cycle Length (s)		107.5					Sum of lost time (s)		20.0			
Intersection Capacity Utilization		141.0%					ICU Level of Service		H			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Wawona St. & Airport Way

1/5/2009

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Volume (veh/h)	110	40	1630	350	80	1000			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95			
Hourly flow rate (vph)	116	42	1716	368	84	1053			
Pedestrians	2					2			
Lane Width (ft)	12.0					12.0			
Walking Speed (ft/s)	4.0					4.0			
Percent Blockage	0					0			
Right turn flare (veh)									
Median type	None								
Median storage veh									
Upstream signal (ft)	1313								
pX, platoon unblocked	0.57	0.57			0.57				
vC, conflicting volume	3123	1904			2086				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	4724	2586			2905				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	0	0			0				
cM capacity (veh/h)	0	19			71				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	158	2084	1137						
Volume Left	116	0	84						
Volume Right	42	368	0						
cSH	0	1700	71						
Volume to Capacity	Err	1.23	1.18						
Queue Length 95th (ft)	Err	0	162						
Control Delay (s)	Err	0.0	662.0						
Lane LOS	F		F						
Approach Delay (s)	Err	0.0	662.0						
Approach LOS	F								
Intersection Summary									
Average Delay	Err								
Intersection Capacity Utilization	134.2%		ICU Level of Service		H				
Analysis Period (min)	15								

HCM Signalized Intersection Capacity Analysis

3: Daniels Street & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1562	3433	1863	1561	3433	3471	1545	1770	3471	1561
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1562	3433	1863	1561	3433	3471	1545	1770	3471	1561
Volume (vph)	440	45	670	480	25	150	335	1390	370	80	900	130
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	463	47	705	505	26	158	353	1463	389	84	947	137
RTOR Reduction (vph)	0	0	118	0	0	75	0	0	121	0	0	91
Lane Group Flow (vph)	463	47	587	505	26	83	353	1463	268	84	947	46
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	13.0	40.0	40.0	14.0	41.0	41.0	13.0	44.0	44.0	6.0	37.0	37.0
Effective Green, g (s)	13.0	40.0	40.0	14.0	41.0	41.0	13.0	44.0	44.0	6.0	37.0	37.0
Actuated g/C Ratio	0.11	0.33	0.33	0.12	0.34	0.34	0.11	0.37	0.37	0.05	0.31	0.31
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	372	621	521	401	637	533	372	1273	567	89	1070	481
v/s Ratio Prot	0.13	0.03		c0.15	0.01		c0.10	c0.42		0.05	0.27	
v/s Ratio Perm			c0.38			0.05			0.17			0.03
v/c Ratio	1.24	0.08	1.13	1.26	0.04	0.16	0.95	1.15	0.47	0.94	0.89	0.10
Uniform Delay, d1	53.5	27.4	40.0	53.0	26.4	27.5	53.2	38.0	29.1	56.8	39.5	29.6
Progression Factor	1.00	1.00	1.00	1.00	1.01	1.02	1.01	1.09	1.25	1.00	1.00	1.00
Incremental Delay, d2	130.8	0.1	79.1	135.3	0.0	0.1	5.8	68.1	0.3	76.4	10.7	0.4
Delay (s)	184.3	27.4	119.1	188.3	26.8	28.2	59.7	109.4	36.7	133.2	50.2	30.0
Level of Service	F	C	F	F	C	C	E	F	D	F	D	C
Approach Delay (s)		140.4			145.5			88.6			53.8	
Approach LOS		F			F			F			D	
Intersection Summary												
HCM Average Control Delay			100.3				HCM Level of Service			F		
HCM Volume to Capacity ratio			1.12									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			90.4%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: SR 120 WB & Airport Way

1/5/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↰	↱	↰	↱			↱	↰
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00
Frt					1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1770	1495	1770	1759			1759	1495
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1770	1495	1770	1759			1759	1495
Volume (vph)	0	0	0	835	0	485	440	1610	0	0	1290	760
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	879	0	511	463	1695	0	0	1358	800
RTOR Reduction (vph)	0	0	0	0	0	20	0	0	0	0	0	194
Lane Group Flow (vph)	0	0	0	0	879	491	463	1695	0	0	1358	606
Heavy Vehicles (%)	0%	2%	2%	2%	2%	8%	2%	8%	2%	2%	8%	8%
Turn Type				Perm		Perm	Prot					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8						6
Actuated Green, G (s)					36.0	36.0	18.0	76.0			54.0	54.0
Effective Green, g (s)					36.0	36.0	18.0	76.0			54.0	54.0
Actuated g/C Ratio					0.30	0.30	0.15	0.63			0.45	0.45
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					531	449	266	1114			792	673
v/s Ratio Prot							c0.26	0.96			c0.77	
v/s Ratio Perm					0.50	0.33						0.41
v/c Ratio					1.66	1.09	1.74	1.52			1.71	0.90
Uniform Delay, d1					42.0	42.0	51.0	22.0			33.0	30.5
Progression Factor					1.00	1.00	1.63	1.35			0.78	0.69
Incremental Delay, d2					303.2	70.0	334.7	235.1			322.1	2.1
Delay (s)					345.2	112.0	417.8	264.9			347.7	23.1
Level of Service					F	F	F	F			F	C
Approach Delay (s)		0.0			259.5			297.7			227.3	
Approach LOS		A			F			F			F	
Intersection Summary												
HCM Average Control Delay			261.8									
HCM Volume to Capacity ratio			1.70									
Actuated Cycle Length (s)			120.0									
Intersection Capacity Utilization			167.5%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

5: SR 120 EB & Airport Way

1/5/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↩	↩					↩	↩	↩	↩	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00	1.00	1.00	1.00	
Frt		1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1671	1583					1863	1583	1671	1863	
Flt Permitted		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1671	1583					1863	1583	1671	1863	
Volume (vph)	810	0	1250	0	0	0	0	1240	990	540	1585	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	853	0	1316	0	0	0	0	1305	1042	568	1668	0
RTOR Reduction (vph)	0	0	10	0	0	0	0	0	311	0	0	0
Lane Group Flow (vph)	0	853	1306	0	0	0	0	1305	731	568	1668	0
Heavy Vehicles (%)	8%	2%	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%
Turn Type	Perm		Perm						Perm		Prot	
Protected Phases		4						2		1	6	
Permitted Phases	4		4						2			
Actuated Green, G (s)		47.0	47.0					42.0	42.0	19.0	65.0	
Effective Green, g (s)		47.0	47.0					42.0	42.0	19.0	65.0	
Actuated g/C Ratio		0.39	0.39					0.35	0.35	0.16	0.54	
Clearance Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		654	620					652	554	265	1009	
v/s Ratio Prot								c0.70		c0.34	0.90	
v/s Ratio Perm		0.51	c0.83						0.46			
v/c Ratio		1.30	2.11					2.00	1.32	2.14	1.65	
Uniform Delay, d1		36.5	36.5					39.0	39.0	50.5	27.5	
Progression Factor		1.00	1.00					1.00	1.00	0.95	1.50	
Incremental Delay, d2		147.9	503.6					456.1	155.9	515.7	294.3	
Delay (s)		184.4	540.1					495.1	194.9	563.6	335.7	
Level of Service		F	F					F	F	F	F	
Approach Delay (s)		400.2			0.0			361.8			393.6	
Approach LOS		F			A			F			F	
Intersection Summary												
HCM Average Control Delay		384.7										
HCM Volume to Capacity ratio		2.07										
Actuated Cycle Length (s)		120.0							12.0			
Intersection Capacity Utilization		167.5%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

6: Atherton Dr & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	730	45	25	155	55	625	45	875	145	790	1485	560
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	768	47	26	163	58	658	47	921	153	832	1563	589
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			14			14						
Median type		None			None							
Median storage veh												
Upstream signal (ft)											720	
pX, platoon unblocked	0.48	0.48	0.48	0.48	0.48		0.48					
vC, conflicting volume	4600	4395	1563	4279	4832	921	2153			1074		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	8530	8100	2178	7858	9014	921	3411			1074		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	6	0	0	0	0			0		
cM capacity (veh/h)	0	0	28	0	0	328	37			649		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3			
Volume Total	842	163	716	47	921	153	832	1563	589			
Volume Left	768	163	0	47	0	0	832	0	0			
Volume Right	26	0	658	0	0	153	0	0	589			
cSH	0	0	0	37	1700	1700	649	1700	1700			
Volume to Capacity	Err	Err	Err	1.26	0.54	0.09	1.28	0.92	0.35			
Queue Length 95th (ft)	Err	Err	Err	122	0	0	810	0	0			
Control Delay (s)	Err	Err	Err	401.6	0.0	0.0	158.5	0.0	0.0			
Lane LOS	F	F	F	F			F					
Approach Delay (s)	Err	Err		17.0			44.2					
Approach LOS	F	F										
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization			149.3%			ICU Level of Service			H			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

7: Woodward Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	480	460	30	60	385	275	40	310	40	510	1030	125
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	505	484	32	63	405	289	42	326	42	537	1084	132
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	1021	758	411	1753								
Volume Left (vph)	505	63	42	537								
Volume Right (vph)	32	289	42	132								
Hadj (s)	0.11	-0.18	-0.01	0.05								
Departure Headway (s)	9.7	9.4	9.6	9.6								
Degree Utilization, x	2.75	1.98	1.09	4.68								
Capacity (veh/h)	382	389	385	380								
Control Delay (s)	812.9	469.9	104.2	1681.1								
Approach Delay (s)	812.9	469.9	104.2	1681.1								
Approach LOS	F	F	F	F								
Intersection Summary												
Delay	1059.1											
HCM Level of Service	F											
Intersection Capacity Utilization	217.3%		ICU Level of Service		H							
Analysis Period (min)	15											

HCM Signalized Intersection Capacity Analysis

8: Yosemite Avenue & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	3444		1770	3284		1770	3392	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	1770	3444		1770	3284		1770	3392	
Volume (vph)	290	520	290	185	550	120	270	605	135	130	600	230
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	305	547	305	195	579	126	284	637	142	137	632	242
RTOR Reduction (vph)	0	0	212	0	23	0	0	24	0	0	50	0
Lane Group Flow (vph)	305	547	93	195	682	0	284	755	0	137	824	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	10.0	24.0	24.0	6.0	20.0		13.0	26.0		8.0	21.0	
Effective Green, g (s)	10.0	24.0	24.0	6.0	20.0		13.0	26.0		8.0	21.0	
Actuated g/C Ratio	0.12	0.30	0.30	0.08	0.25		0.16	0.32		0.10	0.26	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	221	559	475	133	861		288	1067		177	890	
v/s Ratio Prot	c0.17	c0.29		0.11	0.20		c0.16	0.23		0.08	c0.24	
v/s Ratio Perm			0.06									
v/c Ratio	1.38	0.98	0.20	1.47	0.79		0.99	0.71		0.77	0.93	
Uniform Delay, d1	35.0	27.7	20.8	37.0	28.1		33.4	23.7		35.1	28.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	196.7	32.2	0.2	246.1	5.0		48.8	4.0		18.8	16.8	
Delay (s)	231.7	60.0	21.0	283.1	33.1		82.2	27.6		53.9	45.5	
Level of Service	F	E	C	F	C		F	C		D	D	
Approach Delay (s)		95.0			87.2			42.2			46.6	
Approach LOS		F			F			D			D	
Intersection Summary												
HCM Average Control Delay			67.9			HCM Level of Service				E		
HCM Volume to Capacity ratio			1.03									
Actuated Cycle Length (s)			80.0			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			89.8%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: Wawona St. & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.92		1.00	0.92		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1719		1770	1705		1770	3281		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1719		1770	1705		1770	3281		1770	1863	1583
Volume (vph)	110	100	105	115	100	130	190	920	220	160	785	110
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	116	105	111	121	105	137	200	968	232	168	826	116
RTOR Reduction (vph)	0	62	0	0	77	0	0	28	0	0	0	80
Lane Group Flow (vph)	116	154	0	121	165	0	200	1172	0	168	826	36
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot			Prot			Prot			Prot		Over
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												
Actuated Green, G (s)	4.6	11.2		4.6	11.2		6.1	20.6		8.0	22.5	4.6
Effective Green, g (s)	4.6	11.2		4.6	11.2		6.1	20.6		8.0	22.5	4.6
Actuated g/C Ratio	0.08	0.19		0.08	0.19		0.10	0.34		0.13	0.37	0.08
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	135	319		135	316		179	1119		234	694	121
v/s Ratio Prot	0.07	0.09		c0.07	c0.10		c0.11	0.36		0.09	c0.44	0.02
v/s Ratio Perm												
v/c Ratio	0.86	0.48		0.90	0.52		1.12	1.05		0.72	1.19	0.29
Uniform Delay, d1	27.6	22.0		27.7	22.2		27.1	19.9		25.1	18.9	26.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	38.5	1.2		47.2	1.6		102.2	40.3		10.1	99.5	1.4
Delay (s)	66.1	23.2		74.9	23.8		129.4	60.2		35.2	118.5	27.7
Level of Service	E	C		E	C		F	E		D	F	C
Approach Delay (s)		38.2			40.8			70.1			96.4	
Approach LOS		D			D			E			F	
Intersection Summary												
HCM Average Control Delay			72.6			HCM Level of Service				E		
HCM Volume to Capacity ratio			0.90									
Actuated Cycle Length (s)			60.4			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			84.5%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

10: Daniels Street & Union Road

1/5/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	40	110	145	1395	1010	40
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	42	116	153	1468	1063	42
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)				306		
pX, platoon unblocked	0.30					
vC, conflicting volume	2858	1084	1105			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	7227	1084	1105			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	56	76			
cM capacity (veh/h)	0	264	632			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	158	1621	1105			
Volume Left	42	153	0			
Volume Right	116	0	42			
cSH	0	632	1700			
Volume to Capacity	Err	0.24	0.65			
Queue Length 95th (ft)	Err	24	0			
Control Delay (s)	Err	21.3	0.0			
Lane LOS	F	C				
Approach Delay (s)	Err	21.3	0.0			
Approach LOS	F					
Intersection Summary						
Average Delay		559.3				
Intersection Capacity Utilization		156.0%		ICU Level of Service		H
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

11: SR 120 WB Ramps & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↰	↱	↰	↱			↱	↰
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00
Frt					1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1671	1583	1770	1759			1863	1583
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1671	1583	1770	1759			1863	1583
Volume (vph)	0	0	0	155	0	440	410	1100	0	0	810	310
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	163	0	463	432	1158	0	0	853	326
RTOR Reduction (vph)	0	0	0	0	0	102	0	0	0	0	0	126
Lane Group Flow (vph)	0	0	0	0	163	361	432	1158	0	0	853	200
Heavy Vehicles (%)	2%	2%	2%	8%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type				Perm		Perm	Prot					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8						6
Actuated Green, G (s)					26.0	26.0	28.0	86.0			54.0	54.0
Effective Green, g (s)					26.0	26.0	28.0	86.0			54.0	54.0
Actuated g/C Ratio					0.22	0.22	0.23	0.72			0.45	0.45
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					362	343	413	1261			838	712
v/s Ratio Prot							c0.24	0.66			c0.46	
v/s Ratio Perm					0.10	c0.23						0.13
v/c Ratio					0.45	1.05	1.05	0.92			1.02	0.28
Uniform Delay, d1					40.8	47.0	46.0	14.1			33.0	20.8
Progression Factor					1.00	1.00	0.46	0.26			1.00	1.00
Incremental Delay, d2					0.9	63.2	27.4	1.4			35.7	1.0
Delay (s)					41.7	110.2	48.5	5.1			68.7	21.8
Level of Service					D	F	D	A			E	C
Approach Delay (s)		0.0			92.4			16.9			55.7	
Approach LOS		A			F			B			E	
Intersection Summary												
HCM Average Control Delay			44.3									
HCM Volume to Capacity ratio			1.03									
Actuated Cycle Length (s)			120.0									
Intersection Capacity Utilization			107.8%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

12: SR 120 EB Ramps & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00	1.00	1.00	1.00	
Frt		1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1770	1495					1759	1495	1770	1863	
Flt Permitted		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1770	1495					1759	1495	1770	1863	
Volume (vph)	610	0	900	0	0	0	0	900	90	300	665	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	642	0	947	0	0	0	0	947	95	316	700	0
RTOR Reduction (vph)	0	0	137	0	0	0	0	0	33	0	0	0
Lane Group Flow (vph)	0	642	810	0	0	0	0	947	62	316	700	0
Heavy Vehicles (%)	2%	2%	8%	2%	2%	2%	2%	8%	8%	2%	2%	8%
Turn Type	Perm		Perm						Perm		Prot	
Protected Phases		4						2		1	6	
Permitted Phases	4		4						2			
Actuated Green, G (s)		44.0	44.0					48.0	48.0	16.0	68.0	
Effective Green, g (s)		44.0	44.0					48.0	48.0	16.0	68.0	
Actuated g/C Ratio		0.37	0.37					0.40	0.40	0.13	0.57	
Clearance Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		649	548					704	598	236	1056	
v/s Ratio Prot								c0.54		c0.18	0.38	
v/s Ratio Perm		0.36	c0.54						0.04			
v/c Ratio		0.99	1.48					1.35	0.10	1.34	0.66	
Uniform Delay, d1		37.8	38.0					36.0	22.5	52.0	18.0	
Progression Factor		1.00	1.00					1.00	1.00	1.07	0.13	
Incremental Delay, d2		32.2	224.5					164.7	0.3	155.2	1.4	
Delay (s)		70.0	262.5					200.7	22.9	210.8	3.8	
Level of Service		E	F					F	C	F	A	
Approach Delay (s)		184.7			0.0			184.5			68.2	
Approach LOS		F			A			F			E	
Intersection Summary												
HCM Average Control Delay		152.2						HCM Level of Service		F		
HCM Volume to Capacity ratio		1.40										
Actuated Cycle Length (s)		120.0						Sum of lost time (s)		12.0		
Intersection Capacity Utilization		107.8%						ICU Level of Service		G		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

13: Atherton Dr. & Union Road

1/5/2009

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.88	0.95	0.88	0.97	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	2787	3539	2787	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	2787	3539	2787	3433	3539
Volume (vph)	290	520	470	130	475	1090
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	305	547	495	137	500	1147
RTOR Reduction (vph)	0	465	0	62	0	0
Lane Group Flow (vph)	305	82	495	75	500	1147
Turn Type	Perm		Perm		Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	15.8	15.8	58.4	58.4	19.8	82.2
Effective Green, g (s)	15.8	15.8	58.4	58.4	19.8	82.2
Actuated g/C Ratio	0.15	0.15	0.55	0.55	0.19	0.78
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	512	415	1950	1535	641	2744
v/s Ratio Prot	c0.09		0.14		c0.15	c0.32
v/s Ratio Perm		0.03		0.03		
v/c Ratio	0.60	0.20	0.25	0.05	0.78	0.42
Uniform Delay, d1	42.1	39.5	12.4	11.0	41.0	4.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9	0.2	0.3	0.1	6.1	0.5
Delay (s)	44.0	39.8	12.7	11.0	47.1	4.4
Level of Service	D	D	B	B	D	A
Approach Delay (s)	41.3		12.4			17.4
Approach LOS	D		B			B
Intersection Summary						
HCM Average Control Delay			22.9	HCM Level of Service		C
HCM Volume to Capacity ratio			0.53			
Actuated Cycle Length (s)			106.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization			45.1%	ICU Level of Service	A	
Analysis Period (min)			15			
c Critical Lane Group						

Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

HCM Signalized Intersection Capacity Analysis

15: SR 120 WB Ramp & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↷	↶	↷			↶	↷
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00
Frpb, ped/bikes					1.00	0.98	1.00	1.00			1.00	0.98
Flpb, ped/bikes					1.00	1.00	1.00	1.00			1.00	1.00
Frt					1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1736	1492	1736	1792			1792	1488
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1736	1492	1736	1792			1792	1488
Volume (vph)	0	0	0	740	0	350	380	1465	0	0	740	760
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	779	0	368	400	1542	0	0	779	800
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	339
Lane Group Flow (vph)	0	0	0	0	779	368	400	1542	0	0	779	461
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	2%	2%	2%	4%	2%	6%	4%	6%	2%	2%	6%	6%
Turn Type				Split		Free	Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases						Free						6
Actuated Green, G (s)					44.0	120.0	16.0	68.0			48.0	48.0
Effective Green, g (s)					44.0	120.0	16.0	68.0			48.0	48.0
Actuated g/C Ratio					0.37	1.00	0.13	0.57			0.40	0.40
Clearance Time (s)					4.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)					3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					637	1492	231	1015			717	595
v/s Ratio Prot					c0.45		c0.23	c0.86			0.43	
v/s Ratio Perm						0.25						0.31
v/c Ratio					1.22	0.25	1.73	1.52			1.09	0.77
Uniform Delay, d1					38.0	0.0	52.0	26.0			36.0	31.3
Progression Factor					1.00	1.00	0.36	0.31			1.00	1.00
Incremental Delay, d2					114.0	0.4	330.9	234.1			59.5	9.5
Delay (s)					152.0	0.4	349.6	242.2			95.5	40.8
Level of Service					F	A	F	F			F	D
Approach Delay (s)		0.0			103.3			264.3			67.8	
Approach LOS		A			F			F			E	
Intersection Summary												
HCM Average Control Delay			158.3									
HCM Volume to Capacity ratio			1.41									
Actuated Cycle Length (s)			120.0						8.0			
Intersection Capacity Utilization			150.5%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

16: SR 120 EB Ramps & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.98					0.99		1.00	1.00	
Flpb, ped/bikes		1.00	1.00					1.00		1.00	1.00	
Frt		1.00	0.85					0.95		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1703	1518					1729		1703	1827	
Flt Permitted		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (perm)		1703	1518					1729		1703	1827	
Volume (vph)	1055	0	950	0	0	0	0	790	400	290	1190	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1111	0	1000	0	0	0	0	832	421	305	1253	0
RTOR Reduction (vph)	0	0	33	0	0	0	0	15	0	0	0	0
Lane Group Flow (vph)	0	1111	967	0	0	0	0	1238	0	305	1253	0
Confl. Peds. (#/hr)			2				2			2		2
Heavy Vehicles (%)	6%	2%	4%	2%	2%	2%	2%	4%	4%	6%	4%	2%
Turn Type	Split		Perm							Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases			4									
Actuated Green, G (s)		45.0	45.0					50.0		13.0	67.0	
Effective Green, g (s)		45.0	45.0					50.0		13.0	67.0	
Actuated g/C Ratio		0.38	0.38					0.42		0.11	0.56	
Clearance Time (s)		4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)		639	569					720		184	1020	
v/s Ratio Prot		c0.65						c0.72		c0.18	0.69	
v/s Ratio Perm			0.64									
v/c Ratio		1.74	1.70					1.72		1.66	1.23	
Uniform Delay, d1		37.5	37.5					35.0		53.5	26.5	
Progression Factor		1.00	1.00					1.00		1.46	1.19	
Incremental Delay, d2		338.9	322.2					329.5		298.1	103.6	
Delay (s)		376.4	359.7					364.5		376.2	135.3	
Level of Service		F	F					F		F	F	
Approach Delay (s)		368.5			0.0			364.5			182.5	
Approach LOS		F			A			F			F	
Intersection Summary												
HCM Average Control Delay		308.6										
HCM Volume to Capacity ratio		1.72										
Actuated Cycle Length (s)		120.0								12.0		
Intersection Capacity Utilization		150.5%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

17: Atherton Drive & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	560	0	280	0	0	0	170	630	0	0	1660	480
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	589	0	295	0	0	0	179	663	0	0	1747	505
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)											640	
pX, platoon unblocked	0.45	0.45	0.45	0.45	0.45		0.45					
vC, conflicting volume	2768	2768	1747	3063	3274	663	2253			663		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	4895	4895	2646	5544	6008	663	3759			663		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	0	0	0	100	0			100		
cM capacity (veh/h)	0	0	14	0	0	461	26			926		
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2					
Volume Total	589	295	0	179	663	1747	505					
Volume Left	589	0	0	179	0	0	0					
Volume Right	0	295	0	0	0	0	505					
cSH	0	14	1700	26	1700	1700	1700					
Volume to Capacity	Err	21.66	0.00	6.98	0.39	1.03	0.30					
Queue Length 95th (ft)	Err	Err	0	Err	0	0	0					
Control Delay (s)	Err	Err	0.0	2991.1	0.0	0.0	0.0					
Lane LOS	F	F	A	F								
Approach Delay (s)	Err		0.0	635.6		0.0						
Approach LOS	F		A									
Intersection Summary												
Average Delay	Err											
Intersection Capacity Utilization	137.8%			ICU Level of Service				H				
Analysis Period (min)	15											

Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

Level Of Service Computation Report

2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #14

Cycle (sec): 100 Critical Vol./Cap.(X): 2.858

Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 322.8

Optimal Cycle: 0 Level Of Service: F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0	1	0	1	0	1	0	1	0	1	0

Volume Module:	North Bound			South Bound			East Bound			West Bound		
Base Vol:	110	350	20	205	905	265	145	440	260	20	340	105
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	110	350	20	205	905	265	145	440	260	20	340	105
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	110	350	20	205	905	265	145	440	260	20	340	105
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	110	350	20	205	905	265	145	440	260	20	340	105
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	110	350	20	205	905	265	145	440	260	20	340	105
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	110	350	20	205	905	265	145	440	260	20	340	105

Saturation Flow Module:	North Bound			South Bound			East Bound			West Bound		
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	281	295	309	302	317	337	297	312	331	280	294	309

Capacity Analysis Module:	North Bound			South Bound			East Bound			West Bound		
Vol/Sat:	0.39	1.19	0.06	0.68	2.86	0.79	0.49	1.41	0.78	0.07	1.16	0.34
Crit Moves:	****			****			****			****		
Delay/Veh:	23.2	147	15.0	36.0	865	43.0	25.5	232	43.3	16.4	136	19.9
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	23.2	147	15.0	36.0	865	43.0	25.5	232	43.3	16.4	136	19.9
LOS by Move:	C	F	B	E	F	E	D	F	E	C	F	C
ApproachDel:	113.4			582.9			138.5			104.9		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	113.4			582.9			138.5			104.9		
LOS by Appr:	F			F			F			F		
AllWayAvgQ:	0.6	10.8	0.1	1.8	74.8	2.8	0.9	18.8	2.7	0.1	9.9	0.5

Note: Queue reported is the number of cars per lane.

Level Of Service Detailed Computation Report
2000 HCM 4-Way Stop Method
Future Volume Alternative

Intersection #14

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R

Time Period: 0.25 hour

HevVeh: 0% 0% 0% 0%

Alpha Value: 0.01

GroupType:	6			6			6			6		
P[C1]:	0.0000			0.0000			0.0000			0.0000		
P[C2]:	0.0000			0.0000			0.0000			0.0000		
P[C3]:	0.0000			0.0000			0.0000			0.0000		
P[C4]:	0.0000			0.0000			0.0000			0.0000		
P[C5]:	1.0000			1.0000			1.0000			1.0000		
Padj[C1]:	0.04000			0.04000			0.04000			0.04000		
Padj[C2]:	0.03000			0.03000			0.03000			0.03000		
Padj[C3]:	0.02000			0.02000			0.02000			0.02000		
Padj[C4]:	0.01000			0.01000			0.01000			0.01000		
Padj[C5]:	-0.10000			-0.10000			-0.10000			-0.10000		

Lanes:	L1		L2		L1		L2		L1		L2		L1		L2	
LaneType:	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE
HeadwayAdj:	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700
Volume:	110	20	205	265	145	260	20	105								
Capacity:	281	309	302	337	297	331	280	309								
DegOfUtil:	0.39	0.06	0.67	0.78	0.48	0.78	0.07	0.34								
DepHeadway:	12.69	11.49	11.85	10.65	12.03	10.83	12.72	11.52								
ServiceTime:	10.4	9.2	9.5	8.3	9.7	8.5	10.4	9.2								
Delay:	23.2	15.0	36.0	43.0	25.5	43.3	16.4	19.9								
Queue:	0.6	0.1	1.8	2.8	0.9	2.7	0.1	0.5								

Lane:	L3		L3		L3		L3	
LaneType:	THRU		THRU		THRU		THRU	
HeadwayAdj:	0.000		0.000		0.000		0.000	
Volume:	350		905		440		340	
Capacity:	295		317		312		294	
DegOfUtil:	1.19		2.85		1.41		1.15	
DepHeadway:	12.19		11.35		11.53		12.22	
ServiceTime:	9.9		9.0		9.2		9.9	
Delay:	147.3		864.9		231.9		136.3	
Queue:	10.8		74.8		18.8		9.9	

Approach:	North Bound		South Bound		East Bound		West Bound	
ApproachDel:	113.4		582.9		138.5		104.9	
Delay Adj:	1.00		1.00		1.00		1.00	
ApprAdjDel:	113.4		582.9		138.5		104.9	
LOS by Appr:	F		F		F		F	

OverallDel:	322.8
OverallLOS:	F

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #14

Future Volume Alternative: Peak Hour Warrant Met

Approach:	North Bound			South Bound			East Bound			West Bound					
Movement:	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign					
Lanes:	1	0	1	0	1	1	0	1	0	1	1	0	1	0	1
Initial Vol:	110	350		20	205	905	265	145	440	260	20	340	105		
Major Street Volume:				1855											
Minor Approach Volume:				845											
Minor Approach Volume Threshold:	108 [less than minimum of 150]														

SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

Level Of Service Computation Report

2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #18

Cycle (sec): 100 Critical Vol./Cap.(X): 3.149

Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 404.0

Optimal Cycle: 0 Level Of Service: F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0	1	0	1	0	1	0	1	0	1	0

Volume Module:	North Bound			South Bound			East Bound			West Bound		
Base Vol:	50	310	80	920	630	390	150	410	95	100	290	340
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	50	310	80	920	630	390	150	410	95	100	290	340
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	50	310	80	920	630	390	150	410	95	100	290	340
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	50	310	80	920	630	390	150	410	95	100	290	340
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	50	310	80	920	630	390	150	410	95	100	290	340
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	50	310	80	920	630	390	150	410	95	100	290	340

Saturation Flow Module:	North Bound			South Bound			East Bound			West Bound		
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	272	283	300	292	305	324	272	283	300	280	291	308

Capacity Analysis Module:	North Bound			South Bound			East Bound			West Bound		
Vol/Sat:	0.18	1.10	0.27	3.15	2.07	1.20	0.55	1.45	0.32	0.36	1.00	1.10
Crit Moves:	****			****			****			****		
Delay/Veh:	18.9	119	19.0	999.7	517	150.2	31.0	252	20.2	22.6	88.8	116.8
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	18.9	119	19.0	999.7	517	150.2	31.0	252	20.2	22.6	88.8	116.8
LOS by Move:	C	F	C	F	F	F	D	F	C	C	F	F
ApproachDel:	89.3			672.3			167.9			92.8		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	89.3			672.3			167.9			92.8		
LOS by Appr:	F			F			F			F		
AllWayAvgQ:	0.2	8.1	0.4	79.9	42.5	12.3	1.1	18.6	0.5	0.5	6.0	8.8

Note: Queue reported is the number of cars per lane.

Level Of Service Detailed Computation Report
2000 HCM 4-Way Stop Method
Future Volume Alternative

Intersection #18

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R

Time Period: 0.25 hour

HevVeh: 0% 0% 0% 0%

Alpha Value: 0.01

GroupType:	6			6			6			6		
P[C1]:	0.0000			0.0000			0.0000			0.0000		
P[C2]:	0.0000			0.0000			0.0000			0.0000		
P[C3]:	0.0000			0.0000			0.0000			0.0000		
P[C4]:	0.0000			0.0000			0.0000			0.0000		
P[C5]:	1.0000			1.0000			1.0000			1.0000		
Padj[C1]:	0.04000			0.04000			0.04000			0.04000		
Padj[C2]:	0.03000			0.03000			0.03000			0.03000		
Padj[C3]:	0.02000			0.02000			0.02000			0.02000		
Padj[C4]:	0.01000			0.01000			0.01000			0.01000		
Padj[C5]:	-0.10000			-0.10000			-0.10000			-0.10000		

Lanes:	L1		L2		L1		L2		L1		L2		L1		L2	
LaneType:	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE
HeadwayAdj:	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700
Volume:	50	80	920	390	150	95	100	340								
Capacity:	272	300	292	324	272	300	280	308								
DegOfUtil:	0.18	0.27	3.15	1.20	0.55	0.32	0.36	1.10								
DepHeadway:	13.22	12.02	12.32	11.12	13.22	12.02	12.87	11.67								
ServiceTime:	10.9	9.7	10.0	8.8	10.9	9.7	10.6	9.4								
Delay:	18.9	19.0	999.7	150.2	31.0	20.2	22.6	116.8								
Queue:	0.2	0.4	79.9	12.3	1.1	0.5	0.5	8.8								

Lane:	L3		L3		L3		L3	
LaneType:	THRU		THRU		THRU		THRU	
HeadwayAdj:	0.000		0.000		0.000		0.000	
Volume:	310		630		410		290	
Capacity:	283		305		283		291	
DegOfUtil:	1.10		2.07		1.45		1.00	
DepHeadway:	12.72		11.82		12.72		12.37	
ServiceTime:	10.4		9.5		10.4		10.1	
Delay:	118.8		517.3		252.2		88.8	
Queue:	8.1		42.5		18.6		6.0	

Approach:	North Bound		South Bound		East Bound		West Bound	
ApproachDel:	89.3		672.3		167.9		92.8	
Delay Adj:	1.00		1.00		1.00		1.00	
ApprAdjDel:	89.3		672.3		167.9		92.8	
LOS by Appr:	F		F		F		F	

OverallDel:	404.0
OverallLOS:	F

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #18

Future Volume Alternative: Peak Hour Warrant Met

Approach:	North Bound	South Bound	East Bound	West Bound
Movement:	L - T - R	L - T - R	L - T - R	L - T - R
Control:	Stop Sign	Stop Sign	Stop Sign	Stop Sign
Lanes:	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1
Initial Vol:	50 310 80	920 630 390	150 410 95	100 290 340
Major Street Volume:	2380			
Minor Approach Volume:	730			
Minor Approach Volume Threshold:	1 [less than minimum of 150]			

SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

Cumulative, Plus Project, AM

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: I-5 to Yosemite
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4785	veh/h
Peak-hour factor, PHF	0.97	
Peak 15-min volume, v15	1233	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1759	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1759	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	27.4	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Yosemite to Airport
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3548	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	964	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1350	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1350	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	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Airport to Union
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3906	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1061	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1486	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1486	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	22.9	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Union to Main
Jurisdiction:
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3813	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1036	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1451	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1451	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	22.3	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Main to SR 99
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	3459	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	940	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1316	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1316	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	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: SR 99 to Main
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	5043	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1370	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1919	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1919	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	62.7	mi/h
Number of lanes, N	3	
Density, D	30.6	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: SR 120 Westbound
 From/To: Main to Union
 Jurisdiction: City of Manteca
 Analysis Year: C+P Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	5973	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1623	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2272	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2272	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	54.9	mi/h
Number of lanes, N	3	
Density, D	41.4	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Union to Airport
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	6858	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1864	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2609	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2609	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Airport to Yosemite
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	7068	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1921	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2689	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2689	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Yosemite to I-5
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	6907	veh/h
Peak-hour factor, PHF	0.93	
Peak 15-min volume, v15	1857	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2599	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2599	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Northbound
From/To: Jack Tone to Austin
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	7067	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1963	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2801	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2801	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Northbound
From/To: Yosemite to Louise
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4280	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1189	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2544	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2544	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: Louise to Yosemite
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4115	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1143	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2446	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2446	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

 Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: SR-99 Southbound
 From/To: SR-120 to Austin
 Jurisdiction:
 Analysis Year: C+P Conditions
 Description: Union Crossing EIR

 Flow Inputs and Adjustments

Volume, V	5742	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1595	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2276	pc/h/ln

 Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

 LOS and Performance Measures

Flow rate, vp	2276	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	54.8	mi/h
Number of lanes, N	3	
Density, D	41.6	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: Austin to Jack Tone
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	5649	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1569	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2239	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2239	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	55.9	mi/h
Number of lanes, N	3	
Density, D	40.0	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/2008
Analysis time period: AM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2808	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	1098	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	2808	1098	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	763	298	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3205	1223	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.591 Using Equation 1

$$v_F = v_{FM} (P_F) = 1896 \text{ pc/h}$$

Capacity Checks

v_F	Actual	Maximum	LOS F?
FO	4428	7050	No
v_F	1309 pc/h (Equation 25-4 or 25-5)		
3 or av_{34}			
Is $v_F > 2700$ pc/h?	No		
3 or av_{34}			
Is $v_F > 1.5 v_{12} / 2$	No		
3 or av_{34}	12		
If yes, $v_F =$	(Equation 25-8)		
12A			

Flow Entering Merge Influence Area

v_F	Actual	Max Desirable	Violation?
12	1896	4400	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_F + 0.0078 v_{12} - 0.00627 L = 26.1 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M = 0.374$
Space mean speed in ramp influence area,	$S_R = 56.4 \text{ mph}$
Space mean speed in outer lanes,	$S_0 = 62.1 \text{ mph}$
Space mean speed for all vehicles,	$S = 58.0 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: AM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3548	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	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
Volume, V (vph)	3548	740	vph
Peak-hour factor, PHF	0.92	0.80	
Peak 15-min volume, v15	964	231	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4049	948	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.615 Using Equation 5

$$v = v_R + (v_F - v_R) P = 2856 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	4049	7050	No
v = v - v FO F R	3101	7050	No
v R	948	2000	No
v v 3 or av34	1193 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h?	No		
3 or av34			
Is v v > 1.5 v /2	No		
3 or av34	12		
If yes, v =	(Equation 25-18)		
12A			

Flow Entering Diverge Influence Area

v_{12}	Actual 2856	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D = 27.5 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable, S_D	$D = 0.513$
Space mean speed in ramp influence area, S_R	$S = 53.2 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 70.6 \text{ mph}$
Space mean speed for all vehicles, S	$S = 57.4 \text{ mph}$

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Phone: _____ Fax: _____
E-mail: _____

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: AM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Union Road
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3906	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	622	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)	3906	622	vph
Peak-hour factor, PHF	0.92	0.80	
Peak 15-min volume, v15	1061	194	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4458	797	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.612 Using Equation 5

$$v = v + (v - v) P = 3037 \text{ pc/h}$$

$$12 \quad R \quad F \quad R \quad FD$$

Capacity Checks

$v = v$	Actual	Maximum	LOS F?
$F_i \quad F$	4458	7050	No
$v = v - v$	3661	7050	No
$FO \quad F \quad R$			
v	797	2000	No
R			
$v \quad v$	1421 pc/h	(Equation 25-15 or 25-16)	
$3 \text{ or } av34$			
Is $v \quad v > 2700 \text{ pc/h?}$		No	
$3 \text{ or } av34$			
Is $v \quad v > 1.5 \quad v / 2$		No	
$3 \text{ or } av34$	12		
If yes, $v =$		(Equation 25-18)	
12A			

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v	3037	4600	No
12			!

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 \quad v - 0.009 \quad L = 29.0 \text{ pc/mi/ln}$

$$R \quad 12 \quad D$$

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

Speed Estimation

Intermediate speed variable,	$D = 0.500$
S	
Space mean speed in ramp influence area,	$S = 53.5 \text{ mph}$
R	
Space mean speed in outer lanes,	$S = 69.7 \text{ mph}$
0	
Space mean speed for all vehicles,	$S = 57.8 \text{ mph}$

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/2008
Analysis time period: AM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Union Road
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3284	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	529	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	3284	529	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	892	144	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3748	589	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.591 Using Equation 1

$$v_F = v_F(P_F) = 2217 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_F	4337	7050	No
FO			
v_F	1531 pc/h	(Equation 25-4 or 25-5)	
3 or av_{34}			
Is $v_F > 2700$ pc/h?		No	
3 or av_{34}			
Is $v_F > 1.5 v_F / 2$		No	
3 or av_{34}	12		
If yes, $v_F =$		(Equation 25-8)	
12A			

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_F	2217	4400	No
12			!

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_F + 0.0078 v_F - 0.00627 L = 24.0 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M = 0.351$
Space mean speed in ramp influence area, S_R	$S_R = 56.9 \text{ mph}$
Space mean speed in outer lanes, S_0	$S_0 = 61.3 \text{ mph}$
Space mean speed for all vehicles, S	$S = 58.4 \text{ mph}$

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: AM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	5238	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	1830	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	5238	1830	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	1423	497	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5978	2039	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.591 Using Equation 1

$$v_{12} = v_{FM} (P_{FM}) = 3536 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	8017	7050	Yes
$v_{3 \text{ or } av34}$	2442 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34} > 2700 \text{ pc/h?}$		No	
Is $v_{3 \text{ or } av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} =$		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3536	4400	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 44.9 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$M = 1.315$
Space mean speed in ramp influence area, S_R	$S = 34.8 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 57.6 \text{ mph}$
Space mean speed for all vehicles, S	$S = 39.5 \text{ mph}$

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: AM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6858	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	1620	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
Volume, V (vph)	6858	1620	vph
Peak-hour factor, PHF	0.92	0.95	
Peak 15-min volume, v15	1864	426	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	7827	1748	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.484 Using Equation 5

$$v = v_R + (v_F - v_R) P = 4690 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	7827	7050	Yes
v = v - v FO F R	6079	7050	No
v R	1748	2000	No
v v 3 or av34	3137 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h? 3 or av34		Yes	
Is v v > 1.5 v /2 3 or av34	12	No	
If yes, v = 5127 12A		(Equation 25-18)	

Flow Entering Diverge Influence Area

v	Actual 5127	Max Desirable 4600	Violation? No
12A			

Level of Service Determination (if not F)

$$\text{Density, } D = 4.252 + 0.0086 v_R - 0.009 L = 47.0 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$D = 0.585$
Space mean speed in ramp influence area, S_R	$S = 51.5 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 64.7 \text{ mph}$
Space mean speed for all vehicles, S	$S = 55.4 \text{ mph}$

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Phone: _____ Fax: _____
E-mail: _____

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: AM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Union Road
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	5370	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	1488	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	5370	1488	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	1459	404	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6129	1658	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.591 Using Equation 1

$$v_{12} = v_{FM} (P_{FM}) = 3625 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	7787	7050	Yes
$v_{3 \text{ or } av34}$	2504 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34} > 2700 \text{ pc/h}$?		No	
Is $v_{3 \text{ or } av34} > 1.5 v_{12} / 2$?		No	
If yes, $v_{12A} =$		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3625	4400	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 42.8 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$M = 1.054$
Space mean speed in ramp influence area, S_R	$S = 40.8 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 57.2 \text{ mph}$
Space mean speed for all vehicles, S	$S = 44.9 \text{ mph}$

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: AM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Union Road
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge
Number of lanes in freeway	3
Free-flow speed on freeway	65.0 mph
Volume on freeway	5973 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	603 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)	5973	603	vph
Peak-hour factor, PHF	0.92	0.95	
Peak 15-min volume, v15	1623	159	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6817	651	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.560 Using Equation 5

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 4102 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	6817	7050	No
v = v - v FO F R	6166	7050	No
v R	651	2000	No
v v 3 or av34	2715 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h? 3 or av34		Yes	
Is v v > 1.5 v /2 3 or av34	12	No	
If yes, v = 4117 12A		(Equation 25-18)	

Flow Entering Diverge Influence Area

v_{12A}	Actual 4117	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L = 38.3 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable, S_D	$D = 0.487$
Space mean speed in ramp influence area, S_R	$S = 53.8 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 64.7 \text{ mph}$
Space mean speed for all vehicles, S	$S = 57.6 \text{ mph}$

Leisch Method for Weaving Analysis

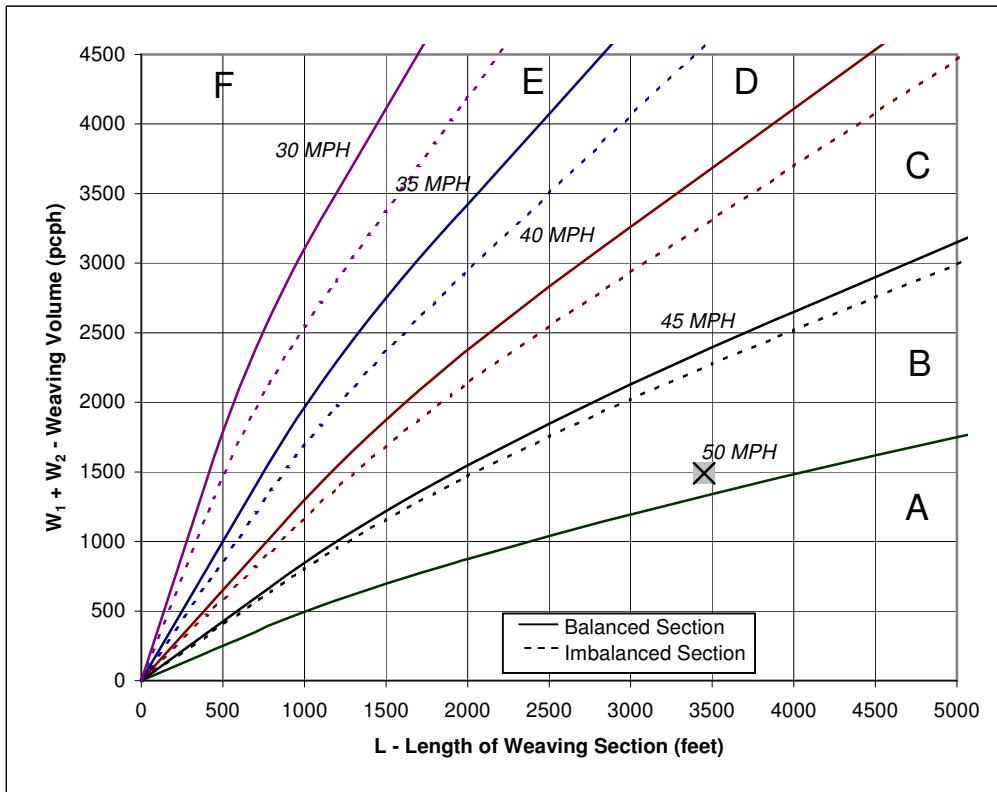
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,450

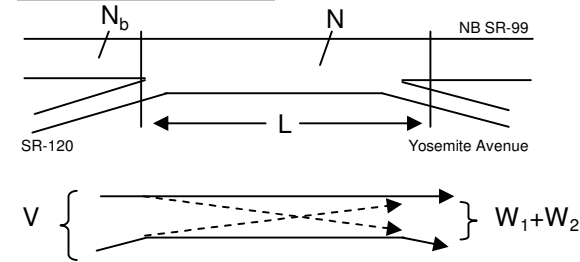
Project Information

Project	Union Commercial
Scenario	CUMULATIVE + PROJECT - AM
Freeway	NB SR-99
On-ramp	SR-120
Off-ramp	Yosemite Avenue

Total Weaving Section (V)	On-ramp to Mainline (W_1)	Mainline to Off-ramp (W_2)
Volume (vph)*	Volume (vph)*	Volume (vph)*
Truck Percentage	Truck Percentage	Truck Percentage
PCE for Trucks	PCE for Trucks	PCE for Trucks
Volume (pcph)	Volume (pcph)	Volume (pcph)



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? Y
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

45 mph and 50 mph

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

3. Interpolated Weaving Speed (S_w , mph)	49.2
4. Weaving Intensity Factor (k)	1.32
5. Service Volume (SV, pcph) $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	1,305
6. Level of Service (LOS)	D

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Leisch Method for Weaving Analysis

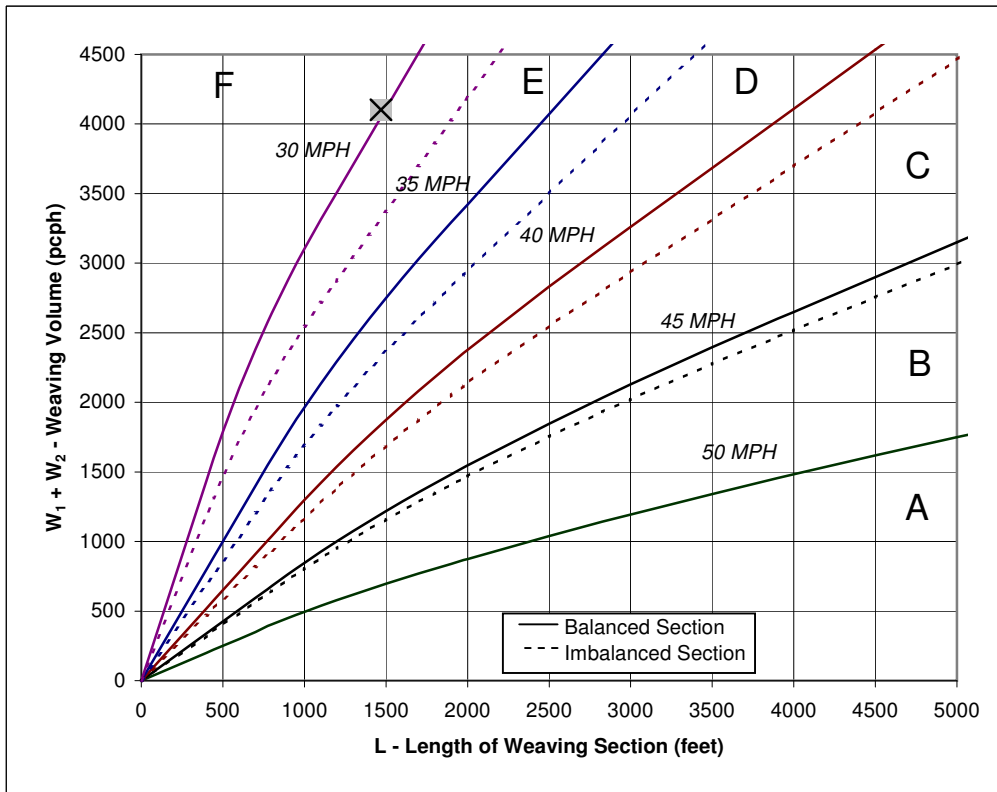
Data Input

Number of Entering Mainline Lanes	N_b	3
Number of Lanes in Weaving Section	N	4
Length of Weaving Section (feet)	L	1,470

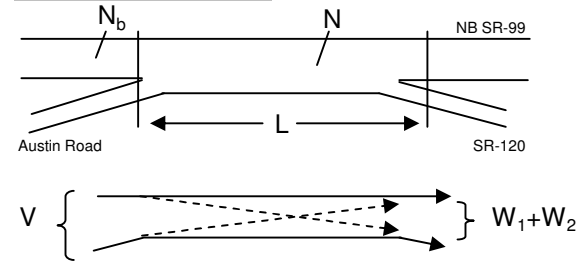
Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,351	Volume (vph)*	96	Volume (vph)*	1,892
Truck Percentage	14%	Truck Percentage	6%	Truck Percentage	10%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	6,331	Volume (pcph)	479	Volume (pcph)	3,623

Project Information

Project	Union Commercial
Scenario	CUMULATIVE + PROJECT - AM
Freeway	NB SR-99
On-ramp	Austin Road
Off-ramp	SR-120



Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)? **Y**
[If optional exit lane, then "Y". Otherwise "N".]
2. In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

35 MPH and **40 MPH**

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

3. Interpolated Weaving Speed (S_w , mph) **26.9**
4. Weaving Intensity Factor (k) **3.00**
5. Service Volume (SV, pcph)
 $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$ **1,822**
6. Level of Service (LOS) **E**

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF)**. The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Leisch Method for Weaving Analysis

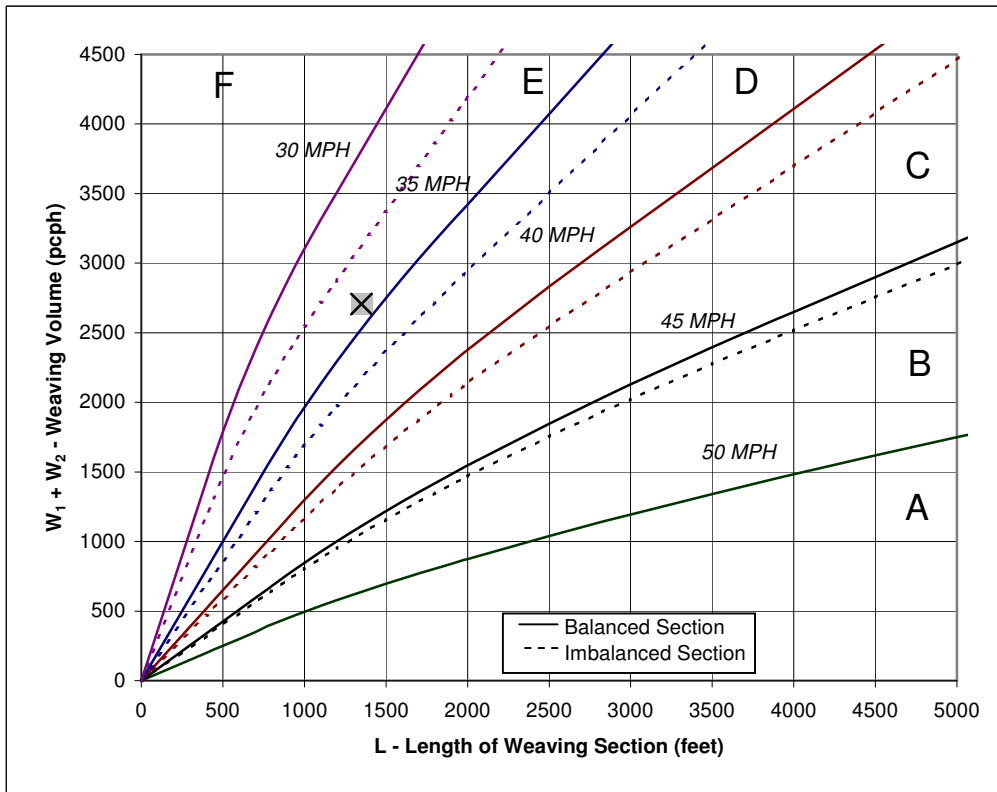
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	1,350

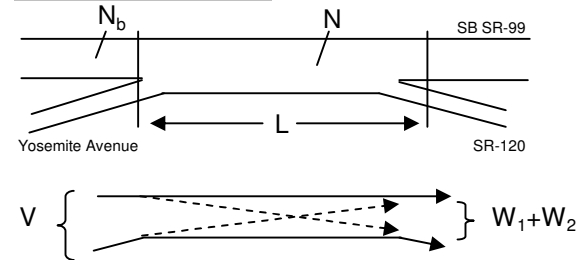
Project Information

Project	Union Commercial
Scenario	CUMULATIVE + PROJECT - AM
Freeway	SB SR-99
On-ramp	Yosemite Avenue
Off-ramp	SR-120

Total Weaving Section (V)	On-ramp to Mainline (W_1)	Mainline to Off-ramp (W_2)
Volume (vph)*	Volume (vph)*	Volume (vph)*
Truck Percentage	Truck Percentage	Truck Percentage
PCE for Trucks	PCE for Trucks	PCE for Trucks
Volume (pcph)	Volume (pcph)	Volume (pcph)



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? n
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

40 mph and 45 mph

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

- Interpolated Weaving Speed (S_w , mph) 27.9
- Weaving Intensity Factor (k) 3.00
- Service Volume (SV, pcph)
 $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$ 2,424
- Level of Service (LOS) F

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Major Street Union Road
 Minor Street Project Access #19

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative Plus Project
 Peak Hour AM

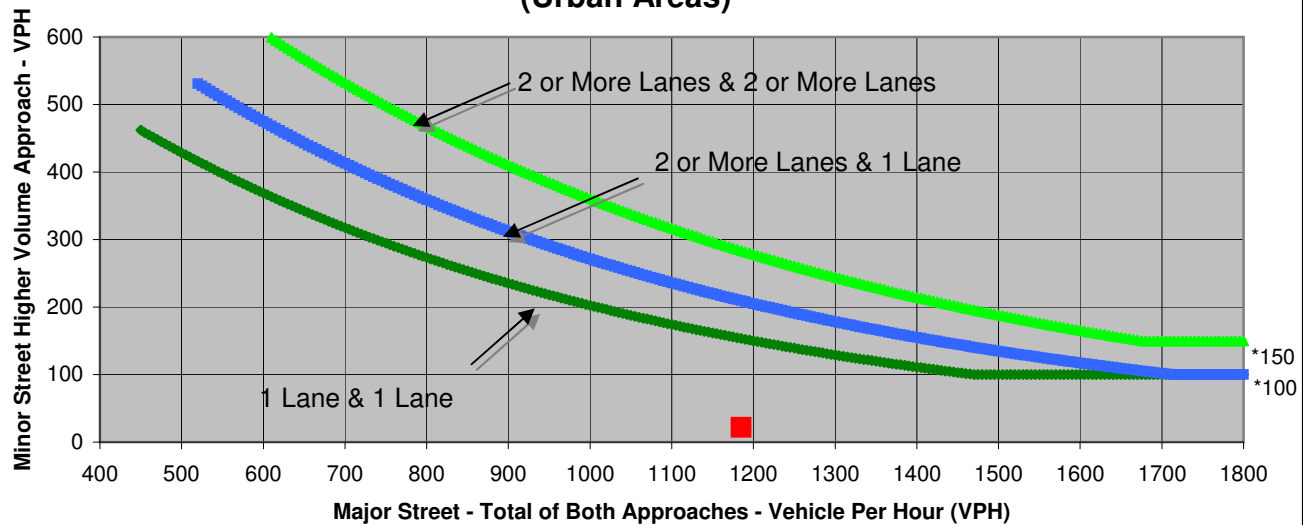
Turn Movement Volumes

	NB	SB	EB	WB
Left		0	0	0
Through		1,128	0	0
Right		57	22	0
Total	0	1,185	22	0

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Union Road	Project Access #19	
Number of Approach Lanes	2	1	<u>NO</u>
Traffic Volume (VPH) *	1,185	22	

* 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 Union Road
 Minor Street Project Access

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative Plus Project
 Peak Hour AM

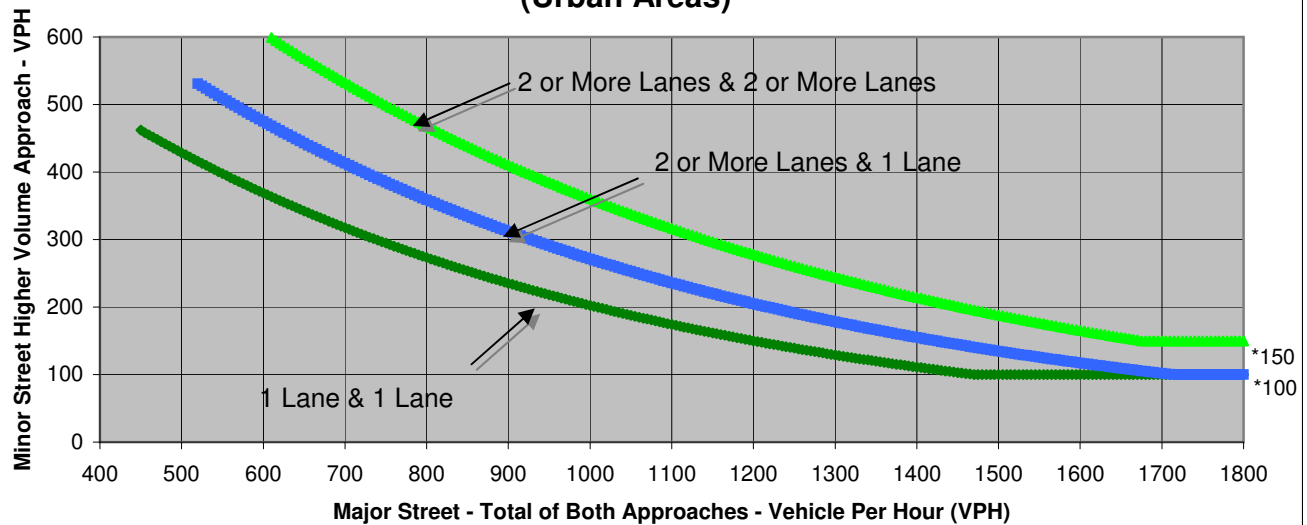
Turn Movement Volumes

	NB	SB	EB	WB
Left	27	0	16	0
Through	1,503	633	0	0
Right	0	16	5	0
Total	1,530	649	21	0

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Union Road	Minor Street Project Access	<u>Warrant Met</u>
Number of Approach Lanes	2	1	<u>NO</u>
Traffic Volume (VPH) *	2,179	21	

* 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 Airport Way
 Minor Street Atherton Drive

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative Plus Project
 Peak Hour AM

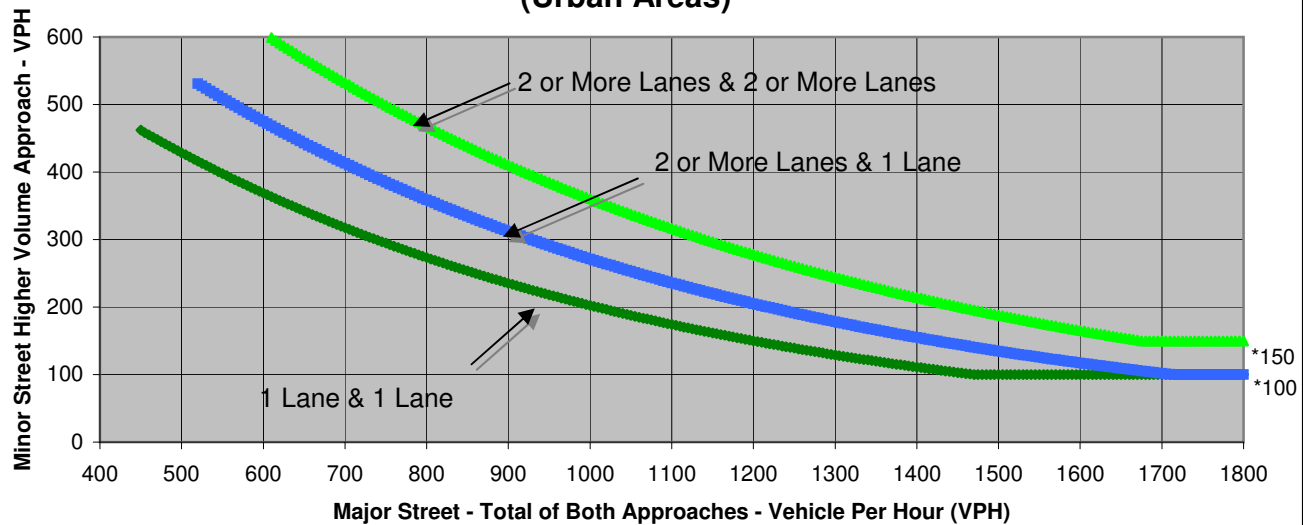
Turn Movement Volumes

	NB	SB	EB	WB
Left	43	370	127	470
Through	1,415	995	35	40
Right	181	675	670	20
Total	1,639	2,040	832	530

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Atherton Drive	<u>Warrant Met</u>
Number of Approach Lanes	3	3	<u>YES</u>
Traffic Volume (VPH) *	3,679	832	

* 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 Airport Way
 Minor Street Wawona Street

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative Plus Project
 Peak Hour AM

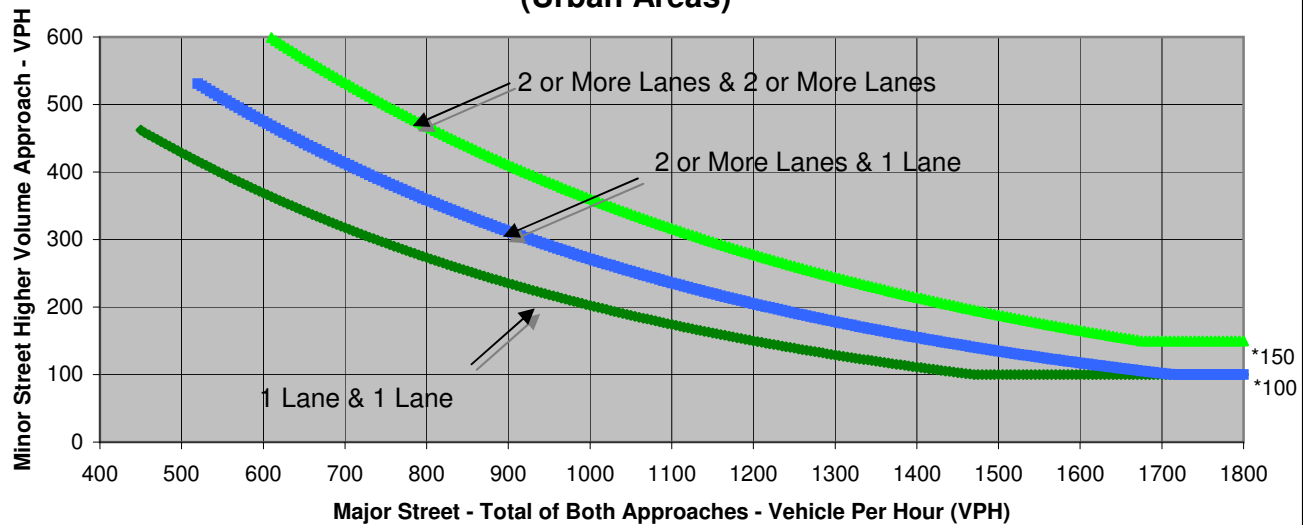
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	40	0	320
Through	719	952	0	0
Right	95	0	0	50
Total	814	992	0	370

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Wawona Street	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,806	370	

* 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 Airport Way
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative Plus Project
 Peak Hour AM

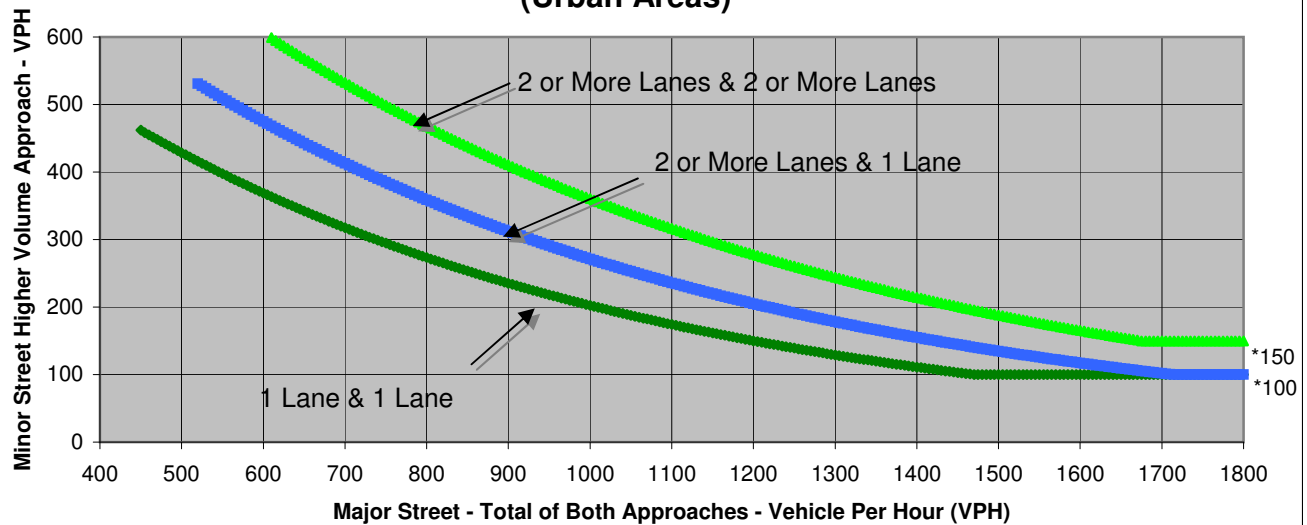
Turn Movement Volumes

	NB	SB	EB	WB
Left	20	137	200	83
Through	925	315	311	537
Right	30	690	40	514
Total	975	1,142	551	1,134

Major Street Direction

x	North/South
	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Woodward Avenue	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	2,117	1,134	

* 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 Main Street
 Minor Street Atherton Drive

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative Plus Project
 Peak Hour AM

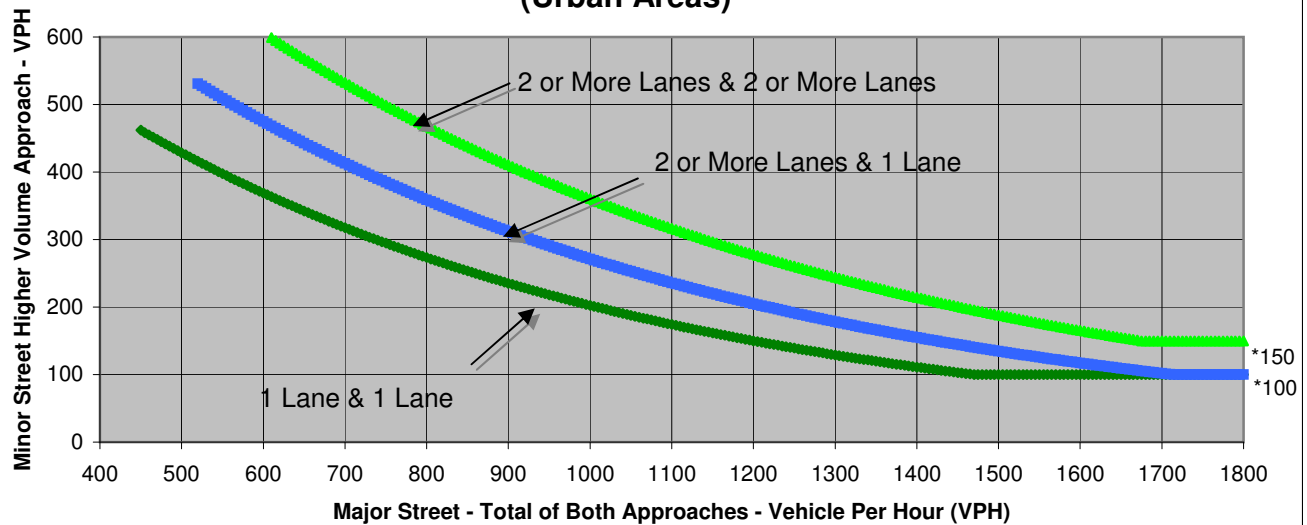
Turn Movement Volumes

	NB	SB	EB	WB
Left	250	0	120	
Through	1,280	590	0	
Right	0	370	70	
Total	1,530	960	190	0

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Main Street	Minor Street Atherton Drive	<u>Warrant Met</u>
Number of Approach Lanes	2	1	<u>YES</u>
Traffic Volume (VPH) *	2,490	190	

* 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 Main Street
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative Plus Project
 Peak Hour AM

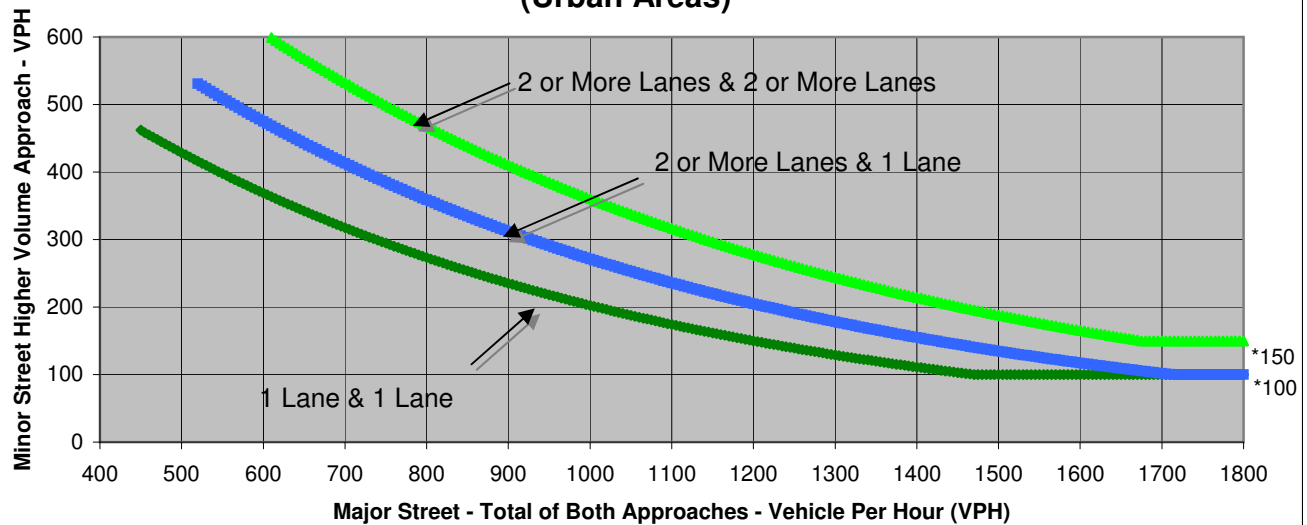
Turn Movement Volumes

	NB	SB	EB	WB
Left	121	245	380	40
Through	550	270	224	532
Right	80	145	62	600
Total	751	660	666	1,172

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Main Street	Woodward Avenue	
Number of Approach Lanes	2	2	<u>YES</u>
Traffic Volume (VPH) *	1,411	1,172	

* 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 Union Road
 Minor Street Daniels Street

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative Plus Project
 Peak Hour AM

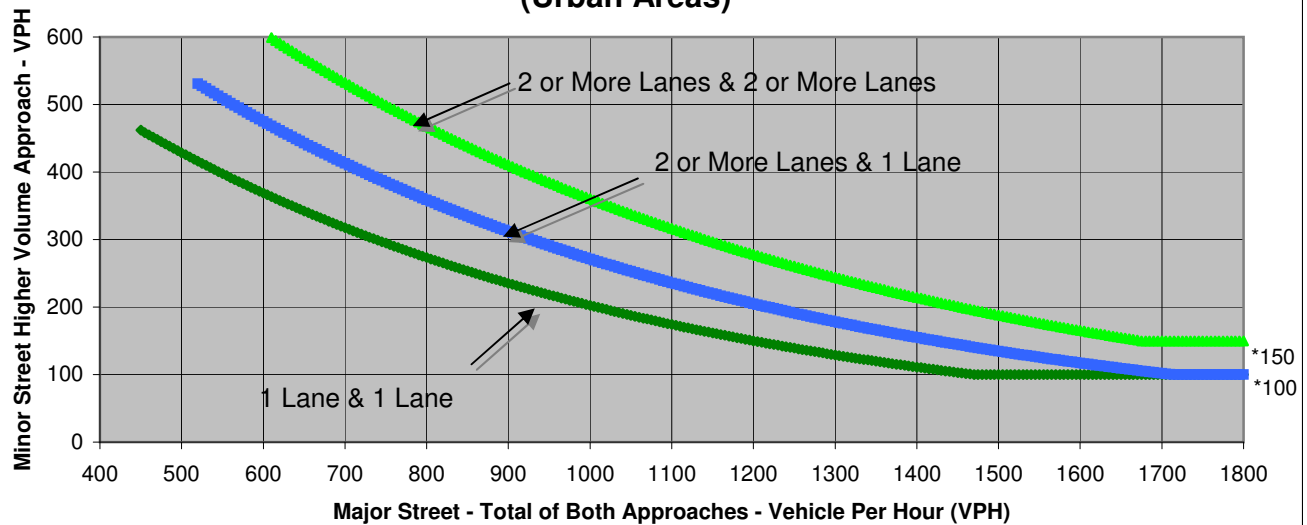
Turn Movement Volumes

	NB	SB	EB	WB
Left	97	0	40	0
Through	1,104	1,313	0	0
Right	0	30	150	0
Total	1,201	1,343	190	0

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Union Road	Minor Street Daniels Street	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	2,544	190	

* 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 Union Road
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative Plus Project
 Peak Hour AM

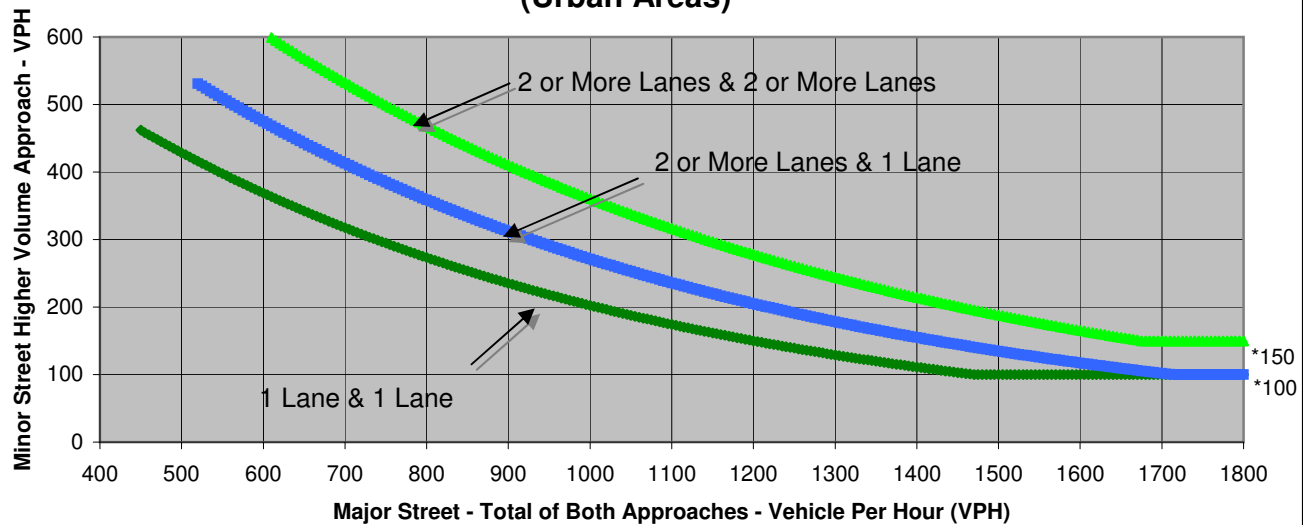
Turn Movement Volumes

	NB	SB	EB	WB
Left	253	104	191	50
Through	1,143	367	275	570
Right	40	160	70	197
Total	1,436	631	536	817

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Union Road	Woodward Avenue	
Number of Approach Lanes	2	2	<u>YES</u>
Traffic Volume (VPH) *	2,067	817	

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

HCM Signalized Intersection Capacity Analysis

1: Yosemite Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	0.93		1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3418		1770	3306		1770	1827	1583	1770	1719	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3418		1770	3306		1770	1827	1583	1770	1719	
Volume (vph)	240	432	127	200	221	173	111	538	120	360	665	540
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	253	455	134	211	233	182	117	566	126	379	700	568
RTOR Reduction (vph)	0	25	0	0	134	0	0	0	50	0	24	0
Lane Group Flow (vph)	253	564	0	211	281	0	117	566	76	379	1244	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	11.1	20.1		15.8	24.8		9.9	28.2	28.2	24.7	43.0	
Effective Green, g (s)	11.1	20.1		15.8	24.8		9.9	28.2	28.2	24.7	43.0	
Actuated g/C Ratio	0.11	0.19		0.15	0.24		0.09	0.27	0.27	0.24	0.41	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	187	656		267	782		167	492	426	417	705	
v/s Ratio Prot	c0.14	c0.16		c0.12	0.08		0.07	0.31		c0.21	c0.72	
v/s Ratio Perm									0.05			
v/c Ratio	1.35	0.86		0.79	0.36		0.70	1.15	0.18	0.91	1.76	
Uniform Delay, d1	46.9	41.0		42.9	33.4		46.0	38.3	29.4	39.0	30.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	189.7	10.9		14.6	0.3		12.5	89.0	0.9	23.1	349.7	
Delay (s)	236.6	51.9		57.5	33.7		58.5	127.3	30.3	62.1	380.6	
Level of Service	F	D		E	C		E	F	C	E	F	
Approach Delay (s)		107.4			41.7			102.2			307.3	
Approach LOS		F			D			F			F	
Intersection Summary												
HCM Average Control Delay			179.8			HCM Level of Service				F		
HCM Volume to Capacity ratio			1.36									
Actuated Cycle Length (s)			104.8			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			114.6%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Wawona St. & Airport Way

1/5/2009

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Volume (veh/h)	320	50	719	95	40	952			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95			
Hourly flow rate (vph)	337	53	757	100	42	1002			
Pedestrians	2					2			
Lane Width (ft)	12.0					12.0			
Walking Speed (ft/s)	4.0					4.0			
Percent Blockage	0					0			
Right turn flare (veh)									
Median type	None								
Median storage veh									
Upstream signal (ft)	1313								
pX, platoon unblocked	0.74	0.74			0.74				
vC, conflicting volume	1895	811			859				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	2216	743			808				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	0	83			93				
cM capacity (veh/h)	33	305			601				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	389	857	1044						
Volume Left	337	0	42						
Volume Right	53	100	0						
cSH	37	1700	601						
Volume to Capacity	10.41	0.50	0.07						
Queue Length 95th (ft)	Err	0	6						
Control Delay (s)	Err	0.0	2.3						
Lane LOS	F		A						
Approach Delay (s)	Err	0.0	2.3						
Approach LOS	F								
Intersection Summary									
Average Delay	1701.3								
Intersection Capacity Utilization	110.0%		ICU Level of Service		H				
Analysis Period (min)	15								

HCM Signalized Intersection Capacity Analysis

3: Daniels Street & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1562	3433	1863	1561	3433	3471	1545	1770	3471	1561
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1562	3433	1863	1561	3433	3471	1545	1770	3471	1561
Volume (vph)	30	13	181	210	32	50	416	734	240	90	1052	130
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	14	191	221	34	53	438	773	253	95	1107	137
RTOR Reduction (vph)	0	0	170	0	0	45	0	0	104	0	0	60
Lane Group Flow (vph)	32	14	21	221	34	8	438	773	149	95	1107	77
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	6.6	13.1	13.1	12.0	18.5	18.5	25.0	65.6	65.6	13.3	53.9	53.9
Effective Green, g (s)	6.6	13.1	13.1	12.0	18.5	18.5	25.0	65.6	65.6	13.3	53.9	53.9
Actuated g/C Ratio	0.05	0.11	0.11	0.10	0.15	0.15	0.21	0.55	0.55	0.11	0.45	0.45
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	189	203	171	343	287	241	715	1897	845	196	1559	701
v/s Ratio Prot	0.01	0.01		c0.06	c0.02		c0.13	0.22		0.05	c0.32	
v/s Ratio Perm			0.01			0.01			0.10			0.05
v/c Ratio	0.17	0.07	0.12	0.64	0.12	0.03	0.61	0.41	0.18	0.48	0.71	0.11
Uniform Delay, d1	54.1	48.0	48.3	51.9	43.7	43.2	43.1	15.9	13.6	50.1	26.7	19.1
Progression Factor	1.00	1.00	1.00	1.03	1.03	1.21	1.03	0.98	0.81	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.1	0.3	4.1	0.2	0.1	0.6	0.3	0.2	1.9	2.8	0.3
Delay (s)	54.5	48.1	48.6	57.3	45.1	52.2	45.1	15.8	11.2	52.0	29.5	19.5
Level of Service	D	D	D	E	D	D	D	B	B	D	C	B
Approach Delay (s)		49.4			55.1			23.8			30.1	
Approach LOS		D			E			C			C	
Intersection Summary												
HCM Average Control Delay			31.0				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			64.4%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: SR 120 WB & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00
Frt					1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1770	1495	1770	1759			1759	1495
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1770	1495	1770	1759			1759	1495
Volume (vph)	0	0	0	1110	0	510	1160	880	0	0	773	670
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	1168	0	537	1221	926	0	0	814	705
RTOR Reduction (vph)	0	0	0	0	0	73	0	0	0	0	0	286
Lane Group Flow (vph)	0	0	0	0	1168	464	1221	926	0	0	814	419
Heavy Vehicles (%)	0%	2%	2%	2%	2%	8%	2%	8%	2%	2%	8%	8%
Turn Type				Perm		Perm	Prot					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8						6
Actuated Green, G (s)					46.0	46.0	14.0	66.0			48.0	48.0
Effective Green, g (s)					46.0	46.0	14.0	66.0			48.0	48.0
Actuated g/C Ratio					0.38	0.38	0.12	0.55			0.40	0.40
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					679	573	207	967			704	598
v/s Ratio Prot							c0.69	0.53			c0.46	
v/s Ratio Perm					0.66	0.31						0.28
v/c Ratio					1.72	0.81	5.90	0.96			1.16	0.70
Uniform Delay, d1					37.0	33.1	53.0	25.7			36.0	30.0
Progression Factor					1.00	1.00	1.27	0.31			0.70	1.15
Incremental Delay, d2					330.3	8.5	2205.3	3.2			82.0	4.9
Delay (s)					367.3	41.6	2272.6	11.3			107.2	39.5
Level of Service					F	D	F	B			F	D
Approach Delay (s)		0.0			264.7			1297.3			75.8	
Approach LOS		A			F			F			E	
Intersection Summary												
HCM Average Control Delay			624.1				HCM Level of Service			F		
HCM Volume to Capacity ratio			2.01									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			177.2%				ICU Level of Service			H		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

5: SR 120 EB & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00	1.00	1.00	1.00	
Frt		1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1671	1583					1863	1583	1671	1863	
Flt Permitted		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1671	1583					1863	1583	1671	1863	
Volume (vph)	290	0	450	0	0	0	0	1750	805	293	1590	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	305	0	474	0	0	0	0	1842	847	308	1674	0
RTOR Reduction (vph)	0	0	12	0	0	0	0	0	179	0	0	0
Lane Group Flow (vph)	0	305	462	0	0	0	0	1842	668	308	1674	0
Heavy Vehicles (%)	8%	2%	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%
Turn Type	Perm		Perm						Perm		Prot	
Protected Phases		4						2		1	6	
Permitted Phases	4		4						2			
Actuated Green, G (s)		38.4	38.4					46.0	46.0	23.6	73.6	
Effective Green, g (s)		38.4	38.4					46.0	46.0	23.6	73.6	
Actuated g/C Ratio		0.32	0.32					0.38	0.38	0.20	0.61	
Clearance Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		535	507					714	607	329	1143	
v/s Ratio Prot								c0.99		0.18	c0.90	
v/s Ratio Perm		0.18	c0.29						0.42			
v/c Ratio		0.57	0.91					2.58	1.10	0.94	1.46	
Uniform Delay, d1		33.9	39.2					37.0	37.0	47.5	23.2	
Progression Factor		1.00	1.00					1.00	1.00	0.25	0.44	
Incremental Delay, d2		1.5	20.5					715.0	66.8	5.4	209.5	
Delay (s)		35.4	59.7					752.0	103.8	17.1	219.7	
Level of Service		D	E					F	F	B	F	
Approach Delay (s)		50.2			0.0			547.9			188.2	
Approach LOS		D			A			F			F	
Intersection Summary												
HCM Average Control Delay		345.9						HCM Level of Service		F		
HCM Volume to Capacity ratio		1.76										
Actuated Cycle Length (s)		120.0						Sum of lost time (s)		12.0		
Intersection Capacity Utilization		177.2%						ICU Level of Service		H		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

6: Atherton Dr & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	470	40	20	127	35	670	43	1415	181	370	995	675
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	495	42	21	134	37	705	45	1489	191	389	1047	711
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			14			14						
Median type		None			None							
Median storage veh												
Upstream signal (ft)											720	
pX, platoon unblocked	0.43	0.43	0.43	0.43	0.43		0.43					
vC, conflicting volume	3777	3597	1047	3438	4117	1489	1758			1680		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	7438	7019	1110	6651	8225	1489	2757			1680		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	81	0	0	0	27			0		
cM capacity (veh/h)	0	0	110	0	0	152	62			381		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3			
Volume Total	558	134	742	45	1489	191	389	1047	711			
Volume Left	495	134	0	45	0	0	389	0	0			
Volume Right	21	0	705	0	0	191	0	0	711			
cSH	0	0	0	62	1700	1700	381	1700	1700			
Volume to Capacity	Err	Err	Err	0.73	0.88	0.11	1.02	0.62	0.42			
Queue Length 95th (ft)	Err	Err	Err	80	0	0	316	0	0			
Control Delay (s)	Err	Err	Err	152.9	0.0	0.0	85.6	0.0	0.0			
Lane LOS	F	F	F	F			F					
Approach Delay (s)	Err	Err		4.0			15.5					
Approach LOS	F	F										
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization			154.1%		ICU Level of Service				H			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

7: Woodward Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	200	311	40	83	537	514	20	925	30	137	315	690
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	211	327	42	87	565	541	21	974	32	144	332	726
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	580	1194	1026	1202								
Volume Left (vph)	211	87	21	144								
Volume Right (vph)	42	541	32	726								
Hadj (s)	0.06	-0.22	0.02	-0.30								
Departure Headway (s)	9.6	9.3	9.6	9.3								
Degree Utilization, x	1.55	3.10	2.73	3.09								
Capacity (veh/h)	387	398	386	401								
Control Delay (s)	285.3	969.9	806.9	967.3								
Approach Delay (s)	285.3	969.9	806.9	967.3								
Approach LOS	F	F	F	F								
Intersection Summary												
Delay			828.1									
HCM Level of Service			F									
Intersection Capacity Utilization			215.7%		ICU Level of Service					H		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

8: Yosemite Avenue & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.97		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	3384		1770	3269		1770	3367	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	1770	3384		1770	3269		1770	3367	
Volume (vph)	150	400	192	301	170	70	194	547	164	70	481	230
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	158	421	202	317	179	74	204	576	173	74	506	242
RTOR Reduction (vph)	0	0	147	0	57	0	0	33	0	0	69	0
Lane Group Flow (vph)	158	421	55	317	196	0	204	716	0	74	679	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	9.4	20.7	20.7	6.0	17.3		11.8	27.9		6.0	22.1	
Effective Green, g (s)	9.4	20.7	20.7	6.0	17.3		11.8	27.9		6.0	22.1	
Actuated g/C Ratio	0.12	0.27	0.27	0.08	0.23		0.15	0.36		0.08	0.29	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	217	503	428	139	764		273	1191		139	971	
v/s Ratio Prot	0.09	c0.23		c0.18	0.06		c0.12	0.22		0.04	c0.20	
v/s Ratio Perm			0.03									
v/c Ratio	0.73	0.84	0.13	2.28	0.26		0.75	0.60		0.53	0.70	
Uniform Delay, d1	32.4	26.4	21.1	35.3	24.4		31.0	19.8		34.0	24.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	11.5	11.6	0.1	598.5	0.2		10.6	2.2		3.9	4.2	
Delay (s)	43.9	37.9	21.3	633.8	24.5		41.6	22.1		37.8	28.5	
Level of Service	D	D	C	F	C		D	C		D	C	
Approach Delay (s)		34.8			363.4			26.3			29.3	
Approach LOS		C			F			C			C	
Intersection Summary												
HCM Average Control Delay			90.7			HCM Level of Service				F		
HCM Volume to Capacity ratio			0.91									
Actuated Cycle Length (s)			76.6			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			82.5%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: Wawona St. & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.89		1.00	0.93		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1667		1770	1732		1770	3304		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1667		1770	1732		1770	3304		1770	1863	1583
Volume (vph)	80	90	212	210	90	80	159	821	113	120	933	20
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	84	95	223	221	95	84	167	864	119	126	982	21
RTOR Reduction (vph)	0	136	0	0	50	0	0	14	0	0	0	12
Lane Group Flow (vph)	84	182	0	221	129	0	167	969	0	126	982	9
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot			Prot			Prot			Prot		Over
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												
Actuated Green, G (s)	4.7	12.5		6.0	13.8		6.0	22.8		6.3	23.1	4.7
Effective Green, g (s)	4.7	12.5		6.0	13.8		6.0	22.8		6.3	23.1	4.7
Actuated g/C Ratio	0.07	0.20		0.09	0.22		0.09	0.36		0.10	0.36	0.07
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	131	328		167	376		167	1184		175	677	117
v/s Ratio Prot	0.05	c0.11		c0.12	0.07		c0.09	0.29		0.07	c0.53	0.01
v/s Ratio Perm												
v/c Ratio	0.64	0.56		1.32	0.34		1.00	0.82		0.72	1.45	0.08
Uniform Delay, d1	28.6	23.0		28.8	21.1		28.8	18.5		27.8	20.2	27.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	10.3	2.0		181.0	0.5		69.6	6.4		13.3	211.0	0.3
Delay (s)	38.9	25.1		209.8	21.6		98.4	24.9		41.1	231.2	27.7
Level of Service	D	C		F	C		F	C		D	F	C
Approach Delay (s)		28.0			125.6			35.6			206.2	
Approach LOS		C			F			D			F	
Intersection Summary												
HCM Average Control Delay			108.8			HCM Level of Service				F		
HCM Volume to Capacity ratio			1.05									
Actuated Cycle Length (s)			63.6			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			100.6%			ICU Level of Service			G			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

10: Daniels Street & Union Road

1/5/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	  					
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	40	150	97	1104	1313	30
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	42	158	102	1162	1382	32
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)	306					
pX, platoon unblocked	0.72					
vC, conflicting volume	2764	1398	1414			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3463	1398	1414			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	8	79			
cM capacity (veh/h)	4	172	482			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	200	1264	1414			
Volume Left	42	102	0			
Volume Right	158	0	32			
cSH	18	482	1700			
Volume to Capacity	10.92	0.21	0.83			
Queue Length 95th (ft)	Err	20	0			
Control Delay (s)	Err	10.1	0.0			
Lane LOS	F	B				
Approach Delay (s)	Err	10.1	0.0			
Approach LOS	F					
Intersection Summary						
Average Delay	699.3					
Intersection Capacity Utilization	155.9%			ICU Level of Service	H	
Analysis Period (min)	15					

HCM Signalized Intersection Capacity Analysis

11: SR 120 WB Ramps & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↰	↱	↰	↱			↱	↰
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00
Frt					1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1671	1583	1770	1759			1863	1583
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1671	1583	1770	1759			1863	1583
Volume (vph)	0	0	0	253	0	350	828	851	0	0	803	660
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	266	0	368	872	896	0	0	845	695
RTOR Reduction (vph)	0	0	0	0	0	185	0	0	0	0	0	262
Lane Group Flow (vph)	0	0	0	0	266	184	872	896	0	0	845	433
Heavy Vehicles (%)	2%	2%	2%	8%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type				Perm		Perm	Prot					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8						6
Actuated Green, G (s)					21.6	21.6	26.4	90.4			60.0	60.0
Effective Green, g (s)					21.6	21.6	26.4	90.4			60.0	60.0
Actuated g/C Ratio					0.18	0.18	0.22	0.75			0.50	0.50
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					301	285	389	1325			932	792
v/s Ratio Prot							c0.49	0.51			c0.45	
v/s Ratio Perm					0.16	0.12						0.27
v/c Ratio					0.88	0.64	2.24	0.68			0.91	0.55
Uniform Delay, d1					48.0	45.6	46.8	7.4			27.4	20.6
Progression Factor					1.00	1.00	0.88	0.33			1.00	1.00
Incremental Delay, d2					24.9	4.9	559.5	0.3			14.1	2.7
Delay (s)					72.9	50.6	600.6	2.7			41.5	23.3
Level of Service					E	D	F	A			D	C
Approach Delay (s)		0.0			59.9			297.6			33.3	
Approach LOS		A			E			F			C	
Intersection Summary												
HCM Average Control Delay			156.1									
HCM Volume to Capacity ratio			1.23									
Actuated Cycle Length (s)			120.0									
Intersection Capacity Utilization			113.9%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

12: SR 120 EB Ramps & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↱	↱					↱	↱	↱	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00	1.00	1.00	1.00	
Frt		1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1770	1495					1759	1495	1770	1863	
Flt Permitted		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1770	1495					1759	1495	1770	1863	
Volume (vph)	220	0	402	0	0	0	0	1459	259	270	786	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	232	0	423	0	0	0	0	1536	273	284	827	0
RTOR Reduction (vph)	0	0	108	0	0	0	0	0	59	0	0	0
Lane Group Flow (vph)	0	232	315	0	0	0	0	1536	214	284	827	0
Heavy Vehicles (%)	2%	2%	8%	2%	2%	2%	2%	8%	8%	2%	2%	8%
Turn Type	Perm		Perm						Perm		Prot	
Protected Phases		4						2		1	6	
Permitted Phases	4		4						2			
Actuated Green, G (s)		28.9	28.9					49.0	49.0	30.1	83.1	
Effective Green, g (s)		28.9	28.9					49.0	49.0	30.1	83.1	
Actuated g/C Ratio		0.24	0.24					0.41	0.41	0.25	0.69	
Clearance Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		426	360					718	610	444	1290	
v/s Ratio Prot								c0.87		0.16	c0.44	
v/s Ratio Perm		0.13	c0.21						0.14			
v/c Ratio		0.54	0.88					2.14	0.35	0.64	0.64	
Uniform Delay, d1		39.8	43.8					35.5	24.5	40.1	10.2	
Progression Factor		1.00	1.00					0.86	1.11	0.82	0.18	
Incremental Delay, d2		1.4	20.4					515.8	1.1	1.3	1.0	
Delay (s)		41.2	64.2					546.2	28.4	34.0	2.8	
Level of Service		D	E					F	C	C	A	
Approach Delay (s)		56.1			0.0			468.0			10.8	
Approach LOS		E			A			F			B	
Intersection Summary												
HCM Average Control Delay		250.5						HCM Level of Service		F		
HCM Volume to Capacity ratio		1.39										
Actuated Cycle Length (s)		120.0						Sum of lost time (s)	12.0			
Intersection Capacity Utilization		113.9%						ICU Level of Service	H			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

13: Atherton Dr. & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	0.88	0.97	0.95	0.88	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	2787	3433	3539	2787	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	2787	3433	3539	2787	3433	3539	1583
Volume (vph)	93	6	38	87	8	295	70	1322	127	535	546	47
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	98	6	40	92	8	311	74	1392	134	563	575	49
RTOR Reduction (vph)	0	0	38	0	0	280	0	0	44	0	0	17
Lane Group Flow (vph)	98	6	2	92	8	31	74	1392	90	563	575	32
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	7.6	6.0	6.0	13.4	11.8	11.8	6.2	58.8	58.8	25.8	78.4	78.4
Effective Green, g (s)	7.6	6.0	6.0	13.4	11.8	11.8	6.2	58.8	58.8	25.8	78.4	78.4
Actuated g/C Ratio	0.06	0.05	0.05	0.11	0.10	0.10	0.05	0.49	0.49	0.22	0.65	0.65
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	217	177	79	383	348	274	177	1734	1366	738	2312	1034
v/s Ratio Prot	c0.03	0.00		c0.03	0.00		0.02	c0.39		c0.16	0.16	
v/s Ratio Perm			0.00			c0.01			0.03			0.02
v/c Ratio	0.45	0.03	0.03	0.24	0.02	0.11	0.42	0.80	0.07	0.76	0.25	0.03
Uniform Delay, d1	54.2	54.2	54.2	48.7	48.9	49.3	55.2	25.7	16.1	44.2	8.6	7.4
Progression Factor	1.15	0.70	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.07	0.77	0.65
Incremental Delay, d2	1.5	0.1	0.1	0.3	0.0	0.2	1.6	4.0	0.1	3.2	0.2	0.0
Delay (s)	63.6	37.8	27.0	49.0	48.9	49.5	56.7	29.8	16.2	50.4	6.8	4.8
Level of Service	E	D	C	D	D	D	E	C	B	D	A	A
Approach Delay (s)		52.3			49.4			29.9			27.4	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM Average Control Delay			32.4				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.67									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			71.1%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

HCM Signalized Intersection Capacity Analysis

15: SR 120 WB Ramp & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↷	↶	↷			↶	↷
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00
Frpb, ped/bikes					1.00	0.98	1.00	1.00			1.00	0.98
Flpb, ped/bikes					1.00	1.00	1.00	1.00			1.00	1.00
Frt					1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1736	1492	1736	1792			1792	1488
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1736	1492	1736	1792			1792	1488
Volume (vph)	0	0	0	260	0	310	520	944	0	0	410	980
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	274	0	326	547	994	0	0	432	1032
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	452
Lane Group Flow (vph)	0	0	0	0	274	326	547	994	0	0	432	580
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	2%	2%	2%	4%	2%	6%	4%	6%	2%	2%	6%	6%
Turn Type				Split		Free	Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases						Free						6
Actuated Green, G (s)					22.7	120.0	46.3	89.3			39.0	39.0
Effective Green, g (s)					22.7	120.0	46.3	89.3			39.0	39.0
Actuated g/C Ratio					0.19	1.00	0.39	0.74			0.32	0.32
Clearance Time (s)					4.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)					3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					328	1492	670	1334			582	484
v/s Ratio Prot					c0.16		c0.32	0.55			0.24	
v/s Ratio Perm						0.22						c0.39
v/c Ratio					0.84	0.22	0.82	0.75			0.74	1.20
Uniform Delay, d1					46.9	0.0	33.0	8.8			36.0	40.5
Progression Factor					1.00	1.00	0.06	0.22			1.00	1.00
Incremental Delay, d2					16.6	0.3	0.7	0.4			8.3	107.6
Delay (s)					63.4	0.3	2.6	2.3			44.3	148.1
Level of Service					E	A	A	A			D	F
Approach Delay (s)		0.0			29.1			2.4			117.5	
Approach LOS		A			C			A			F	
Intersection Summary												
HCM Average Control Delay			53.6									
HCM Volume to Capacity ratio			0.96									
Actuated Cycle Length (s)			120.0									
Intersection Capacity Utilization			126.0%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

16: SR 120 EB Ramps & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.98					0.99		1.00	1.00	
Flpb, ped/bikes		1.00	1.00					1.00		1.00	1.00	
Frt		1.00	0.85					0.96		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1703	1517					1731		1703	1827	
Flt Permitted		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (perm)		1703	1517					1731		1703	1827	
Volume (vph)	524	0	460	0	0	0	0	940	460	170	500	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	552	0	484	0	0	0	0	989	484	179	526	0
RTOR Reduction (vph)	0	0	184	0	0	0	0	13	0	0	0	0
Lane Group Flow (vph)	0	552	300	0	0	0	0	1460	0	179	526	0
Confl. Peds. (#/hr)			2				2			2		2
Heavy Vehicles (%)	6%	2%	4%	2%	2%	2%	2%	4%	4%	6%	4%	2%
Turn Type	Split		Perm							Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases			4									
Actuated Green, G (s)		40.0	40.0					48.2		19.8	72.0	
Effective Green, g (s)		40.0	40.0					48.2		19.8	72.0	
Actuated g/C Ratio		0.33	0.33					0.40		0.17	0.60	
Clearance Time (s)		4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)		568	506					695		281	1096	
v/s Ratio Prot		c0.32						c0.84		c0.11	0.29	
v/s Ratio Perm			0.20									
v/c Ratio		0.97	0.59					2.10		0.64	0.48	
Uniform Delay, d1		39.4	33.2					35.9		46.7	13.5	
Progression Factor		1.00	1.00					1.00		1.34	0.23	
Incremental Delay, d2		30.5	1.9					500.1		3.1	0.9	
Delay (s)		70.0	35.1					536.0		65.7	3.9	
Level of Service		E	D					F		E	A	
Approach Delay (s)		53.7			0.0			536.0			19.6	
Approach LOS		D			A			F			B	
Intersection Summary												
HCM Average Control Delay		267.3										
HCM Volume to Capacity ratio		1.41										
Actuated Cycle Length (s)		120.0								12.0		
Intersection Capacity Utilization		126.0%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

17: Atherton Drive & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	120	0	70	0	0	0	250	1280	0	0	590	370
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	126	0	74	0	0	0	263	1347	0	0	621	389
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)											640	
pX, platoon unblocked	0.92	0.92	0.92	0.92	0.92		0.92					
vC, conflicting volume	2495	2495	621	2568	2884	1347	1011			1347		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2619	2619	589	2699	3041	1347	1011			1347		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	84	100	100	100	58			100		
cM capacity (veh/h)	10	13	469	7	7	185	633			511		
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2					
Volume Total	126	74	0	263	1347	621	389					
Volume Left	126	0	0	263	0	0	0					
Volume Right	0	74	0	0	0	0	389					
cSH	10	469	1700	633	1700	1700	1700					
Volume to Capacity	12.69	0.16	0.00	0.42	0.79	0.37	0.23					
Queue Length 95th (ft)	Err	14	0	51	0	0	0					
Control Delay (s)	Err	14.1	0.0	14.7	0.0	0.0	0.0					
Lane LOS	F	B	A	B								
Approach Delay (s)	6320.4		0.0	2.4	0.0							
Approach LOS	F		A									
Intersection Summary												
Average Delay	449.5											
Intersection Capacity Utilization	80.7%			ICU Level of Service				D				
Analysis Period (min)	15											

Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

HCM Unsignalized Intersection Capacity Analysis

19: Union Road &

1/5/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				↑↑	↑↑↱	
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	0	0	1710	1128	57
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	0	1800	1187	60
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)				370	489	
pX, platoon unblocked	0.66					
vC, conflicting volume	2117	624	1247			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2178	624	1247			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	26	428	554			
Direction, Lane #	NB 1	NB 2	SB 1	SB 2		
Volume Total	900	900	792	456		
Volume Left	0	0	0	0		
Volume Right	0	0	0	60		
cSH	1700	1700	1700	1700		
Volume to Capacity	0.53	0.53	0.47	0.27		
Queue Length 95th (ft)	0	0	0	0		
Control Delay (s)	0.0	0.0	0.0	0.0		
Lane LOS						
Approach Delay (s)	0.0		0.0			
Approach LOS						
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization		50.6%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

20: Union Road &

1/5/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	16	0	1519	633	38
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	17	0	1599	666	40
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)					310	
pX, platoon unblocked	0.94	0.94	0.94			
vC, conflicting volume	1486	353	706			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1451	240	618			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	100			
cM capacity (veh/h)	114	712	897			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	17	799	799	444	262	
Volume Left	0	0	0	0	0	
Volume Right	17	0	0	0	40	
cSH	712	1700	1700	1700	1700	
Volume to Capacity	0.02	0.47	0.47	0.26	0.15	
Queue Length 95th (ft)	2	0	0	0	0	
Control Delay (s)	10.2	0.0	0.0	0.0	0.0	
Lane LOS	B					
Approach Delay (s)	10.2	0.0		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization		45.3%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

21: Union Road &

1/5/2009

							
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Sign Control	Stop			Free	Free		
Grade	0%			0%	0%		
Volume (veh/h)	16	5	27	1503	633	16	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	
Hourly flow rate (vph)	17	5	28	1582	666	17	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None						
Median storage veh							
Upstream signal (ft)	530						
pX, platoon unblocked	0.95	0.95	0.95				
vC, conflicting volume	1523	342	683				
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1496	248	609				
tC, single (s)	6.8	6.9	4.1				
tC, 2 stage (s)							
tF (s)	3.5	3.3	2.2				
p0 queue free %	84	99	97				
cM capacity (veh/h)	104	712	914				
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	17	5	28	791	791	444	239
Volume Left	17	0	28	0	0	0	0
Volume Right	0	5	0	0	0	0	17
cSH	104	712	914	1700	1700	1700	1700
Volume to Capacity	0.16	0.01	0.03	0.47	0.47	0.26	0.14
Queue Length 95th (ft)	14	1	2	0	0	0	0
Control Delay (s)	46.1	10.1	9.1	0.0	0.0	0.0	0.0
Lane LOS	E	B	A				
Approach Delay (s)	37.6		0.2			0.0	
Approach LOS	E						
Intersection Summary							
Average Delay			0.5				
Intersection Capacity Utilization			51.5%		ICU Level of Service		A
Analysis Period (min)			15				

HCM Unsignalized Intersection Capacity Analysis

22: Union Road &

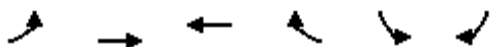
1/5/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	5	0	1530	626	11
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	5	0	1611	659	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)					720	
pX, platoon unblocked	0.96	0.96	0.96			
vC, conflicting volume	1470	335	671			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1448	265	615			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	117	703	922			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	5	805	805	439	231	
Volume Left	0	0	0	0	0	
Volume Right	5	0	0	0	12	
cSH	703	1700	1700	1700	1700	
Volume to Capacity	0.01	0.47	0.47	0.26	0.14	
Queue Length 95th (ft)	1	0	0	0	0	
Control Delay (s)	10.2	0.0	0.0	0.0	0.0	
Lane LOS	B					
Approach Delay (s)	10.2	0.0		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay		0.0				
Intersection Capacity Utilization		45.6%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

23: Woodward Avenue &

1/5/2009

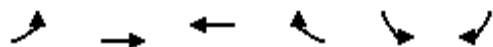


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	533	973	7	0	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	561	1024	7	0	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1032				1308	516
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1032				1308	516
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	669				151	504
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	281	281	683	349	1	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	7	1	
cSH	1700	1700	1700	1700	504	
Volume to Capacity	0.17	0.17	0.40	0.21	0.00	
Queue Length 95th (ft)	0	0	0	0	0	
Control Delay (s)	0.0	0.0	0.0	0.0	12.2	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		12.2	
Approach LOS					B	
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			37.1%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

24: Int

1/5/2009



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↑	↑
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	0	0	15	11	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	0	16	12	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)			451			
pX, platoon unblocked						
vC, conflicting volume	16				8	8
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	16				8	8
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1600				1011	1072
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	0	0	0	16	12	0
Volume Left	0	0	0	0	12	0
Volume Right	0	0	0	16	0	0
cSH	1700	1700	1700	1700	1011	1700
Volume to Capacity	0.00	0.00	0.00	0.01	0.01	0.00
Queue Length 95th (ft)	0	0	0	0	1	0
Control Delay (s)	0.0	0.0	0.0	0.0	8.6	0.0
Lane LOS					A	A
Approach Delay (s)	0.0		0.0		8.6	
Approach LOS					A	
Intersection Summary						
Average Delay			3.6			
Intersection Capacity Utilization			13.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Int

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↵	↑↑				↵			↵
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	11	0	5	15	16	0	0	3	12	0	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	12	0	5	16	17	0	0	3	13	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)					249							
pX, platoon unblocked												
vC, conflicting volume	33			12			30	55	6	44	46	16
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	33			12			30	55	6	44	46	16
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	99	100	100
cM capacity (veh/h)	1578			1606			972	833	1075	948	842	1059
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1					
Volume Total	6	6	5	11	22	3	13					
Volume Left	0	0	5	0	0	0	13					
Volume Right	0	0	0	0	17	3	0					
cSH	1700	1700	1606	1700	1700	1075	948					
Volume to Capacity	0.00	0.00	0.00	0.01	0.01	0.00	0.01					
Queue Length 95th (ft)	0	0	0	0	0	0	1					
Control Delay (s)	0.0	0.0	7.2	0.0	0.0	8.4	8.8					
Lane LOS			A			A	A					
Approach Delay (s)	0.0		1.0			8.4	8.8					
Approach LOS						A	A					
Intersection Summary												
Average Delay			2.7									
Intersection Capacity Utilization			Err%	ICU Level of Service				H				
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

26: Int

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		0.95		0.97	0.95			1.00	1.00		1.00	
Frt		1.00		1.00	0.91			1.00	0.85		1.00	
Flt Protected		1.00		0.95	1.00			1.00	1.00		0.97	
Satd. Flow (prot)		3539		3433	3214			1863	1583		1798	
Flt Permitted		1.00		0.95	1.00			1.00	1.00		0.79	
Satd. Flow (perm)		3539		3433	3214			1863	1583		1463	
Volume (vph)	0	26	0	32	36	57	0	25	44	67	26	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	27	0	34	38	60	0	26	46	71	27	0
RTOR Reduction (vph)	0	0	0	0	52	0	0	0	21	0	0	0
Lane Group Flow (vph)	0	27	0	34	46	0	0	26	25	0	98	0
Turn Type	Prot			Prot			Split		Perm	Perm		Perm
Protected Phases	7	4		3	8		2	2			6	
Permitted Phases									2	6		6
Actuated Green, G (s)		8.1		4.1	16.2			66.4	66.4		25.4	
Effective Green, g (s)		8.1		4.1	16.2			66.4	66.4		25.4	
Actuated g/C Ratio		0.07		0.03	0.13			0.55	0.55		0.21	
Clearance Time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		239		117	434			1031	876		310	
v/s Ratio Prot		0.01		c0.01	c0.01			0.01				
v/s Ratio Perm									c0.02		c0.07	
v/c Ratio		0.11		0.29	0.11			0.03	0.03		0.32	
Uniform Delay, d1		52.6		56.5	45.5			12.1	12.2		40.0	
Progression Factor		1.00		0.50	0.14			1.00	1.00		1.00	
Incremental Delay, d2		0.2		1.4	0.1			0.0	0.1		2.7	
Delay (s)		52.8		29.5	6.5			12.2	12.2		42.6	
Level of Service		D		C	A			B	B		D	
Approach Delay (s)		52.8			12.4			12.2			42.6	
Approach LOS		D			B			B			D	
Intersection Summary												
HCM Average Control Delay			24.7			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.12									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			26.0%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

Level Of Service Computation Report

2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #14

Cycle (sec): 100 Critical Vol./Cap.(X): 3.651

Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 512.9

Optimal Cycle: 0 Level Of Service: F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0	1	0	1	0	1	0	1	0	1	0

Volume Module:	North Bound			South Bound			East Bound			West Bound		
Base Vol:	250	1110	40	85	350	140	165	275	70	50	570	170
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	250	1110	40	85	350	140	165	275	70	50	570	170
Added Vol:	0	36	0	15	23	12	23	0	0	0	0	23
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	250	1146	40	100	373	152	188	275	70	50	570	193
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	250	1146	40	100	373	152	188	275	70	50	570	193
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	250	1146	40	100	373	152	188	275	70	50	570	193
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	250	1146	40	100	373	152	188	275	70	50	570	193

Saturation Flow Module:	North Bound			South Bound			East Bound			West Bound		
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	300	314	328	292	310	325	294	308	324	291	309	325

Capacity Analysis Module:	North Bound			South Bound			East Bound			West Bound		
Vol/Sat:	0.83	3.65	0.12	0.34	1.20	0.47	0.64	0.89	0.22	0.17	1.84	0.59
Crit Moves:	****			****			****			****		
Delay/Veh:	53.6	1223	14.9	20.9	152	22.7	34.0	62.9	16.6	17.3	418	28.1
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	53.6	1223	14.9	20.9	152	22.7	34.0	62.9	16.6	17.3	418	28.1
LOS by Move:	F	F	B	C	F	C	D	F	C	C	F	D
ApproachDel:	985.7			99.7			46.6			301.1		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	985.7			99.7			46.6			301.1		
LOS by Appr:	F			F			E			F		
AllWayAvgQ:	3.2	105	0.1	0.5	11.9	0.8	1.6	4.1	0.3	0.2	34.7	1.3

Note: Queue reported is the number of cars per lane.

Level Of Service Detailed Computation Report
2000 HCM 4-Way Stop Method
Future Volume Alternative

Intersection #14

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
----- ----- ----- -----												
Time Period:	0.25 hour											
HevVeh:	0%			0%			0%			0%		
Alpha Value:	0.01											
----- ----- ----- -----												
GroupType:	6			6			6			6		
P[C1]:	0.0000			0.0000			0.0000			0.0000		
P[C2]:	0.0000			0.0000			0.0000			0.0000		
P[C3]:	0.0000			0.0000			0.0000			0.0000		
P[C4]:	0.0307			0.0307			0.0000			0.0307		
P[C5]:	0.9693			0.9693			1.0000			0.9693		
Padj[C1]:	0.03969			0.03969			0.04000			0.03969		
Padj[C2]:	0.02969			0.02969			0.03000			0.02969		
Padj[C3]:	0.01969			0.01969			0.02000			0.01969		
Padj[C4]:	0.00785			0.00785			0.01000			0.00785		
Padj[C5]:	-0.09693			-0.09693			-0.10000			-0.09693		
----- ----- ----- -----												
Lanes:	L1		L2	L1		L2	L1		L2	L1		L2
LaneType:	LEFT		RITE	LEFT		RITE	LEFT		RITE	LEFT		RITE
----- ----- ----- -----												
HeadwayAdj:	0.500		-0.700	0.500		-0.700	0.500		-0.700	0.500		-0.700
Volume:	250		40	100		152	188		70	50		193
Capacity:	300		328	292		325	294		324	291		325
DegOfUtil:	0.83		0.12	0.34		0.46	0.64		0.21	0.17		0.59
DepHeadway:	11.97		10.77	12.13		10.93	12.19		10.99	12.15		10.95
ServiceTime:	9.7		8.5	9.8		8.6	9.9		8.7	9.9		8.7
Delay:	53.6		14.9	20.9		22.7	34.0		16.6	17.3		28.1
Queue:	3.2		0.1	0.5		0.8	1.6		0.3	0.2		1.3
----- ----- ----- -----												
Lane:	L3			L3			L3			L3		
LaneType:	THRU			THRU			THRU			THRU		
----- ----- ----- -----												
HeadwayAdj:	0.000			0.000			0.000			0.000		
Volume:	1146			373			275			570		
Capacity:	314			310			308			309		
DegOfUtil:	3.65			1.20			0.89			1.84		
DepHeadway:	11.47			11.63			11.69			11.65		
ServiceTime:	9.2			9.3			9.4			9.4		
Delay:	1222.9			152.2			62.9			418.4		
Queue:	105.4			11.9			4.1			34.7		
----- ----- ----- -----												
Approach:	North Bound			South Bound			East Bound			West Bound		
----- ----- ----- -----												
ApproachDel:	985.7			99.7			46.6			301.1		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	985.7			99.7			46.6			301.1		
LOS by Appr:	F			F			E			F		

OverallDel:	512.9
OverallLOS:	F

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #14

Future Volume Alternative: Peak Hour Warrant Met

Approach:	North Bound	South Bound	East Bound	West Bound
Movement:	L - T - R	L - T - R	L - T - R	L - T - R
Control:	Stop Sign	Stop Sign	Stop Sign	Stop Sign
Lanes:	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1
Initial Vol:	250 1146 40	100 373 152	188 275 70	50 570 193
Major Street Volume:	2061			
Minor Approach Volume:	813			
Minor Approach Volume Threshold:	63 [less than minimum of 150]			

SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

Level Of Service Computation Report

2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #18

Cycle (sec): 100 Critical Vol./Cap.(X): 1.887

Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 255.8

Optimal Cycle: 0 Level Of Service: F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0	1	0	1	0	1	0	1	0	1	0

Volume Module:

Base Vol:	110	550	80	245	270	145	380	220	55	40	525	600
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	110	550	80	245	270	145	380	220	55	40	525	600
Added Vol:	11	0	0	0	0	0	0	4	7	0	7	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	121	550	80	245	270	145	380	224	62	40	532	600
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	121	550	80	245	270	145	380	224	62	40	532	600
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	121	550	80	245	270	145	380	224	62	40	532	600
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	121	550	80	245	270	145	380	224	62	40	532	600

Saturation Flow Module:

Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	278	291	306	289	301	319	285	296	312	286	302	320

Capacity Analysis Module:

Vol/Sat:	0.44	1.89	0.26	0.85	0.90	0.45	1.33	0.76	0.20	0.14	1.76	1.87
Crit Moves:	****			****			****			****		
Delay/Veh:	24.9	437	18.3	57.6	64.3	22.9	204.4	44.1	16.9	17.1	384	429.6
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	24.9	437	18.3	57.6	64.3	22.9	204.4	44.1	16.9	17.1	384	429.6
LOS by Move:	C	F	C	F	F	C	F	E	C	C	F	F
ApproachDel:	326.3			52.7			133.0			394.9		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	326.3			52.7			133.0			394.9		
LOS by Appr:	F			F			F			F		
AllWayAvgQ:	0.7	34.2	0.3	3.4	4.2	0.8	15.0	2.4	0.2	0.2	31.0	37.0

Note: Queue reported is the number of cars per lane.

Level Of Service Detailed Computation Report
2000 HCM 4-Way Stop Method
Future Volume Alternative

Intersection #18

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R

Time Period: 0.25 hour

HevVeh: 0% 0% 0% 0%

Alpha Value: 0.01

GroupType:	6			6			6			6		
P[C1]:	0.0000			0.0000			0.0000			0.0000		
P[C2]:	0.0000			0.0000			0.0000			0.0000		
P[C3]:	0.0000			0.0000			0.0000			0.0000		
P[C4]:	0.0089			0.0000			0.0089			0.0089		
P[C5]:	0.9911			1.0000			0.9911			0.9911		
Padj[C1]:	0.03991			0.04000			0.03991			0.03991		
Padj[C2]:	0.02991			0.03000			0.02991			0.02991		
Padj[C3]:	0.01991			0.02000			0.01991			0.01991		
Padj[C4]:	0.00938			0.01000			0.00938			0.00938		
Padj[C5]:	-0.09911			-0.10000			-0.09911			-0.09911		

Lanes:	L1		L2		L1		L2		L1		L2		L1		L2	
LaneType:	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE
HeadwayAdj:	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700
Volume:	121	80	245	145	380	62	40	600								
Capacity:	278	306	289	319	285	312	286	320								
DegOfUtil:	0.43	0.26	0.85	0.45	1.33	0.20	0.14	1.87								
DepHeadway:	12.83	11.63	12.44	11.24	12.61	11.41	12.44	11.24								
ServiceTime:	10.5	9.3	10.1	8.9	10.3	9.1	10.1	8.9								
Delay:	24.9	18.3	57.6	22.9	204.4	16.9	17.1	429.6								
Queue:	0.7	0.3	3.4	0.8	15.0	0.2	0.2	37.0								

Lane:	L3		L3		L3		L3	
LaneType:	THRU	THRU	THRU	THRU	THRU	THRU	THRU	
HeadwayAdj:	0.000		0.000		0.000		0.000	
Volume:	550		270		224		532	
Capacity:	291		301		296		302	
DegOfUtil:	1.88		0.90		0.75		1.76	
DepHeadway:	12.33		11.94		12.11		11.94	
ServiceTime:	10.0		9.6		9.8		9.6	
Delay:	437.4		64.3		44.1		384.2	
Queue:	34.2		4.2		2.4		31.0	

Approach:	North Bound		South Bound		East Bound		West Bound	
ApproachDel:	326.3		52.7		133.0		394.9	
Delay Adj:	1.00		1.00		1.00		1.00	
ApprAdjDel:	326.3		52.7		133.0		394.9	
LOS by Appr:	F		F		F		F	

OverallDel:	255.8
OverallLOS:	F

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #18

Future Volume Alternative: Peak Hour Warrant Met

Approach:	North Bound	South Bound	East Bound	West Bound
Movement:	L - T - R	L - T - R	L - T - R	L - T - R
Control:	Stop Sign	Stop Sign	Stop Sign	Stop Sign
Lanes:	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1
Initial Vol:	121 550 80	245 270 145	380 224 62	40 532 600
Major Street Volume:	1838			
Minor Approach Volume:	751			
Minor Approach Volume Threshold:	112 [less than minimum of 150]			

SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

Cumulative, Plus Project, PM

Phone: _____ Fax: _____
 E-mail: _____

 Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR 120 Eastbound
 From/To: I-5 to Yosemite
 Jurisdiction: City of Manteca
 Analysis Year: C+P Conditions
 Description: Union Crossing EIR

 Flow Inputs and Adjustments

Volume, V	7273	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1976	v
Trucks and buses	7	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.966	
Driver population factor, fp	1.00	
Flow rate, vp	2727	pc/h/ln

 Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

 LOS and Performance Measures

Flow rate, vp	2727	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Yosemite to Airport
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Commercial EIR

Flow Inputs and Adjustments

Volume, V	8375	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	2276	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	3186	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	3186	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: _____ Fax: _____
 E-mail: _____

 Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR 120 Eastbound
 From/To: Airport to Union
 Jurisdiction: City of Manteca
 Analysis Year: C+P Conditions
 Description: Union Crossing EIR

 Flow Inputs and Adjustments

Volume, V	7869	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	2138	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2994	pc/h/ln

 Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

 LOS and Performance Measures

Flow rate, vp	2994	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Union to Main
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	6558	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1782	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2495	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2495	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Main to SR 99
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	5197	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1412	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1977	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1977	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	61.8	mi/h
Number of lanes, N	3	
Density, D	32.0	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: SR 99 to Main
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4395	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1194	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1672	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1672	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.7	mi/h
Number of lanes, N	3	
Density, D	25.9	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR 120 Westbound
 From/To: Main to Union
 Jurisdiction: City of Manteca
 Analysis Year: C+P Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4487	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1219	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1707	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1707	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	26.5	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Union to Airport
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4634	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1259	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1763	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1763	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	27.5	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Airport to Yosemite
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4488	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1220	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1707	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1707	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	26.5	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Yosemite to I-5
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4938	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	1313	v
Trucks and buses	7	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.966	
Driver population factor, fp	1.00	
Flow rate, vp	1812	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1812	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	28.4	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR-99 Northbound
From/To: Jack Tone to Austin
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	6177	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	1626	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2319	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2319	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	53.3	mi/h
Number of lanes, N	3	
Density, D	43.5	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR-99 Northbound
From/To: Yosemite to Louise
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	4128	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	1086	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2325	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	2325	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	53.1	mi/h
Number of lanes, N	2	
Density, D	43.8	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 9/10/08
 Analysis Time Period: PM Peak Hour
 Freeway/Direction: SR-99 Southbound
 From/To: Louise to Yosemite
 Jurisdiction: City of Manteca
 Analysis Year: C+P Conditions
 Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	6292	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	1656	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	3543	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	3543	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: SR-120 to Austin
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	8265	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	2175	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	3103	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	3103	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 9/10/08
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR-99 Southbound
From/To: Austin to Jack Tone
Jurisdiction: City of Manteca
Analysis Year: C+P Conditions
Description: Union Crossing EIR

Flow Inputs and Adjustments

Volume, V	8762	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	2306	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	3290	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	3290	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/2008
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6315	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	1554	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	6315	1554	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	1716	422	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	7207	1731	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.591 Using Equation 1

$$v_{12F} = v_{FM} (P_{FM}) = 4263 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v _{FO}	8938	7050	Yes
v _{3 or av34}	2944 pc/h	(Equation 25-4 or 25-5)	
Is v _{3 or av34} > 2700 pc/h?		Yes	
Is v _{3 or av34} > 1.5 v ₁₂ / 2		No	
If yes, v _{12A} = 4507	12	(Equation 25-8)	

Flow Entering Merge Influence Area

v_{12A}	Actual 4507	Max Desirable 4400	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12A} - 0.00627 L = 50.2 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$M = 2.282$
Space mean speed in ramp influence area, S_R	$S = 12.5 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 56.1 \text{ mph}$
Space mean speed for all vehicles, S	$S = 16.3 \text{ mph}$

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	8375	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	2060	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
Volume, V (vph)	8375	2060	vph
Peak-hour factor, PHF	0.92	0.80	
Peak 15-min volume, v15	2276	644	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	9558	2639	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.400 Using Equation 5

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 5404 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	9558	7050	Yes
v = v - v FO F R	6919	7050	No
v R	2639	2000	Yes
v v 3 or av34	4154 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h?		Yes	
3 or av34			
Is v v > 1.5 v /2		Yes	
3 or av34	12		
If yes, v = 6858		(Equation 25-18)	
12A			

Flow Entering Diverge Influence Area

v_{12A}	Actual 6858	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 4.252 + 0.0086 v_{12} - 0.009 L = 61.9 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S_D	$D = 0.666$
Space mean speed in ramp influence area, S_R	$S = 49.7 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 64.7 \text{ mph}$
Space mean speed for all vehicles, S	$S = 53.2 \text{ mph}$

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Phone: _____ Fax: _____
E-mail: _____

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Union Road
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	7869	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	1918	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
Volume, V (vph)	7869	1918	vph
Peak-hour factor, PHF	0.92	0.80	
Peak 15-min volume, v15	2138	599	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	8981	2457	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.422 Using Equation 5

$$v = v_R + (v_F - v_R) P = 5213 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	8981	7050	Yes
v = v - v FO F R	6524	7050	No
v R	2457	2000	Yes
v v 3 or av34	3768 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h? 3 or av34		Yes	
Is v v > 1.5 v /2 3 or av34 12		No	
If yes, v = 6281 12A		(Equation 25-18)	

Flow Entering Diverge Influence Area

v	Actual 6281	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 4.252 + 0.0086 v_R - 0.009 L = 56.9 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$D = 0.649$
Space mean speed in ramp influence area, S_R	$S = 50.1 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 64.7 \text{ mph}$
Space mean speed for all vehicles, S	$S = 53.7 \text{ mph}$

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/2008
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 EB
Junction: Union Road
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge
Number of lanes in freeway	3
Free-flow speed on freeway	65.0 mph
Volume on freeway	5951 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	607 vph
Length of first accel/decel lane	500 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)	5951	607	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	1617	165	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6792	676	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.591 Using Equation 1

$$v_{12F} = v_{FM} (P_{12F}) = 4017 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v FO	7468	7050	Yes
v v 3 or av34	2775 pc/h	(Equation 25-4 or 25-5)	
Is v v > 2700 pc/h? 3 or av34		Yes	
Is v v > 1.5 v / 2 3 or av34 12		No	
If yes, v = 4092 12A		(Equation 25-8)	

Flow Entering Merge Influence Area

v_{12A}	Actual 4092	Max Desirable 4400	Violation? No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_{12R} + 0.0078 v_{12A} - 0.00627 L = 39.2 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$M = 0.745$
Space mean speed in ramp influence area, S_R	$S = 47.9 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 56.1 \text{ mph}$
Space mean speed for all vehicles, S	$S = 50.5 \text{ mph}$

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3288	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	1200	vph
Length of first accel/decel lane	500	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
Volume, V (vph)	3288	1200	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	893	326	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3753	1337	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.591 Using Equation 1

$$v = v_{FM} = \frac{P}{12} = 2220 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5090	7050	No
$v_{3 \text{ or } av34}$	1533 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34} > 2700 \text{ pc/h?}$		No	
$v_{3 \text{ or } av34}$			
Is $v_{3 \text{ or } av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} =$		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2220	4400	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 29.5 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$M = 0.423$
Space mean speed in ramp influence area, S_R	$S = 55.3 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 61.3 \text{ mph}$
Space mean speed for all vehicles, S	$S = 57.0 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Airport Way
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4634	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	1346	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
Volume, V (vph)	4634	1346	vph
Peak-hour factor, PHF	0.92	0.95	
Peak 15-min volume, v15	1259	354	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5289	1452	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.561 Using Equation 5

$$v = v_R + (v_F - v_R) P = 3604 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	5289	7050	No
v = v - v FO F R	3837	7050	No
v R	1452	2000	No
v v 3 or av34	1685 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h?	No		
3 or av34			
Is v v > 1.5 v /2	No		
3 or av34	12		
If yes, v =	(Equation 25-18)		
12A			

Flow Entering Diverge Influence Area

v_{12}	Actual 3604	Max Desirable 4600	Violation? No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D = 33.9 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable, S_D	$D = 0.559$
Space mean speed in ramp influence area, S_R	$S = 52.2 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 68.6 \text{ mph}$
Space mean speed for all vehicles, S	$S = 56.5 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Union Road
Jurisdiction: City of Manteca
Analysis Year: Cumulative Conditions
Description: Union Crossing EIR

Freeway Data

Type of analysis	Merge
Number of lanes in freeway	3
Free-flow speed on freeway	65.0 mph
Volume on freeway	3724 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	910 vph
Length of first accel/decel lane	500 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)	3724	910	vph
Peak-hour factor, PHF	0.92	0.92	
Peak 15-min volume, v15	1012	247	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4250	1014	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.591 Using Equation 1

$$v_{12F} = v_{FM} (P_{FM}) = 2514 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5264	7050	No
$v_{3 \text{ or } av34}$	1736 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34} > 2700 \text{ pc/h?}$		No	
Is $v_{3 \text{ or } av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} =$		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2514	4400	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_{12R} + 0.0078 v_{12A} - 0.00627 L = 29.4 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, S	$M = 0.419$
Space mean speed in ramp influence area, S_R	$S = 55.4 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 60.6 \text{ mph}$
Space mean speed for all vehicles, S	$S = 57.0 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr and Peers
Agency/Co.: Fehr and Peers
Date performed: 9/10/08
Analysis time period: PM Peak
Freeway/Dir of Travel: SR 120 WB
Junction: Union Road
Jurisdiction: City of Manteca
Analysis Year: Existing
Description: Union Crossing EIR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4487	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	763	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)	4487	763	vph
Peak-hour factor, PHF	0.92	0.95	
Peak 15-min volume, v15	1219	201	v
Trucks and buses	10	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	0.952	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5121	823	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.594 Using Equation 5

$$v = v_R + (v_F - v_R) P = 3377 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v = v Fi F	5121	7050	No
v = v - v FO F R	4298	7050	No
v R	823	2000	No
v v 3 or av34	1744 pc/h	(Equation 25-15 or 25-16)	
Is v v > 2700 pc/h? 3 or av34		No	
Is v v > 1.5 v /2 3 or av34	12	No	
If yes, v = 12A		(Equation 25-18)	

Flow Entering Diverge Influence Area

v_{12}	Actual 3377	Max Desirable 4600	Violation? No
Level of Service Determination (if not F)			

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D = 31.9 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable, S_D	$D = 0.502$
Space mean speed in ramp influence area, S_R	$S = 53.5 \text{ mph}$
Space mean speed in outer lanes, S_0	$S = 68.4 \text{ mph}$
Space mean speed for all vehicles, S	$S = 57.8 \text{ mph}$

Leisch Method for Weaving Analysis

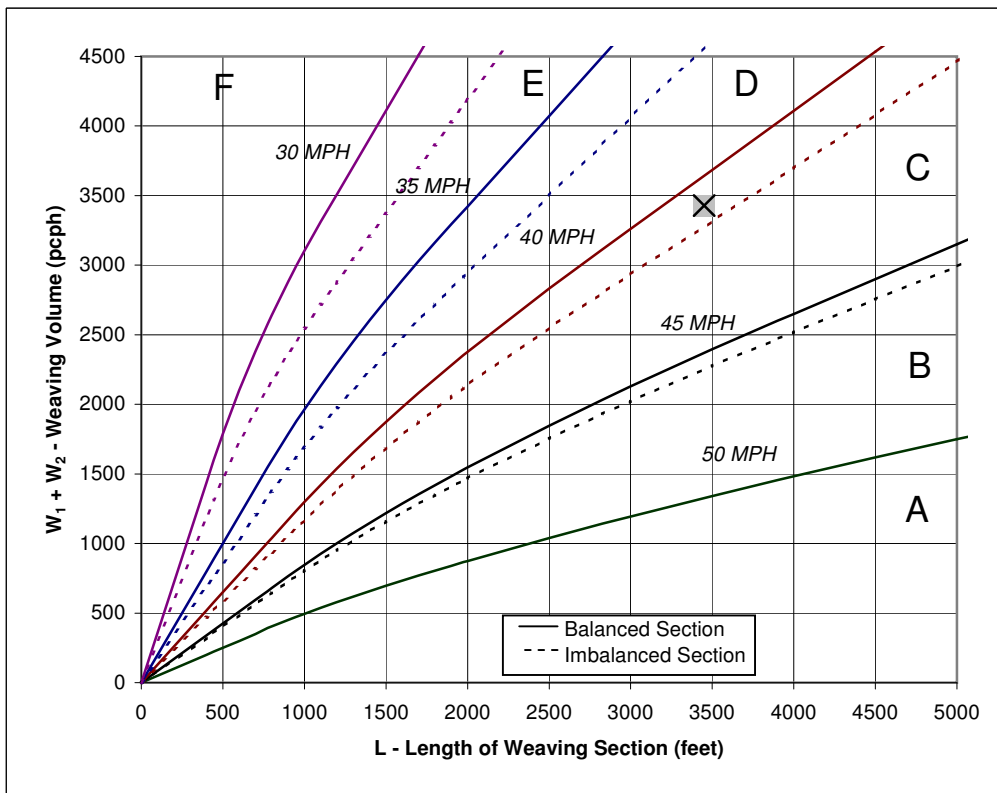
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,450

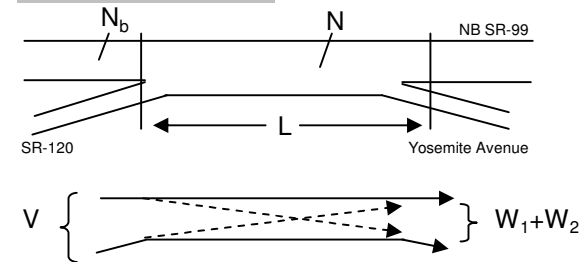
Project Information

Project	Union Crossing
Scenario	CUMULATIVE + PROJECT - PM
Freeway	NB SR-99
On-ramp	SR-120
Off-ramp	Yosemite Avenue

Total Weaving Section (V)	On-ramp to Mainline (W_1)	Mainline to Off-ramp (W_2)
Volume (vph)*	Volume (vph)*	Volume (vph)*
Truck Percentage	Truck Percentage	Truck Percentage
PCE for Trucks	PCE for Trucks	PCE for Trucks
Volume (pcph)	Volume (pcph)	Volume (pcph)



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? Y
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

45 mph and 50 mph

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

3. Interpolated Weaving Speed (S_w , mph)	39.9
4. Weaving Intensity Factor (k)	2.55
5. Service Volume (SV, pcph) $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	2,443
6. Level of Service (LOS)	F

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Leisch Method for Weaving Analysis

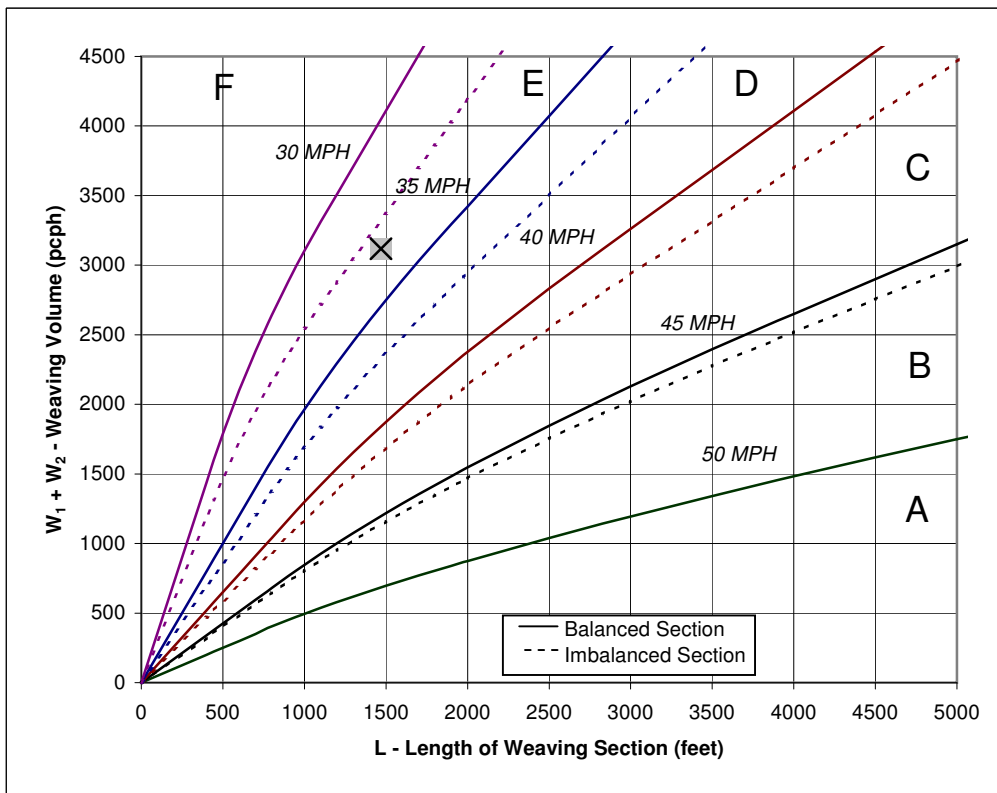
Data Input

Number of Entering Mainline Lanes	N_b	3
Number of Lanes in Weaving Section	N	4
Length of Weaving Section (feet)	L	1,470

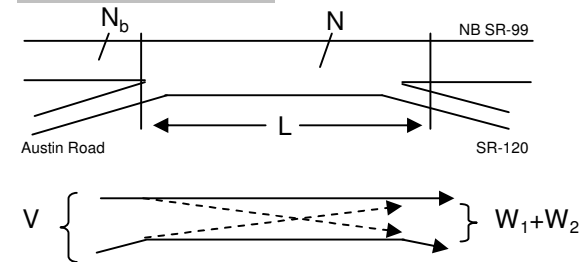
Total Weaving Section (V)	On-ramp to Mainline (W_1)	Mainline to Off-ramp (W_2)
Volume (vph)*	Volume (vph)*	Volume (vph)*
Truck Percentage	Truck Percentage	Truck Percentage
PCE for Trucks	PCE for Trucks	PCE for Trucks
Volume (pcph)	Volume (pcph)	Volume (pcph)
4,713	119	1,877
14%	6%	10%
1.5	1.5	1.5
6,610	382	2,736

Project Information

Project	Union Crossing
Scenario	CUMULATIVE + PROJECT - PM
Freeway	NB SR-99
On-ramp	Austin Road
Off-ramp	SR-120



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? **Y**
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

35 MPH and **40 MPH**

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

3. Interpolated Weaving Speed (S_w , mph)	32.6
4. Weaving Intensity Factor (k)	3.00
5. Service Volume (SV, pcph) $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	1,844
6. Level of Service (LOS)	E

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF)**. The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Leisch Method for Weaving Analysis

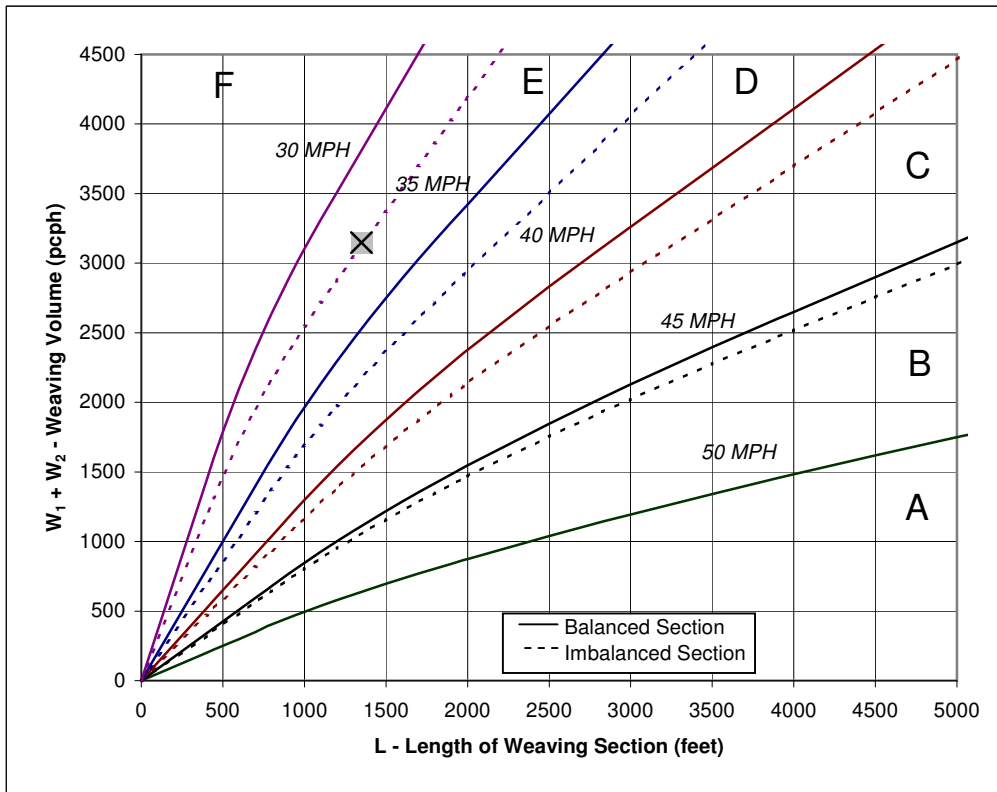
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	1,350

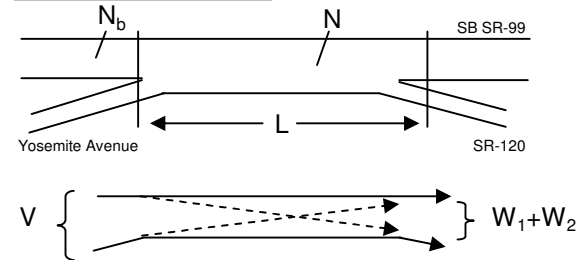
Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	3,383	Volume (vph)*	777	Volume (vph)*	400
Truck Percentage	14%	Truck Percentage	10%	Truck Percentage	6%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	6,778	Volume (pcph)	1,489	Volume (pcph)	1,659

Project Information

Project	Union Crossing
Scenario	CUMULATIVE + PROJECT - PM
Freeway	SB SR-99
On-ramp	Yosemite Avenue
Off-ramp	SR-120



Figure



Capacity Analysis

- Is the weaving section balanced (Y / N)? n
[If optional exit lane, then "Y". Otherwise "N".]
- In the Weaving Speed Chart to the left, which two speed curves is the black "x" between?

40 mph and 45 mph

If below the 50 MPH curve, out of the realm of weaving.
If left of the 30 MPH curve, LOS is F.

- Interpolated Weaving Speed (S_w , mph) 23.4
- Weaving Intensity Factor (k) 3.00
- Service Volume (SV, pcph)
 $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$ 3,252
- Level of Service (LOS) F

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Source: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983.

Major Street Union Road
 Minor Street Project Access #19

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative Plus Project
 Peak Hour PM

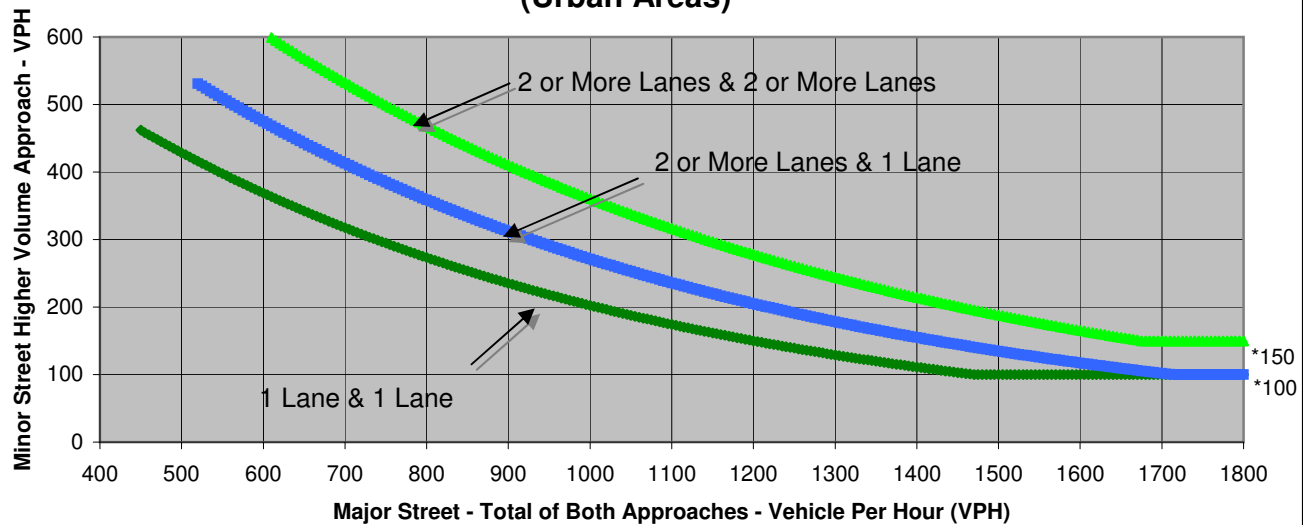
Turn Movement Volumes

	NB	SB	EB	WB
Left		0	0	0
Through		1,840	0	0
Right		271	109	0
Total	0	2,111	109	0

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Union Road	Project Access #19	
Number of Approach Lanes	2	1	<u>YES</u>
Traffic Volume (VPH) *	2,111	109	

* 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 Union Road
 Minor Street Project Access

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative Plus Project
 Peak Hour PM

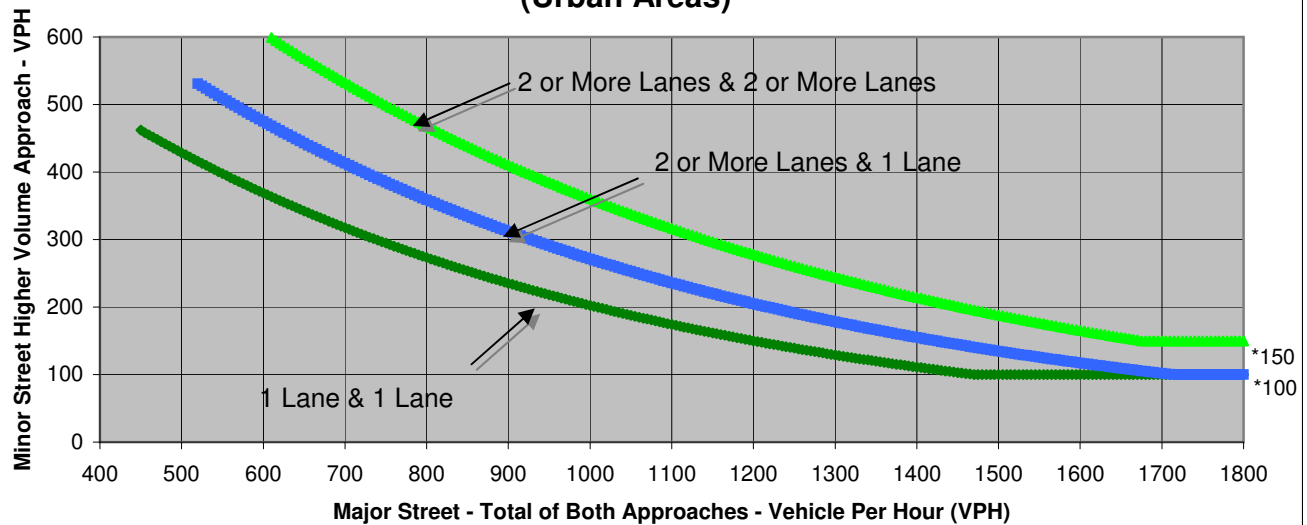
Turn Movement Volumes

	NB	SB	EB	WB
Left	41	0	91	0
Through	774	1,550	0	0
Right	0	60	14	0
Total	815	1,610	105	0

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Union Road	Project Access	
Number of Approach Lanes	2	1	<u>YES</u>
Traffic Volume (VPH) *	2,425	105	

* 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 Airport Way
 Minor Street Atherton Drive

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative Plus Project
 Peak Hour PM

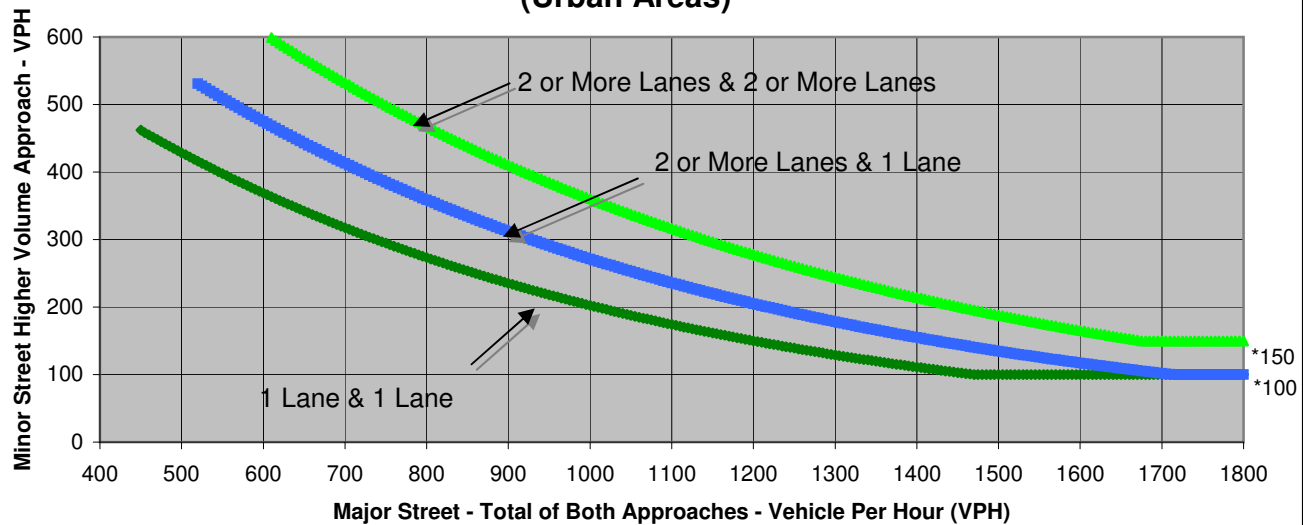
Turn Movement Volumes

	NB	SB	EB	WB
Left	59	790	730	162
Through	875	1,485	45	55
Right	152	560	38	625
Total	1,086	2,835	813	842

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Atherton Drive	<u>Warrant Met</u>
Number of Approach Lanes	3	3	<u>YES</u>
Traffic Volume (VPH) *	3,921	842	

* 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 Airport Way
 Minor Street Wawona Street

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative Plus Project
 Peak Hour PM

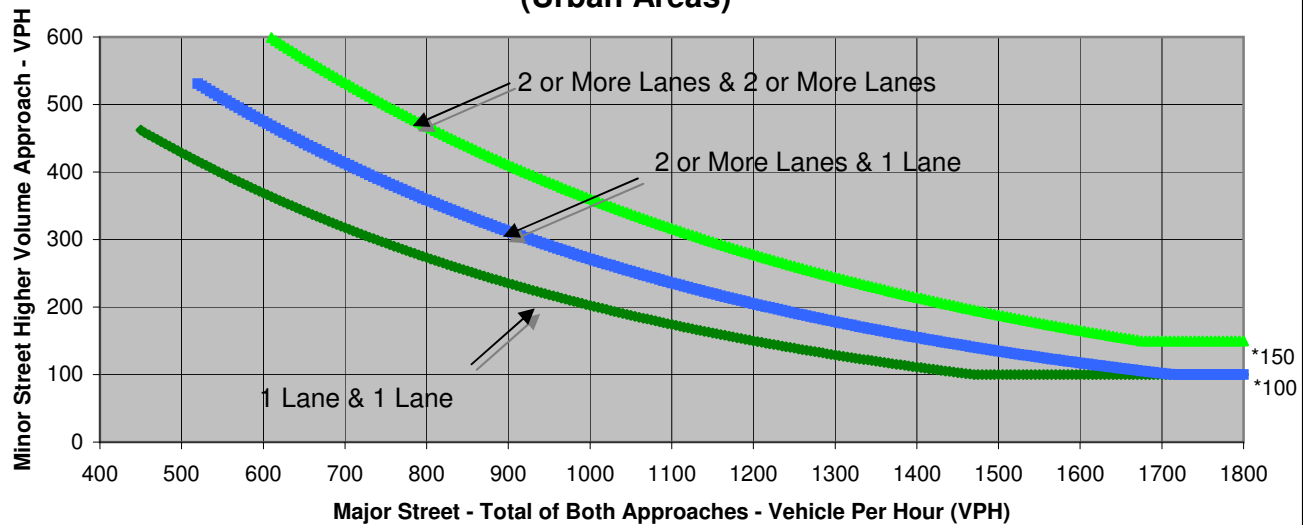
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	80	0	110
Through	1,651	1,020	0	0
Right	350	0	0	40
Total	2,001	1,100	0	150

Major Street Direction

<u>x</u>	North/South
	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Wawona Street	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	3,101	150	

* 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 Airport Way
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative Plus Project
 Peak Hour PM

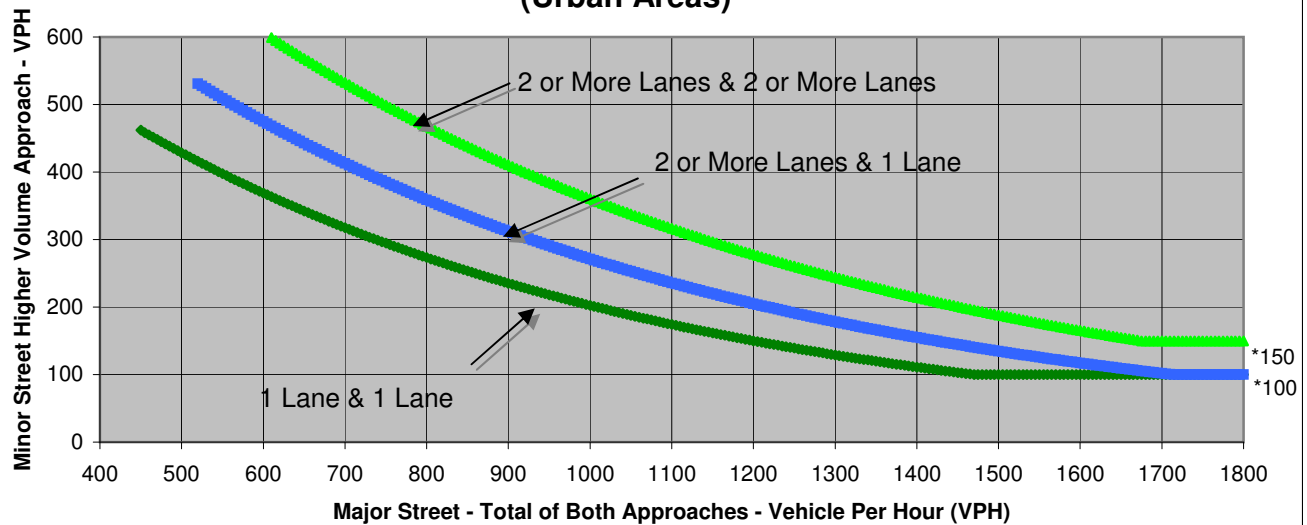
Turn Movement Volumes

	NB	SB	EB	WB
Left	40	530	74	480
Through	310	1,030	420	493
Right	53	125	296	30
Total	403	1,685	790	1,003

Major Street Direction

<u>x</u>	North/South
	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Woodward Avenue	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	2,088	1,003	

* 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 Main Street
 Minor Street Atherton Drive

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative Plus Project
 Peak Hour PM

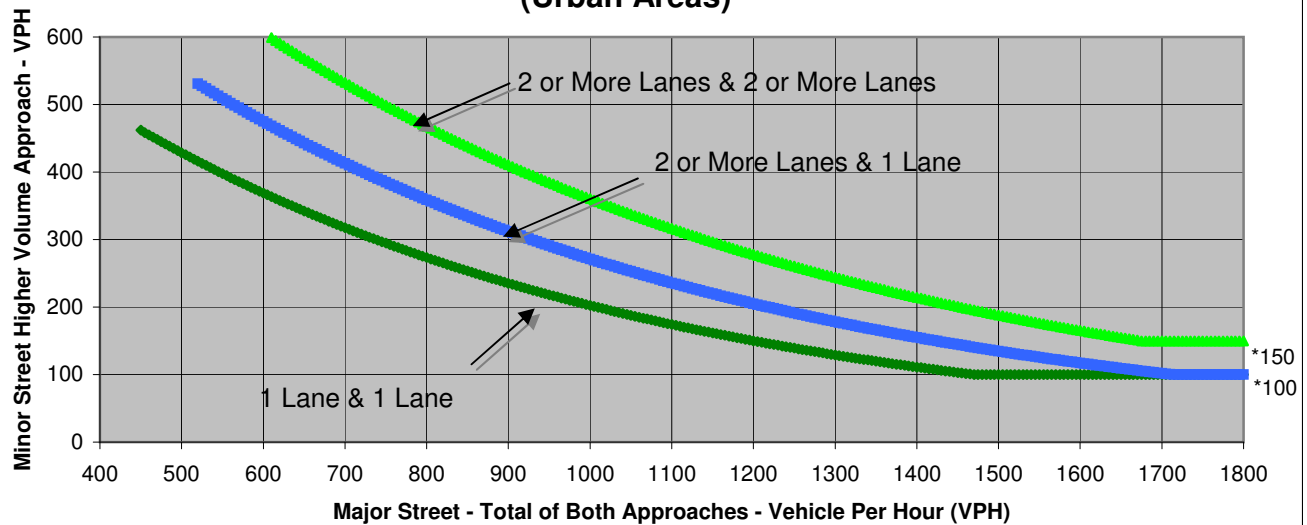
Turn Movement Volumes

	NB	SB	EB	WB
Left	170	0	560	
Through	630	1,660	0	
Right	0	480	280	
Total	800	2,140	840	0

Major Street Direction

<u>x</u>	North/South
	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Main Street	Minor Street Atherton Drive	<u>Warrant Met</u>
Number of Approach Lanes	2	1	<u>YES</u>
Traffic Volume (VPH) *	2,940	840	

* 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 Main Street
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative Plus Project
 Peak Hour PM

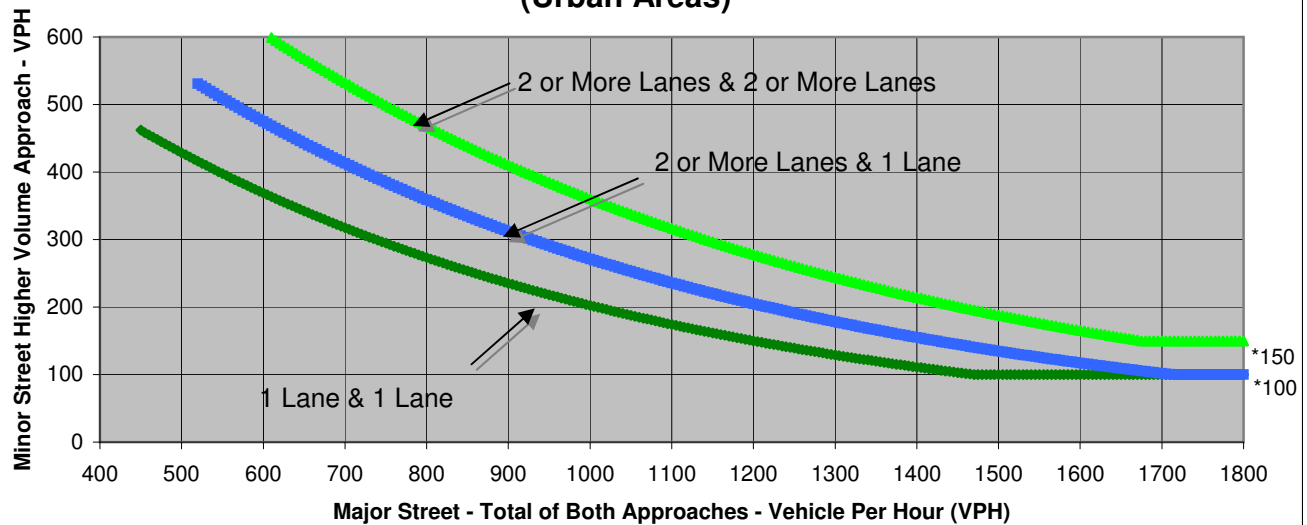
Turn Movement Volumes

	NB	SB	EB	WB
Left	83	920	100	150
Through	310	630	310	431
Right	80	390	340	130
Total	473	1,940	750	711

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Main Street	Woodward Avenue	
Number of Approach Lanes	2	2	<u>YES</u>
Traffic Volume (VPH) *	2,413	750	

* 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 Union Road
 Minor Street Daniels Street

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative Plus Project
 Peak Hour PM

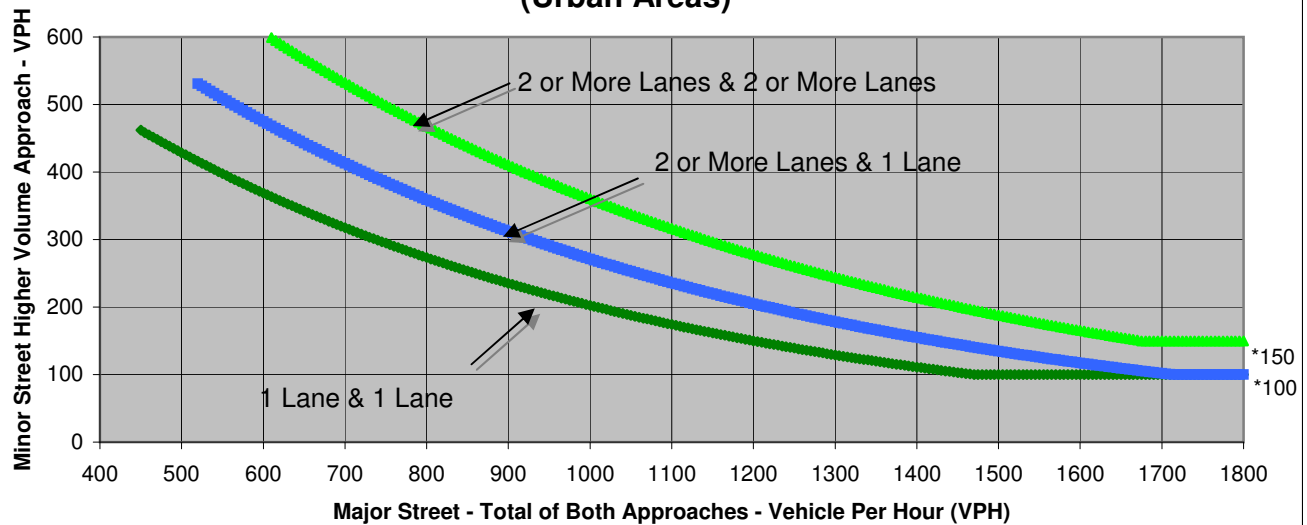
Turn Movement Volumes

	NB	SB	EB	WB
Left	175	0	40	0
Through	1,585	1,163	0	0
Right	0	40	138	0
Total	1,760	1,203	178	0

Major Street Direction

<u>x</u>	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Union Road	Minor Street Daniels Street	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	2,963	178	

* 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 Union Road
 Minor Street Woodward Avenue

Sheet No 1 of ?

Project Union Crossing
 Scenario Cumulative Plus Project
 Peak Hour PM

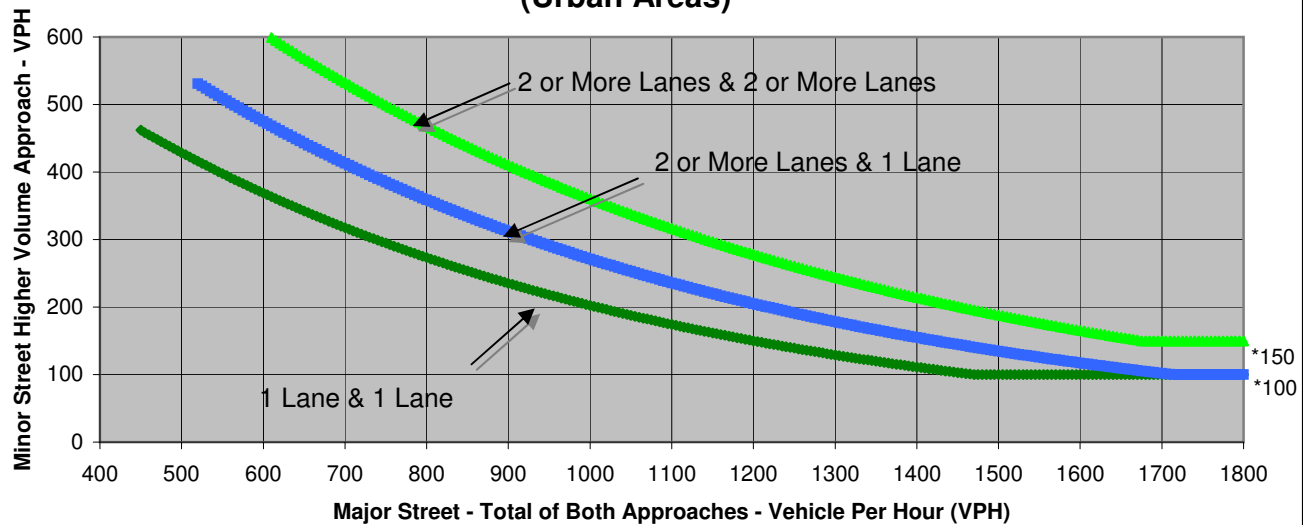
Turn Movement Volumes

	NB	SB	EB	WB
Left	136	280	213	20
Through	428	916	440	340
Right	20	337	260	174
Total	584	1,533	913	534

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Union Road	Woodward Avenue	
Number of Approach Lanes	2	2	<u>YES</u>
Traffic Volume (VPH) *	2,117	913	

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

HCM Signalized Intersection Capacity Analysis

1: Yosemite Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.95		1.00	0.93		1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3355		1770	3281		1770	1827	1583	1770	1747	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3355		1770	3281		1770	1827	1583	1770	1747	
Volume (vph)	560	352	187	275	352	334	222	1189	280	283	638	320
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	589	371	197	289	371	352	234	1252	295	298	672	337
RTOR Reduction (vph)	0	65	0	0	159	0	0	0	51	0	16	0
Lane Group Flow (vph)	589	503	0	289	564	0	234	1252	244	298	993	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	11.0	19.7		18.0	26.7		15.0	31.9	31.9	22.1	39.0	
Effective Green, g (s)	11.0	19.7		18.0	26.7		15.0	31.9	31.9	22.1	39.0	
Actuated g/C Ratio	0.10	0.18		0.17	0.25		0.14	0.30	0.30	0.21	0.36	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	181	614		296	813		247	541	469	363	633	
v/s Ratio Prot	c0.33	c0.15		c0.16	0.17		c0.13	c0.69		0.17	c0.57	
v/s Ratio Perm									0.15			
v/c Ratio	3.25	0.82		0.98	0.69		0.95	2.31	0.52	0.82	1.57	
Uniform Delay, d1	48.4	42.3		44.6	36.8		46.0	37.9	31.5	40.9	34.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1028.5	8.4		45.4	2.6		42.5	597.2	4.1	13.8	263.6	
Delay (s)	1076.9	50.7		90.0	39.4		88.4	635.1	35.6	54.7	297.9	
Level of Service	F	D		F	D		F	F	D	D	F	
Approach Delay (s)		573.1			53.8			464.0			242.5	
Approach LOS		F			D			F			F	
Intersection Summary												
HCM Average Control Delay			354.0			HCM Level of Service				F		
HCM Volume to Capacity ratio			1.74									
Actuated Cycle Length (s)			107.7			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			143.1%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Wawona St. & Airport Way

1/5/2009

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Volume (veh/h)	110	40	1651	350	80	1020			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95			
Hourly flow rate (vph)	116	42	1738	368	84	1074			
Pedestrians	2					2			
Lane Width (ft)	12.0					12.0			
Walking Speed (ft/s)	4.0					4.0			
Percent Blockage	0					0			
Right turn flare (veh)									
Median type	None								
Median storage veh									
Upstream signal (ft)	1313								
pX, platoon unblocked	0.57	0.57			0.57				
vC, conflicting volume	3166	1926			2108				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	4800	2624			2944				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	0	0			0				
cM capacity (veh/h)	0	18			69				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	158	2106	1158						
Volume Left	116	0	84						
Volume Right	42	368	0						
cSH	0	1700	69						
Volume to Capacity	Err	1.24	1.22						
Queue Length 95th (ft)	Err	0	166						
Control Delay (s)	Err	0.0	735.5						
Lane LOS	F		F						
Approach Delay (s)	Err	0.0	735.5						
Approach LOS	F								
Intersection Summary									
Average Delay	Err								
Intersection Capacity Utilization	135.2%		ICU Level of Service		H				
Analysis Period (min)	15								

HCM Signalized Intersection Capacity Analysis

3: Daniels Street & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1562	3433	1863	1561	3433	3471	1545	1770	3471	1561
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1562	3433	1863	1561	3433	3471	1545	1770	3471	1561
Volume (vph)	440	54	674	480	34	150	340	1411	370	80	920	130
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	463	57	709	505	36	158	358	1485	389	84	968	137
RTOR Reduction (vph)	0	0	117	0	0	75	0	0	120	0	0	89
Lane Group Flow (vph)	463	57	592	505	36	83	358	1485	269	84	968	48
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	13.0	40.0	40.0	14.0	41.0	41.0	13.0	44.0	44.0	6.0	37.0	37.0
Effective Green, g (s)	13.0	40.0	40.0	14.0	41.0	41.0	13.0	44.0	44.0	6.0	37.0	37.0
Actuated g/C Ratio	0.11	0.33	0.33	0.12	0.34	0.34	0.11	0.37	0.37	0.05	0.31	0.31
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	372	621	521	401	637	533	372	1273	567	89	1070	481
v/s Ratio Prot	0.13	0.03		c0.15	0.02		c0.10	c0.43		0.05	0.28	
v/s Ratio Perm			c0.38			0.05			0.17			0.03
v/c Ratio	1.24	0.09	1.14	1.26	0.06	0.16	0.96	1.17	0.47	0.94	0.90	0.10
Uniform Delay, d1	53.5	27.5	40.0	53.0	26.5	27.5	53.3	38.0	29.1	56.8	39.8	29.6
Progression Factor	1.00	1.00	1.00	1.00	1.02	1.04	1.02	1.08	1.23	1.00	1.00	1.00
Incremental Delay, d2	130.8	0.1	82.5	135.2	0.0	0.1	7.3	75.8	0.3	76.4	12.4	0.4
Delay (s)	184.3	27.6	122.5	188.2	27.0	28.6	61.4	116.9	36.1	133.2	52.2	30.0
Level of Service	F	C	F	F	C	C	E	F	D	F	D	C
Approach Delay (s)		141.4			143.8			93.9			55.4	
Approach LOS		F			F			F			E	
Intersection Summary												
HCM Average Control Delay			102.8				HCM Level of Service			F		
HCM Volume to Capacity ratio			1.13									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			91.1%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: SR 120 WB & Airport Way

1/5/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↰	↱	↰	↱			↱	↰
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00
Frt					1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1770	1495	1770	1759			1759	1495
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1770	1495	1770	1759			1759	1495
Volume (vph)	0	0	0	835	0	511	440	1610	0	0	1314	760
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	879	0	538	463	1695	0	0	1383	800
RTOR Reduction (vph)	0	0	0	0	0	20	0	0	0	0	0	191
Lane Group Flow (vph)	0	0	0	0	879	518	463	1695	0	0	1383	609
Heavy Vehicles (%)	0%	2%	2%	2%	2%	8%	2%	8%	2%	2%	8%	8%
Turn Type				Perm		Perm	Prot					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8						6
Actuated Green, G (s)					36.0	36.0	18.0	76.0			54.0	54.0
Effective Green, g (s)					36.0	36.0	18.0	76.0			54.0	54.0
Actuated g/C Ratio					0.30	0.30	0.15	0.63			0.45	0.45
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					531	449	266	1114			792	673
v/s Ratio Prot							c0.26	0.96			c0.79	
v/s Ratio Perm					0.50	0.35						0.41
v/c Ratio					1.66	1.15	1.74	1.52			1.75	0.91
Uniform Delay, d1					42.0	42.0	51.0	22.0			33.0	30.6
Progression Factor					1.00	1.00	1.63	1.35			0.77	0.67
Incremental Delay, d2					303.2	91.6	334.7	235.1			336.3	2.2
Delay (s)					345.2	133.6	417.8	264.9			361.6	22.6
Level of Service					F	F	F	F			F	C
Approach Delay (s)		0.0			264.9			297.7			237.3	
Approach LOS		A			F			F			F	
Intersection Summary												
HCM Average Control Delay			266.7				HCM Level of Service			F		
HCM Volume to Capacity ratio			1.72									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			167.5%				ICU Level of Service			H		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

5: SR 120 EB & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00	1.00	1.00	1.00	
Frt		1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1671	1583					1863	1583	1671	1863	
Flt Permitted		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1671	1583					1863	1583	1671	1863	
Volume (vph)	810	0	1250	0	0	0	0	1240	990	564	1585	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	853	0	1316	0	0	0	0	1305	1042	594	1668	0
RTOR Reduction (vph)	0	0	10	0	0	0	0	0	311	0	0	0
Lane Group Flow (vph)	0	853	1306	0	0	0	0	1305	731	594	1668	0
Heavy Vehicles (%)	8%	2%	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%
Turn Type	Perm		Perm						Perm		Prot	
Protected Phases		4						2		1	6	
Permitted Phases	4		4						2			
Actuated Green, G (s)		47.0	47.0					42.0	42.0	19.0	65.0	
Effective Green, g (s)		47.0	47.0					42.0	42.0	19.0	65.0	
Actuated g/C Ratio		0.39	0.39					0.35	0.35	0.16	0.54	
Clearance Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		654	620					652	554	265	1009	
v/s Ratio Prot								c0.70		c0.36	0.90	
v/s Ratio Perm		0.51	c0.83						0.46			
v/c Ratio		1.30	2.11					2.00	1.32	2.24	1.65	
Uniform Delay, d1		36.5	36.5					39.0	39.0	50.5	27.5	
Progression Factor		1.00	1.00					1.00	1.00	0.95	1.50	
Incremental Delay, d2		147.9	503.6					456.1	155.9	559.8	294.3	
Delay (s)		184.4	540.1					495.1	194.9	607.7	335.7	
Level of Service		F	F					F	F	F	F	
Approach Delay (s)		400.2			0.0			361.8			407.1	
Approach LOS		F			A			F			F	
Intersection Summary												
HCM Average Control Delay		389.2						HCM Level of Service		F		
HCM Volume to Capacity ratio		2.09										
Actuated Cycle Length (s)		120.0						Sum of lost time (s)		12.0		
Intersection Capacity Utilization		167.5%						ICU Level of Service		H		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

6: Atherton Dr & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	730	45	38	162	55	625	59	875	152	790	1485	560
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	768	47	40	171	58	658	62	921	160	832	1563	589
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			14			14						
Median type		None			None							
Median storage veh												
Upstream signal (ft)											720	
pX, platoon unblocked	0.48	0.48	0.48	0.48	0.48		0.48					
vC, conflicting volume	4629	4432	1563	4315	4861	921	2153			1081		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	8591	8178	2178	7934	9076	921	3411			1081		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	0	0	0	0	0			0		
cM capacity (veh/h)	0	0	28	0	0	328	37			645		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3			
Volume Total	856	171	716	62	921	160	832	1563	589			
Volume Left	768	171	0	62	0	0	832	0	0			
Volume Right	40	0	658	0	0	160	0	0	589			
cSH	0	0	0	37	1700	1700	645	1700	1700			
Volume to Capacity	Err	Err	Err	1.66	0.54	0.09	1.29	0.92	0.35			
Queue Length 95th (ft)	Err	Err	Err	165	0	0	820	0	0			
Control Delay (s)	Err	Err	Err	554.7	0.0	0.0	162.0	0.0	0.0			
Lane LOS	F	F	F	F			F					
Approach Delay (s)	Err	Err		30.1			45.1					
Approach LOS	F	F										
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization			149.3%		ICU Level of Service				H			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

7: Woodward Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	480	493	30	74	420	296	40	310	53	530	1030	125
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	505	519	32	78	442	312	42	326	56	558	1084	132
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	1056	832	424	1774								
Volume Left (vph)	505	78	42	558								
Volume Right (vph)	32	312	56	132								
Hadj (s)	0.11	-0.17	-0.03	0.05								
Departure Headway (s)	9.7	9.4	9.5	9.6								
Degree Utilization, x	2.84	2.17	1.12	4.74								
Capacity (veh/h)	383	390	389	380								
Control Delay (s)	854.3	555.7	115.3	1706.8								
Approach Delay (s)	854.3	555.7	115.3	1706.8								
Approach LOS	F	F	F	F								
Intersection Summary												
Delay				1086.9								
HCM Level of Service				F								
Intersection Capacity Utilization				224.8%	ICU Level of Service	H						
Analysis Period (min)				15								

HCM Signalized Intersection Capacity Analysis

8: Yosemite Avenue & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	3444		1770	3281		1770	3398	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	1770	3444		1770	3281		1770	3398	
Volume (vph)	290	520	310	201	550	120	291	640	153	130	633	230
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	305	547	326	212	579	126	306	674	161	137	666	242
RTOR Reduction (vph)	0	0	208	0	23	0	0	26	0	0	46	0
Lane Group Flow (vph)	305	547	118	212	682	0	306	809	0	137	862	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	10.0	24.0	24.0	6.0	20.0		13.0	26.0		8.0	21.0	
Effective Green, g (s)	10.0	24.0	24.0	6.0	20.0		13.0	26.0		8.0	21.0	
Actuated g/C Ratio	0.12	0.30	0.30	0.08	0.25		0.16	0.32		0.10	0.26	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	221	559	475	133	861		288	1066		177	892	
v/s Ratio Prot	c0.17	c0.29		0.12	0.20		c0.17	0.25		0.08	c0.25	
v/s Ratio Perm			0.07									
v/c Ratio	1.38	0.98	0.25	1.59	0.79		1.06	0.76		0.77	0.97	
Uniform Delay, d1	35.0	27.7	21.2	37.0	28.1		33.5	24.2		35.1	29.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	196.7	32.2	0.3	299.7	5.0		70.5	5.1		18.8	22.9	
Delay (s)	231.7	60.0	21.5	336.7	33.1		104.0	29.3		53.9	52.1	
Level of Service	F	E	C	F	C		F	C		D	D	
Approach Delay (s)		93.8			103.3			49.3			52.3	
Approach LOS		F			F			D			D	
Intersection Summary												
HCM Average Control Delay			73.8			HCM Level of Service				E		
HCM Volume to Capacity ratio			1.06									
Actuated Cycle Length (s)			80.0			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			92.8%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: Wawona St. & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.92		1.00	0.92		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1707		1770	1705		1770	3283		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1707		1770	1705		1770	3283		1770	1863	1583
Volume (vph)	110	100	125	128	100	130	214	1040	238	160	880	110
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	116	105	132	135	105	137	225	1095	251	168	926	116
RTOR Reduction (vph)	0	73	0	0	74	0	0	27	0	0	0	72
Lane Group Flow (vph)	116	164	0	135	168	0	225	1319	0	168	926	44
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot			Prot			Prot			Prot		Over
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												
Actuated Green, G (s)	4.7	12.2		6.0	13.5		6.0	20.2		8.0	22.2	4.7
Effective Green, g (s)	4.7	12.2		6.0	13.5		6.0	20.2		8.0	22.2	4.7
Actuated g/C Ratio	0.08	0.20		0.10	0.22		0.10	0.32		0.13	0.36	0.08
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	133	334		170	369		170	1063		227	663	119
v/s Ratio Prot	0.07	0.10		c0.08	c0.10		c0.13	0.40		0.09	c0.50	0.03
v/s Ratio Perm												
v/c Ratio	0.87	0.49		0.79	0.46		1.32	1.24		0.74	1.40	0.37
Uniform Delay, d1	28.6	22.3		27.6	21.3		28.2	21.1		26.2	20.1	27.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	42.2	1.1		22.0	0.9		180.5	116.5		12.2	187.6	1.9
Delay (s)	70.7	23.5		49.6	22.2		208.7	137.6		38.4	207.7	29.4
Level of Service	E	C		D	C		F	F		D	F	C
Approach Delay (s)		39.0			32.0			147.8			167.1	
Approach LOS		D			C			F			F	
Intersection Summary												
HCM Average Control Delay			131.1			HCM Level of Service				F		
HCM Volume to Capacity ratio			0.92									
Actuated Cycle Length (s)			62.4			Sum of lost time (s)				8.0		
Intersection Capacity Utilization			91.5%			ICU Level of Service				F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

10: Daniels Street & Union Road

1/5/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	40	138	175	1585	1163	40
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	42	145	184	1668	1224	42
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)				306		
pX, platoon unblocked	0.29					
vC, conflicting volume	3282	1245	1266			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	8888	1245	1266			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	32	66			
cM capacity (veh/h)	0	212	549			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	187	1853	1266			
Volume Left	42	184	0			
Volume Right	145	0	42			
cSH	0	549	1700			
Volume to Capacity	Err	0.34	0.74			
Queue Length 95th (ft)	Err	37	0			
Control Delay (s)	Err	242.9	0.0			
Lane LOS	F	F				
Approach Delay (s)	Err	242.9	0.0			
Approach LOS	F					
Intersection Summary						
Average Delay		702.8				
Intersection Capacity Utilization		177.4%		ICU Level of Service		H
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

11: SR 120 WB Ramps & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↰	↱	↰	↱			↱	↰
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00
Frt					1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1671	1583	1770	1759			1863	1583
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1671	1583	1770	1759			1863	1583
Volume (vph)	0	0	0	323	0	440	600	1320	0	0	991	310
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	340	0	463	632	1389	0	0	1043	326
RTOR Reduction (vph)	0	0	0	0	0	65	0	0	0	0	0	103
Lane Group Flow (vph)	0	0	0	0	340	398	632	1389	0	0	1043	223
Heavy Vehicles (%)	2%	2%	2%	8%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type				Perm		Perm	Prot					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8						6
Actuated Green, G (s)					26.0	26.0	28.0	86.0			54.0	54.0
Effective Green, g (s)					26.0	26.0	28.0	86.0			54.0	54.0
Actuated g/C Ratio					0.22	0.22	0.23	0.72			0.45	0.45
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					362	343	413	1261			838	712
v/s Ratio Prot							c0.36	0.79			c0.56	
v/s Ratio Perm					0.20	c0.25						0.14
v/c Ratio					0.94	1.16	1.53	1.10			1.24	0.31
Uniform Delay, d1					46.2	47.0	46.0	17.0			33.0	21.1
Progression Factor					1.00	1.00	0.56	0.36			1.00	1.00
Incremental Delay, d2					31.6	99.6	239.7	47.0			120.1	1.1
Delay (s)					77.9	146.6	265.6	53.1			153.1	22.3
Level of Service					E	F	F	D			F	C
Approach Delay (s)		0.0			117.5			119.5			121.9	
Approach LOS		A			F			F			F	
Intersection Summary												
HCM Average Control Delay			119.9									
HCM Volume to Capacity ratio			1.30									
Actuated Cycle Length (s)			120.0									
Intersection Capacity Utilization			129.4%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

12: SR 120 EB Ramps & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱					↑	↱	↰	↑	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00	1.00	1.00	1.00	
Frt		1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1770	1495					1759	1495	1770	1863	
Flt Permitted		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1770	1495					1759	1495	1770	1863	
Volume (vph)	610	0	1108	0	0	0	0	1310	307	300	1014	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	642	0	1166	0	0	0	0	1379	323	316	1067	0
RTOR Reduction (vph)	0	0	57	0	0	0	0	0	77	0	0	0
Lane Group Flow (vph)	0	642	1109	0	0	0	0	1379	246	316	1067	0
Heavy Vehicles (%)	2%	2%	8%	2%	2%	2%	2%	8%	8%	2%	2%	8%
Turn Type	Perm		Perm						Perm		Prot	
Protected Phases		4						2		1	6	
Permitted Phases	4		4						2			
Actuated Green, G (s)		44.0	44.0					48.0	48.0	16.0	68.0	
Effective Green, g (s)		44.0	44.0					48.0	48.0	16.0	68.0	
Actuated g/C Ratio		0.37	0.37					0.40	0.40	0.13	0.57	
Clearance Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		649	548					704	598	236	1056	
v/s Ratio Prot								c0.78		c0.18	0.57	
v/s Ratio Perm		0.36	c0.74						0.16			
v/c Ratio		0.99	2.02					1.96	0.41	1.34	1.01	
Uniform Delay, d1		37.8	38.0					36.0	25.8	52.0	26.0	
Progression Factor		1.00	1.00					0.72	0.49	1.03	0.36	
Incremental Delay, d2		32.2	467.1					435.0	1.4	155.2	11.0	
Delay (s)		70.0	505.1					461.1	14.2	209.0	20.3	
Level of Service		E	F					F	B	F	C	
Approach Delay (s)		350.6			0.0			376.3			63.4	
Approach LOS		F			A			F			E	
Intersection Summary												
HCM Average Control Delay		278.4						HCM Level of Service		F		
HCM Volume to Capacity ratio		1.89										
Actuated Cycle Length (s)		120.0						Sum of lost time (s)	12.0			
Intersection Capacity Utilization		129.4%						ICU Level of Service	H			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

13: Atherton Dr. & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	0.88	0.97	0.95	0.88	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	2787	3433	3539	2787	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	2787	3433	3539	2787	3433	3539	1583
Volume (vph)	669	35	143	303	26	520	211	517	137	475	1221	144
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	704	37	151	319	27	547	222	544	144	500	1285	152
RTOR Reduction (vph)	0	0	125	0	0	506	0	0	88	0	0	57
Lane Group Flow (vph)	704	37	26	319	27	41	222	544	56	500	1285	95
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	27.0	20.6	20.6	15.3	8.9	8.9	12.1	46.5	46.5	21.6	56.0	56.0
Effective Green, g (s)	27.0	20.6	20.6	15.3	8.9	8.9	12.1	46.5	46.5	21.6	56.0	56.0
Actuated g/C Ratio	0.22	0.17	0.17	0.13	0.07	0.07	0.10	0.39	0.39	0.18	0.47	0.47
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	772	608	272	438	262	207	346	1371	1080	618	1652	739
v/s Ratio Prot	c0.21	0.01		0.09	0.01		0.06	0.15		c0.15	c0.36	
v/s Ratio Perm			0.02			c0.01			0.02			0.06
v/c Ratio	0.91	0.06	0.10	0.73	0.10	0.20	0.64	0.40	0.05	0.81	0.78	0.13
Uniform Delay, d1	45.3	41.6	41.9	50.4	51.8	52.2	51.9	26.6	23.0	47.2	26.8	18.2
Progression Factor	0.95	0.96	1.20	1.00	1.00	1.00	1.00	1.00	1.00	1.07	0.83	0.72
Incremental Delay, d2	11.9	0.0	0.1	6.0	0.2	0.5	4.0	0.9	0.1	0.7	0.3	0.0
Delay (s)	55.1	40.0	50.4	56.3	52.0	52.7	55.9	27.5	23.1	51.5	22.6	13.1
Level of Service	E	D	D	E	D	D	E	C	C	D	C	B
Approach Delay (s)		53.7			53.9			33.7			29.3	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM Average Control Delay			39.6				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.76									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			75.5%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

HCM Signalized Intersection Capacity Analysis

15: SR 120 WB Ramp & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↷	↶	↷			↶	↷
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00
Frpb, ped/bikes					1.00	0.98	1.00	1.00			1.00	0.98
Flpb, ped/bikes					1.00	1.00	1.00	1.00			1.00	1.00
Frt					1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1736	1492	1736	1792			1792	1488
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1736	1492	1736	1792			1792	1488
Volume (vph)	0	0	0	740	0	350	380	1511	0	0	740	802
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	779	0	368	400	1591	0	0	779	844
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	358
Lane Group Flow (vph)	0	0	0	0	779	368	400	1591	0	0	779	486
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	2%	2%	2%	4%	2%	6%	4%	6%	2%	2%	6%	6%
Turn Type				Split		Free	Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases						Free						6
Actuated Green, G (s)					44.0	120.0	16.0	68.0			48.0	48.0
Effective Green, g (s)					44.0	120.0	16.0	68.0			48.0	48.0
Actuated g/C Ratio					0.37	1.00	0.13	0.57			0.40	0.40
Clearance Time (s)					4.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)					3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					637	1492	231	1015			717	595
v/s Ratio Prot					c0.45		c0.23	c0.89			0.43	
v/s Ratio Perm						0.25						0.33
v/c Ratio					1.22	0.25	1.73	1.57			1.09	0.82
Uniform Delay, d1					38.0	0.0	52.0	26.0			36.0	32.1
Progression Factor					1.00	1.00	0.36	0.33			1.00	1.00
Incremental Delay, d2					114.0	0.4	330.9	255.8			59.5	11.8
Delay (s)					152.0	0.4	349.6	264.5			95.5	43.9
Level of Service					F	A	F	F			F	D
Approach Delay (s)		0.0			103.3			281.6			68.7	
Approach LOS		A			F			F			E	
Intersection Summary												
HCM Average Control Delay			166.1									
HCM Volume to Capacity ratio			1.43									
Actuated Cycle Length (s)			120.0									
Intersection Capacity Utilization			153.1%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

16: SR 120 EB Ramps & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.98					0.99		1.00	1.00	
Flpb, ped/bikes		1.00	1.00					1.00		1.00	1.00	
Frt		1.00	0.85					0.95		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1703	1518					1729		1703	1827	
Flt Permitted		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (perm)		1703	1518					1729		1703	1827	
Volume (vph)	1101	0	950	0	0	0	0	790	400	290	1190	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1159	0	1000	0	0	0	0	832	421	305	1253	0
RTOR Reduction (vph)	0	0	33	0	0	0	0	15	0	0	0	0
Lane Group Flow (vph)	0	1159	967	0	0	0	0	1238	0	305	1253	0
Confl. Peds. (#/hr)			2				2			2		2
Heavy Vehicles (%)	6%	2%	4%	2%	2%	2%	2%	4%	4%	6%	4%	2%
Turn Type	Split		Perm							Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases			4									
Actuated Green, G (s)		45.0	45.0					50.0		13.0	67.0	
Effective Green, g (s)		45.0	45.0					50.0		13.0	67.0	
Actuated g/C Ratio		0.38	0.38					0.42		0.11	0.56	
Clearance Time (s)		4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)		639	569					720		184	1020	
v/s Ratio Prot		c0.68						c0.72		c0.18	0.69	
v/s Ratio Perm			0.64									
v/c Ratio		1.81	1.70					1.72		1.66	1.23	
Uniform Delay, d1		37.5	37.5					35.0		53.5	26.5	
Progression Factor		1.00	1.00					1.00		1.46	1.19	
Incremental Delay, d2		372.4	322.2					329.5		298.1	103.6	
Delay (s)		409.9	359.7					364.5		376.2	135.3	
Level of Service		F	F					F		F	F	
Approach Delay (s)		386.6			0.0			364.5			182.5	
Approach LOS		F			A			F			F	
Intersection Summary												
HCM Average Control Delay		317.0										
HCM Volume to Capacity ratio		1.75										
Actuated Cycle Length (s)		120.0								12.0		
Intersection Capacity Utilization		153.1%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

17: Atherton Drive & Main Street

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	560	0	280	0	0	0	170	630	0	0	1660	480
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	589	0	295	0	0	0	179	663	0	0	1747	505
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)											640	
pX, platoon unblocked	0.45	0.45	0.45	0.45	0.45		0.45					
vC, conflicting volume	2768	2768	1747	3063	3274	663	2253			663		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	4895	4895	2646	5544	6008	663	3759			663		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	0	0	0	100	0			100		
cM capacity (veh/h)	0	0	14	0	0	461	26			926		
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2					
Volume Total	589	295	0	179	663	1747	505					
Volume Left	589	0	0	179	0	0	0					
Volume Right	0	295	0	0	0	0	505					
cSH	0	14	1700	26	1700	1700	1700					
Volume to Capacity	Err	21.66	0.00	6.98	0.39	1.03	0.30					
Queue Length 95th (ft)	Err	Err	0	Err	0	0	0					
Control Delay (s)	Err	Err	0.0	2991.1	0.0	0.0	0.0					
Lane LOS	F	F	A	F								
Approach Delay (s)	Err		0.0	635.6		0.0						
Approach LOS	F		A									
Intersection Summary												
Average Delay	Err											
Intersection Capacity Utilization	137.8%			ICU Level of Service				H				
Analysis Period (min)	15											

Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

HCM Unsignalized Intersection Capacity Analysis

19: Union Road &

1/5/2009



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				↑↑	↑↑	
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	0	0	1706	1840	271
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	0	1796	1937	285
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)				370	489	
pX, platoon unblocked	0.89					
vC, conflicting volume	2977	1111	2222			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3096	1111	2222			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	8	204	231			
Direction, Lane #	NB 1	NB 2	SB 1	SB 2		
Volume Total	898	898	1291	931		
Volume Left	0	0	0	0		
Volume Right	0	0	0	285		
cSH	1700	1700	1700	1700		
Volume to Capacity	0.53	0.53	0.76	0.55		
Queue Length 95th (ft)	0	0	0	0		
Control Delay (s)	0.0	0.0	0.0	0.0		
Lane LOS						
Approach Delay (s)	0.0		0.0			
Approach LOS						
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			62.8%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

20: Union Road &

1/5/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	100	0	866	1511	155
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	105	0	912	1591	163
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)					310	
pX, platoon unblocked	0.69	0.69	0.69			
vC, conflicting volume	2128	877	1754			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2185	371	1643			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	76	100			
cM capacity (veh/h)	27	432	269			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	105	456	456	1060	693	
Volume Left	0	0	0	0	0	
Volume Right	105	0	0	0	163	
cSH	432	1700	1700	1700	1700	
Volume to Capacity	0.24	0.27	0.27	0.62	0.41	
Queue Length 95th (ft)	24	0	0	0	0	
Control Delay (s)	16.0	0.0	0.0	0.0	0.0	
Lane LOS	C					
Approach Delay (s)	16.0	0.0		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			59.6%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

21: Union Road &

1/5/2009

							
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Sign Control	Stop			Free	Free		
Grade	0%			0%	0%		
Volume (veh/h)	91	14	41	774	1550	60	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	
Hourly flow rate (vph)	96	15	43	815	1632	63	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None						
Median storage veh							
Upstream signal (ft)					530		
pX, platoon unblocked	0.70	0.70	0.70				
vC, conflicting volume	2157	847	1695				
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	2224	350	1563				
tC, single (s)	6.8	6.9	4.1				
tC, 2 stage (s)							
tF (s)	3.5	3.3	2.2				
p0 queue free %	0	97	85				
cM capacity (veh/h)	22	451	293				
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	96	15	43	407	407	1088	607
Volume Left	96	0	43	0	0	0	0
Volume Right	0	15	0	0	0	0	63
cSH	22	451	293	1700	1700	1700	1700
Volume to Capacity	4.39	0.03	0.15	0.24	0.24	0.64	0.36
Queue Length 95th (ft)	Err	3	13	0	0	0	0
Control Delay (s)	Err	13.2	19.4	0.0	0.0	0.0	0.0
Lane LOS	F	B	C				
Approach Delay (s)	8667.6		1.0			0.0	
Approach LOS	F						
Intersection Summary							
Average Delay			360.0				
Intersection Capacity Utilization			56.5%		ICU Level of Service		B
Analysis Period (min)			15				

HCM Unsignalized Intersection Capacity Analysis

22: Union Road &

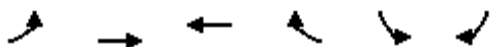
1/5/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	14	0	816	1519	46
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	15	0	859	1599	48
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)	720					
pX, platoon unblocked	0.71	0.71	0.71			
vC, conflicting volume	2053	824	1647			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2075	334	1501			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	100			
cM capacity (veh/h)	33	467	313			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	15	429	429	1066	581	
Volume Left	0	0	0	0	0	
Volume Right	15	0	0	0	48	
cSH	467	1700	1700	1700	1700	
Volume to Capacity	0.03	0.25	0.25	0.63	0.34	
Queue Length 95th (ft)	2	0	0	0	0	
Control Delay (s)	13.0	0.0	0.0	0.0	0.0	
Lane LOS	B					
Approach Delay (s)	13.0	0.0		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay		0.1				
Intersection Capacity Utilization		53.5%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

23: Woodward Avenue &

1/5/2009

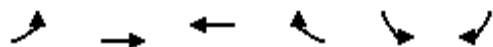


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	910	769	35	0	12
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	958	809	37	0	13
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	846				1307	423
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	846				1307	423
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	98
cM capacity (veh/h)	786				151	579
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	479	479	540	307	13	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	37	13	
cSH	1700	1700	1700	1700	579	
Volume to Capacity	0.28	0.28	0.32	0.18	0.02	
Queue Length 95th (ft)	0	0	0	0	2	
Control Delay (s)	0.0	0.0	0.0	0.0	11.4	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		11.4	
Approach LOS					B	
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			32.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

24: Int

1/5/2009



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↑	↑
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	0	0	30	54	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	0	32	57	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)			451			
pX, platoon unblocked						
vC, conflicting volume	32				16	16
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	32				16	16
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				94	100
cM capacity (veh/h)	1579				1000	1060
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	0	0	0	32	57	0
Volume Left	0	0	0	0	57	0
Volume Right	0	0	0	32	0	0
cSH	1700	1700	1700	1700	1000	1700
Volume to Capacity	0.00	0.00	0.00	0.02	0.06	0.00
Queue Length 95th (ft)	0	0	0	0	5	0
Control Delay (s)	0.0	0.0	0.0	0.0	8.8	0.0
Lane LOS					A	A
Approach Delay (s)	0.0		0.0		8.8	
Approach LOS					A	
Intersection Summary						
Average Delay			5.7			
Intersection Capacity Utilization			13.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Int

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↵	↑↑				↵	↵		↵
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	54	0	17	30	42	0	0	13	100	0	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	57	0	18	32	44	0	0	14	105	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)					249							
pX, platoon unblocked												
vC, conflicting volume	76			57			108	168	28	132	146	38
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	76			57			108	168	28	132	146	38
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	100	99	87	100	100
cM capacity (veh/h)	1521			1546			851	715	1040	809	735	1026
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2				
Volume Total	28	28	18	21	55	14	105	0				
Volume Left	0	0	18	0	0	0	105	0				
Volume Right	0	0	0	0	44	14	0	0				
cSH	1700	1700	1546	1700	1700	1040	809	1700				
Volume to Capacity	0.02	0.02	0.01	0.01	0.03	0.01	0.13	0.00				
Queue Length 95th (ft)	0	0	1	0	0	1	11	0				
Control Delay (s)	0.0	0.0	7.4	0.0	0.0	8.5	10.1	0.0				
Lane LOS			A			A	B	A				
Approach Delay (s)	0.0		1.4			8.5	10.1					
Approach LOS						A	B					
Intersection Summary												
Average Delay			4.9									
Intersection Capacity Utilization			22.2%	ICU Level of Service				A				
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

26: Int

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		0.95		0.97	0.95			1.00	1.00		1.00	
Frt		1.00		1.00	0.90			1.00	0.85		1.00	
Flt Protected		1.00		0.95	1.00			1.00	1.00		0.96	
Satd. Flow (prot)		3539		3433	3198			1863	1583		1793	
Flt Permitted		1.00		0.95	1.00			1.00	1.00		0.70	
Satd. Flow (perm)		3539		3433	3198			1863	1583		1303	
Volume (vph)	0	167	0	135	88	159	0	107	294	386	109	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	176	0	142	93	167	0	113	309	406	115	0
RTOR Reduction (vph)	0	0	0	0	132	0	0	0	254	0	0	0
Lane Group Flow (vph)	0	176	0	142	128	0	0	113	55	0	521	0
Turn Type	Prot			Prot			Split		Perm	Perm		Perm
Protected Phases	7	4		3	8		2	2			6	
Permitted Phases									2	6		6
Actuated Green, G (s)		11.5		9.3	24.8			21.2	21.2		62.0	
Effective Green, g (s)		11.5		9.3	24.8			21.2	21.2		62.0	
Actuated g/C Ratio		0.10		0.08	0.21			0.18	0.18		0.52	
Clearance Time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		339		266	661			329	280		673	
v/s Ratio Prot		c0.05		c0.04	0.04			c0.06				
v/s Ratio Perm									0.03		c0.40	
v/c Ratio		0.52		0.53	0.19			0.34	0.19		0.77	
Uniform Delay, d1		51.6		53.3	39.3			43.3	42.1		23.4	
Progression Factor		1.00		0.55	0.13			1.00	1.00		1.00	
Incremental Delay, d2		1.3		1.9	0.1			2.8	1.6		8.5	
Delay (s)		53.0		31.2	5.3			46.1	43.7		31.8	
Level of Service		D		C	A			D	D		C	
Approach Delay (s)		53.0			14.4			44.3			31.8	
Approach LOS		D			B			D			C	
Intersection Summary												
HCM Average Control Delay			33.1			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			59.9%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

Level Of Service Computation Report

2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #14

Cycle (sec): 100 Critical Vol./Cap.(X): 3.366

Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 413.9

Optimal Cycle: 0 Level Of Service: F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0	1	0	1	0	1	0	1	0	1	0

Volume Module:

Base Vol:	110	350	20	205	905	265	145	440	260	20	340	105
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	110	350	20	205	905	265	145	440	260	20	340	105
Added Vol:	0	104	0	71	113	60	65	0	0	0	0	65
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	110	454	20	276	1018	325	210	440	260	20	340	170
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	110	454	20	276	1018	325	210	440	260	20	340	170
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	110	454	20	276	1018	325	210	440	260	20	340	170
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	110	454	20	276	1018	325	210	440	260	20	340	170

Saturation Flow Module:

Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	273	284	300	291	302	322	282	294	312	273	284	301

Capacity Analysis Module:

Vol/Sat:	0.40	1.60	0.07	0.95	3.37	1.01	0.74	1.50	0.83	0.07	1.20	0.57
Crit Moves:	****			****			****			****		
Delay/Veh:	24.5	315	15.5	77.3	1093	87.3	44.8	270	52.5	16.9	153	29.1
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	24.5	315	15.5	77.3	1093	87.3	44.8	270	52.5	16.9	153	29.1
LOS by Move:	C	F	C	F	F	F	E	F	F	C	F	D
ApproachDel:	249.9			718.1			156.1			107.9		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	249.9			718.1			156.1			107.9		
LOS by Appr:	F			F			F			F		
AllWayAvgQ:	0.7	23.6	0.1	5.0	90.6	6.6	2.3	20.8	3.3	0.1	10.8	1.2

Note: Queue reported is the number of cars per lane.

Level Of Service Detailed Computation Report
2000 HCM 4-Way Stop Method
Future Volume Alternative

Intersection #14

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
----- ----- ----- -----												

Time Period: 0.25 hour

HevVeh: 0% 0% 0% 0%

Alpha Value: 0.01

GroupType:	6			6			6			6		
P[C1]:	0.0000			0.0000			0.0000			0.0000		
P[C2]:	0.0000			0.0000			0.0000			0.0000		
P[C3]:	0.0000			0.0000			0.0000			0.0000		
P[C4]:	0.0000			0.0000			0.0000			0.0000		
P[C5]:	1.0000			1.0000			1.0000			1.0000		
Padj[C1]:	0.04000			0.04000			0.04000			0.04000		
Padj[C2]:	0.03000			0.03000			0.03000			0.03000		
Padj[C3]:	0.02000			0.02000			0.02000			0.02000		
Padj[C4]:	0.01000			0.01000			0.01000			0.01000		
Padj[C5]:	-0.10000			-0.10000			-0.10000			-0.10000		

Lanes:	L1		L2		L1		L2		L1		L2		L1		L2	
LaneType:	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE
----- ----- ----- -----																
HeadwayAdj:	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700
Volume:	110	20	276	325	210	260	20	170								
Capacity:	273	300	291	322	282	312	273	301								
DegOfUtil:	0.40	0.07	0.95	1.01	0.74	0.83	0.07	0.56								
DepHeadway:	13.17	11.97	12.38	11.18	12.74	11.54	13.15	11.95								
ServiceTime:	10.9	9.7	10.1	8.9	10.4	9.2	10.9	9.7								
Delay:	24.5	15.5	77.3	87.3	44.8	52.5	16.9	29.1								
Queue:	0.7	0.1	5.0	6.6	2.3	3.3	0.1	1.2								

Lane:	L3		L3		L3		L3	
LaneType:	THRU		THRU		THRU		THRU	
----- ----- ----- -----								
HeadwayAdj:	0.000		0.000		0.000		0.000	
Volume:	454		1018		440		340	
Capacity:	284		302		294		284	
DegOfUtil:	1.60		3.36		1.50		1.20	
DepHeadway:	12.67		11.88		12.24		12.65	
ServiceTime:	10.4		9.6		9.9		10.4	
Delay:	314.8		1093.2		270.5		152.7	
Queue:	23.6		90.6		20.8		10.8	

Approach:	North Bound		South Bound		East Bound		West Bound	
----- ----- ----- -----								
ApproachDel:	249.9		718.1		156.1		107.9	
Delay Adj:	1.00		1.00		1.00		1.00	
ApprAdjDel:	249.9		718.1		156.1		107.9	
LOS by Appr:	F		F		F		F	

OverallDel:	413.9
OverallLOS:	F

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #14

Future Volume Alternative: Peak Hour Warrant Met

Approach:	North Bound	South Bound	East Bound	West Bound
Movement:	L - T - R	L - T - R	L - T - R	L - T - R
Control:	Stop Sign	Stop Sign	Stop Sign	Stop Sign
Lanes:	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1	1 0 1 0 1
Initial Vol:	110 454 20	276 1018 325	210 440 260	20 340 170
Major Street Volume:	2203			
Minor Approach Volume:	910			
Minor Approach Volume Threshold:	34 [less than minimum of 150]			

SIGNAL WARRANT DISCLAIMER

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The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

Level Of Service Computation Report

2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #18

Cycle (sec): 100 Critical Vol./Cap.(X): 3.197

Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 409.0

Optimal Cycle: 0 Level Of Service: F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0	1	0	1	0	1	0	1	0	1	0

Volume Module:	North Bound			South Bound			East Bound			West Bound		
Base Vol:	50	310	80	920	630	390	150	410	95	100	290	340
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	50	310	80	920	630	390	150	410	95	100	290	340
Added Vol:	33	0	0	0	0	0	0	21	35	0	20	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	83	310	80	920	630	390	150	431	130	100	310	340
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	83	310	80	920	630	390	150	431	130	100	310	340
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	83	310	80	920	630	390	150	431	130	100	310	340
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	83	310	80	920	630	390	150	431	130	100	310	340

Saturation Flow Module:	North Bound			South Bound			East Bound			West Bound		
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	272	283	300	288	300	318	272	282	300	277	289	306

Capacity Analysis Module:	North Bound			South Bound			East Bound			West Bound		
Vol/Sat:	0.30	1.10	0.27	3.20	2.10	1.23	0.55	1.53	0.43	0.36	1.07	1.11
Crit Moves:	****			****			****			****		
Delay/Veh:	21.6	119	19.0	1022	532	158.4	31.0	283	23.6	22.8	111	120.4
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	21.6	119	19.0	1022	532	158.4	31.0	283	23.6	22.8	111	120.4
LOS by Move:	C	F	C	F	F	F	D	F	C	C	F	F
ApproachDel:	84.9			689.1			182.5			103.6		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	84.9			689.1			182.5			103.6		
LOS by Appr:	F			F			F			F		
AllWayAvgQ:	0.4	8.1	0.4	80.5	43.1	12.8	1.1	21.0	0.7	0.5	7.7	9.0

Note: Queue reported is the number of cars per lane.

Level Of Service Detailed Computation Report
2000 HCM 4-Way Stop Method
Future Volume Alternative

Intersection #18

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R

Time Period: 0.25 hour

HevVeh: 0% 0% 0% 0%

Alpha Value: 0.01

GroupType:	6			6			6			6		
P[C1]:	0.0000			0.0000			0.0000			0.0000		
P[C2]:	0.0000			0.0000			0.0000			0.0000		
P[C3]:	0.0000			0.0000			0.0000			0.0000		
P[C4]:	0.0000			0.0000			0.0000			0.0000		
P[C5]:	1.0000			1.0000			1.0000			1.0000		
Padj[C1]:	0.04000			0.04000			0.04000			0.04000		
Padj[C2]:	0.03000			0.03000			0.03000			0.03000		
Padj[C3]:	0.02000			0.02000			0.02000			0.02000		
Padj[C4]:	0.01000			0.01000			0.01000			0.01000		
Padj[C5]:	-0.10000			-0.10000			-0.10000			-0.10000		

Lanes:	L1		L2		L1		L2		L1		L2		L1		L2	
LaneType:	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE	LEFT	RITE
HeadwayAdj:	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700	0.500	-0.700
Volume:	83	80	920	390	150	130	100	340								
Capacity:	272	300	288	318	272	300	277	306								
DegOfUtil:	0.30	0.27	3.20	1.23	0.55	0.43	0.36	1.11								
DepHeadway:	13.22	12.02	12.51	11.31	13.22	12.02	12.97	11.77								
ServiceTime:	10.9	9.7	10.2	9.0	10.9	9.7	10.7	9.5								
Delay:	21.6	19.0	1021.5	158.4	31.0	23.6	22.8	120.4								
Queue:	0.4	0.4	80.5	12.8	1.1	0.7	0.5	9.0								

Lane:	L3		L3		L3		L3	
LaneType:	THRU		THRU		THRU		THRU	
HeadwayAdj:	0.000		0.000		0.000		0.000	
Volume:	310		630		431		310	
Capacity:	283		300		282		289	
DegOfUtil:	1.10		2.10		1.52		1.07	
DepHeadway:	12.72		12.01		12.72		12.47	
ServiceTime:	10.4		9.7		10.4		10.2	
Delay:	118.9		532.3		283.2		111.3	
Queue:	8.1		43.1		21.0		7.7	

Approach:	North Bound		South Bound		East Bound		West Bound	
ApproachDel:	84.9		689.1		182.5		103.6	
Delay Adj:	1.00		1.00		1.00		1.00	
ApprAdjDel:	84.9		689.1		182.5		103.6	
LOS by Appr:	F		F		F		F	

OverallDel:	409.0
OverallLOS:	F

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #18

Future Volume Alternative: Peak Hour Warrant Met

Approach:	North Bound			South Bound			East Bound			West Bound					
Movement:	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign					
Lanes:	1	0	1	0	1	1	0	1	0	1	1	0	1	0	1
Initial Vol:	83	310		80	920	630	390	150	431	130	100	310	340		
Major Street Volume:				2413											
Minor Approach Volume:				750											
Minor Approach Volume Threshold:				-5 [less than minimum of 150]											

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The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

Mitigated Scenarios

2: Wawona St. & Airport Way Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Delay / Veh (s)	11.6	5.9	7.3	3.9	16.8	3.3	6.0
Vehicles Exited	12	10	82	21	8	85	218
Hourly Exit Rate	48	40	328	84	32	340	872

3: Daniels Street & Airport Way Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Delay / Veh (s)	40.7	43.0	5.9	45.4	39.3	6.7	48.4	7.5	1.3	57.7	12.1	2.1
Vehicles Exited	8	3	18	33	8	6	19	96	16	3	79	16
Hourly Exit Rate	32	12	72	132	32	24	76	384	64	12	316	64

3: Daniels Street & Airport Way Performance by movement

Movement	All
Delay / Veh (s)	17.1
Vehicles Exited	305
Hourly Exit Rate	1220

4: SR 120 WB & Airport Way Performance by movement

Movement	WBL	WBR	NBL	NBT	SBT	SBR	All
Delay / Veh (s)	36.6	8.5	42.6	7.4	10.6	6.9	11.9
Vehicles Exited	7	47	26	80	64	74	298
Hourly Exit Rate	28	188	104	320	256	296	1192

5: SR 120 EB & Airport Way Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Delay / Veh (s)	41.7	3.2	19.0	13.9	52.6	4.8	23.0
Vehicles Exited	23	3	81	25	28	38	198
Hourly Exit Rate	92	12	324	100	112	152	792

6: Atherton Dr & Airport Way Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Delay / Veh (s)	41.7		4.5	52.7		7.7	42.4	11.0	5.2	49.2	5.7	1.3
Vehicles Exited	39	0	2	1	0	22	1	44	1	6	26	7
Hourly Exit Rate	156	0	8	4	0	88	4	176	4	24	104	28

6: Atherton Dr & Airport Way Performance by movement

Movement	All
Delay / Veh (s)	19.3
Vehicles Exited	149
Hourly Exit Rate	596

10: Daniels Street & Union Road Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Delay / Veh (s)	28.5	10.1	31.3	2.2	5.4	3.2	5.7
Vehicles Exited	8	26	12	146	194	6	392
Hourly Exit Rate	32	104	48	584	776	24	1568

11: SR 120 WB Ramps & Union Road Performance by movement

Movement	WBL	WBR	NBL	NBT	SBT	SBR	All
Delay / Veh (s)	29.8	9.0	33.0	5.2	6.7	4.6	8.6
Vehicles Exited	24	61	16	93	128	92	414
Hourly Exit Rate	96	244	64	372	512	368	1656

12: SR 120 EB Ramps & Union Road Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Delay / Veh (s)	29.5	7.1	7.3	3.2	27.8	4.2	11.9
Vehicles Exited	30	18	86	20	56	98	308
Hourly Exit Rate	120	72	344	80	224	392	1232

13: Atherton Dr. & Union Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Delay / Veh (s)	31.3	9.7	6.6		39.3	3.7	32.2	6.9	3.7	30.2	2.8	1.3
Vehicles Exited	32	1	3	0	1	9	6	63	1	9	92	13
Hourly Exit Rate	128	4	12	0	4	36	24	252	4	36	368	52

13: Atherton Dr. & Union Road Performance by movement

Movement	All
Delay / Veh (s)	10.0
Vehicles Exited	230
Hourly Exit Rate	920

Total Network Performance

Movement	All
Delay / Veh (s)	35.6
Vehicles Exited	887
Hourly Exit Rate	3548

2: Wawona St. & Airport Way Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Delay / Veh (s)	15.5	8.5	9.0	5.8	19.6	5.1	7.9
Vehicles Exited	11	9	124	16	18	146	324
Hourly Exit Rate	44	36	496	64	72	584	1296

3: Daniels Street & Airport Way Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Delay / Veh (s)	48.1	47.3	8.9	52.0	40.4	8.4	40.9	12.5	2.0	44.8	18.3	4.9
Vehicles Exited	20	8	33	11	9	2	48	130	18	5	106	48
Hourly Exit Rate	80	32	132	44	36	8	192	520	72	20	424	192

3: Daniels Street & Airport Way Performance by movement

Movement	All
Delay / Veh (s)	19.9
Vehicles Exited	438
Hourly Exit Rate	1752

4: SR 120 WB & Airport Way Performance by movement

Movement	WBL	WBR	NBL	NBT	SBT	SBR	All
Delay / Veh (s)	39.6	11.5	62.4	13.7	11.0	7.6	15.1
Vehicles Exited	26	56	10	136	115	42	385
Hourly Exit Rate	104	224	40	544	460	168	1540

5: SR 120 EB & Airport Way Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Delay / Veh (s)	47.6	13.1	23.6	19.8	42.9	11.8	28.9
Vehicles Exited	84	30	59	14	55	82	324
Hourly Exit Rate	336	120	236	56	220	328	1296

6: Atherton Dr & Airport Way Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Delay / Veh (s)	45.2	29.3	6.9	52.2		6.1	65.7	13.0	8.8	38.9	4.5	1.8
Vehicles Exited	19	2	3	3	0	16	1	36	3	22	75	12
Hourly Exit Rate	76	8	12	12	0	64	4	144	12	88	300	48

6: Atherton Dr & Airport Way Performance by movement

Movement	All
Delay / Veh (s)	15.6
Vehicles Exited	192
Hourly Exit Rate	768

10: Daniels Street & Union Road Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Delay / Veh (s)	33.1	13.8	30.3	3.3	7.7	3.2	7.2
Vehicles Exited	8	24	30	284	189	8	543
Hourly Exit Rate	32	96	120	1136	756	32	2172

11: SR 120 WB Ramps & Union Road Performance by movement

Movement	WBL	WBR	NBL	NBT	SBT	SBR	All
Delay / Veh (s)	33.8	16.9	40.4	9.3	18.8	11.9	18.3
Vehicles Exited	70	88	60	229	172	37	656
Hourly Exit Rate	280	352	240	916	688	148	2624

12: SR 120 EB Ramps & Union Road Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Delay / Veh (s)	32.1	14.9	18.5	8.9	39.3	10.6	19.0
Vehicles Exited	115	69	195	80	59	182	700
Hourly Exit Rate	460	276	780	320	236	728	2800

13: Atherton Dr. & Union Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Delay / Veh (s)	55.6	37.7	34.6	41.2	31.7	9.1	37.0	12.1	6.8	28.4	12.6	3.2
Vehicles Exited	190	4	5	2	4	12	19	54	1	7	196	47
Hourly Exit Rate	760	16	20	8	16	48	76	216	4	28	784	188

13: Atherton Dr. & Union Road Performance by movement

Movement	All
Delay / Veh (s)	28.5
Vehicles Exited	541
Hourly Exit Rate	2164

Total Network Performance

Movement	All
Delay / Veh (s)	54.3
Vehicles Exited	1450
Hourly Exit Rate	5800

SIMTRAFFIC LEVEL OF SERVICE REPORT

Project: Union Crossing EIR **HCM:** 2000
Scenario: Cumulative Mitigated **# of Runs:** 7
TOD: AM Peak **Analysis Period:** Hourly **PHF:** 0.95

Intersection: 4: SR 120 WB & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	926	175	19	14	13.2	B	2.1
	R	1221	230	19	10	10.3	B	0.9
	Subtotal	2147	405	19	--	11.5	B	--
SB	T	814	210	26	13	17.7	B	1.7
	R	705	171	24	9	10.2	B	1.0
	Subtotal	1519	381	25	--	14.3	B	--
WB	L	1168	284	24	12	24.7	C	2.4
	R	537	130	24	8	21.7	C	3.4
	Subtotal	1705	414	24	--	23.7	C	--
Total		5372	1201	22	--	16.6	B	--

Intersection: 5: SR 120 EB & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	1842	332	18	13	17.6	B	2.3
	R	847	148	17	6	13.8	B	1.4
	Subtotal	2689	480	18	--	16.4	B	--
SB	T	1674	412	25	14	10.3	B	0.9
	R	308	80	26	12	7.3	A	2.1
	Subtotal	1982	492	25	--	9.8	A	--
EB	L	305	70	23	7	24.4	C	3.5
	R	474	109	23	8	21.0	C	2.4
	Subtotal	779	179	23	--	22.3	C	--
Total		5451	1150	21	--	14.5	B	--

SIMTRAFFIC LEVEL OF SERVICE REPORT

Project: Union Crossing EIR **HCM:** 2000
Scenario: Cumulative Mitigated **# of Runs:** 7
TOD: AM Peak **Analysis Period:** Hourly **PHF:** 0.95

Intersection: 10: Daniels Street & Union Road **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	102	25	25	4	32.2	C	11.5
	T	1162	281	24	8	5.1	A	1.0
	Subtotal	1264	306	24	--	7.3	A	--
SB	T	1382	325	24	18	15.2	B	3.3
	R	32	8	25	4	17.3	B	11.8
	Subtotal	1414	333	24	--	15.2	B	--
EB	L	42	10	24	2	19.6	B	5.2
	R	158	39	25	9	13.7	B	2.7
	Subtotal	200	49	25	--	14.9	B	--
Total		2878	689	24	--	11.7	B	--

Intersection: 11: SR 120 WB Ramps & Union Road **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	896	216	24	9	9.4	A	1.0
	R	872	207	24	12	11.0	B	1.5
	Subtotal	1767	424	24	--	10.2	B	--
SB	T	845	204	24	19	10.8	B	1.9
	R	695	164	24	12	6.4	A	0.8
	Subtotal	1540	368	24	--	8.8	A	--
WB	L	266	61	23	9	23.5	C	4.5
	R	368	95	26	12	17.4	B	3.3
	Subtotal	635	155	24	--	19.8	B	--
Total		3942	947	24	--	11.2	B	--

SIMTRAFFIC LEVEL OF SERVICE REPORT

Project: Union Crossing EIR **HCM:** 2000
Scenario: Cumulative Mitigated **# of Runs:** 7
TOD: AM Peak **Analysis Period:** Hourly **PHF:** 0.95

Intersection: 12: SR 120 EB Ramps & Union Road **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	1536	382	25	13	11.7	B	2.1
	R	273	65	24	9	5.0	A	0.9
	Subtotal	1808	447	25	--	10.8	B	--
SB	T	827	194	23	19	10.1	B	1.9
	R	284	66	23	10	4.6	A	1.2
	Subtotal	1112	260	23	--	8.7	A	--
EB	L	232	56	24	5	26.1	C	4.9
	R	423	100	24	9	15.1	B	2.5
	Subtotal	655	156	24	--	19.0	B	--
Total		3575	864	24	--	11.6	B	--

Intersection: 13: Atherton Dr. & Union Road **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	74	19	26	1	69.1	E	13.6
	T	1392	317	23	9	39.8	D	9.6
	R	134	29	22	4	24.8	C	9.7
	Subtotal	1599	365	23	--	40.1	D	--
SB	L	563	129	23	11	51.2	D	12.0
	T	598	144	24	16	9.5	A	2.2
	R	49	12	24	4	2.5	A	1.2
	Subtotal	1211	284	23	--	28.1	C	--
EB	L	98	24	24	7	57.5	E	14.3
	T	6	2	33	1	43.4	D	30.0
	R	17	4	24	3	9.5	A	8.7
	Subtotal	121	30	25	--	50.4	D	--
WB	L	108	26	24	6	50.6	D	12.1
	T	8	2	25	2	65.8	E	51.8
	R	311	75	24	13	15.8	B	5.1
	Subtotal	427	104	24	--	25.7	C	--
Total		3358	783	23	--	34.2	C	--

SIMTRAFFIC LEVEL OF SERVICE REPORT

Project: Union Crossing EIR **HCM:** 2000
Scenario: Cumulative Mitigated **# of Runs:** 7
TOD: AM Peak **Analysis Period:** Hourly **PHF:** 0.95

Intersection: 15: SR 120 WB Ramp & Main Street **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	994	234	24	20	7.0	A	1.4
	R	547	128	23	11	4.9	A	1.5
	Subtotal	1541	362	23	--	6.2	A	--
SB	T	432	108	25	8	13.9	B	1.1
	R	1032	241	23	16	21.8	C	4.0
	Subtotal	1463	349	24	--	19.4	B	--
WB	L	274	62	23	12	36.7	D	7.8
	R	326	74	23	11	9.3	A	2.4
	Subtotal	600	136	23	--	21.7	C	--
Total		3604	847	24	--	14.1	B	--

Intersection: 16: SR 120 EB Ramps & Main Street **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	989	240	24	9	11.0	B	2.4
	R	484	114	24	9	3.9	A	0.6
	Subtotal	1474	354	24	--	8.7	A	--
SB	T	526	135	26	13	9.5	A	2.2
	R	179	39	22	6	3.4	A	0.9
	Subtotal	705	175	25	--	8.1	A	--
EB	L	552	128	23	7	34.5	C	5.4
	R	484	117	24	12	14.2	B	2.5
	Subtotal	1036	245	24	--	24.8	C	--
Total		3215	774	24	--	13.7	B	--

SIMTRAFFIC LEVEL OF SERVICE REPORT

Project: Union Crossing EIR **HCM:** 2000
Scenario: Cumulative Mitigated **# of Runs:** 7
TOD: AM Peak **Analysis Period:** Hourly **PHF:** 0.95

Intersection: 17: Atherton Drive & Main Street **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	263	65	25	6	36.6	D	3.7
	T	1347	318	24	9	4.4	A	0.7
	Subtotal	1611	383	24	--	9.9	A	--
SB	T	621	155	25	17	9.1	A	1.9
	R	389	97	25	3	7.0	A	1.4
	Subtotal	1011	253	25	--	8.2	A	--
EB	L	126	28	22	4	37.2	D	9.6
	R	74	19	26	5	5.7	A	2.4
	Subtotal	200	46	23	--	24.4	C	--
Total		2821	682	24	--	10.2	B	--

HCM Signalized Intersection Capacity Analysis

1: Yosemite Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5085	1583	3433	5085	1583	3433	4988	1583	3433	4988	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5085	1583	3433	5085	1583	3433	4988	1583	3433	4988	1583
Volume (vph)	240	432	127	200	221	173	111	538	120	360	665	540
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	253	455	134	211	233	182	117	566	126	379	700	568
RTOR Reduction (vph)	0	0	109	0	0	148	0	0	82	0	0	297
Lane Group Flow (vph)	253	455	25	211	233	34	117	566	44	379	700	271
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	6.0	11.3	11.3	6.0	11.3	11.3	4.7	20.9	20.9	6.0	22.2	22.2
Effective Green, g (s)	6.0	11.3	11.3	6.0	11.3	11.3	4.7	20.9	20.9	6.0	22.2	22.2
Actuated g/C Ratio	0.10	0.19	0.19	0.10	0.19	0.19	0.08	0.35	0.35	0.10	0.37	0.37
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	342	954	297	342	954	297	268	1732	550	342	1839	584
v/s Ratio Prot	c0.07	c0.09		0.06	0.05		0.03	0.11		c0.11	0.14	
v/s Ratio Perm			0.02			0.02			0.03			c0.17
v/c Ratio	0.74	0.48	0.08	0.62	0.24	0.12	0.44	0.33	0.08	1.11	0.38	0.46
Uniform Delay, d1	26.3	21.8	20.2	26.0	20.8	20.3	26.5	14.5	13.2	27.1	14.0	14.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.1	0.4	0.1	3.3	0.1	0.2	1.1	0.5	0.3	81.1	0.6	2.6
Delay (s)	34.5	22.2	20.3	29.3	20.9	20.5	27.6	15.0	13.5	108.2	14.6	17.1
Level of Service	C	C	C	C	C	C	C	B	B	F	B	B
Approach Delay (s)		25.6			23.6			16.6			37.0	
Approach LOS		C			C			B			D	
Intersection Summary												
HCM Average Control Delay			28.2				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.56									
Actuated Cycle Length (s)			60.2				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			51.0%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Wawona St. & Airport Way

1/5/2009

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.91	1.00	1.00	0.91
Frpb, ped/bikes	1.00	0.99	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1562	4988	1548	1770	4988
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1562	4988	1548	1770	4988
Volume (vph)	320	50	719	95	40	952
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	337	53	757	100	42	1002
RTOR Reduction (vph)	0	38	0	62	0	0
Lane Group Flow (vph)	337	15	757	38	42	1002
Confl. Peds. (#/hr)		2		2		
Heavy Vehicles (%)	2%	2%	4%	2%	2%	4%
Turn Type	Perm		Perm		Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	11.9	11.9	15.5	15.5	1.9	21.4
Effective Green, g (s)	11.9	11.9	15.5	15.5	1.9	21.4
Actuated g/C Ratio	0.29	0.29	0.38	0.38	0.05	0.52
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	510	450	1872	581	81	2585
v/s Ratio Prot	c0.19		0.15		0.02	c0.20
v/s Ratio Perm		0.01		0.02		
v/c Ratio	0.66	0.03	0.40	0.06	0.52	0.39
Uniform Delay, d1	12.9	10.6	9.5	8.3	19.3	6.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.2	0.0	0.1	0.0	5.5	0.1
Delay (s)	16.1	10.6	9.6	8.3	24.8	6.1
Level of Service	B	B	A	A	C	A
Approach Delay (s)	15.4		9.5			6.8
Approach LOS	B		A			A
Intersection Summary						
HCM Average Control Delay			9.3		HCM Level of Service	A
HCM Volume to Capacity ratio			0.49			
Actuated Cycle Length (s)			41.3		Sum of lost time (s)	8.0
Intersection Capacity Utilization			45.0%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

6: Atherton Dr & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.91	1.00	0.97	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	5085	1583	3433	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	5085	1583	3433	5085	1583
Volume (vph)	470	40	20	127	35	670	43	1415	181	370	995	675
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	495	42	21	134	37	705	45	1489	191	389	1047	711
RTOR Reduction (vph)	0	0	18	0	0	2	0	0	124	0	0	216
Lane Group Flow (vph)	495	42	3	134	37	703	45	1489	67	389	1047	495
Turn Type	Prot		Perm	Prot		pm+ov	Prot		Perm	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2		1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	13.1	11.6	11.6	6.8	5.3	23.5	3.4	28.7	28.7	18.2	43.5	56.6
Effective Green, g (s)	13.1	11.6	11.6	6.8	5.3	23.5	3.4	28.7	28.7	18.2	43.5	56.6
Actuated g/C Ratio	0.16	0.14	0.14	0.08	0.07	0.29	0.04	0.35	0.35	0.22	0.54	0.70
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	553	505	226	287	231	535	74	1795	559	769	2721	1180
v/s Ratio Prot	c0.14	0.01		0.04	0.01	c0.29	0.03	c0.29		0.11	0.21	0.07
v/s Ratio Perm			0.00			0.15			0.04			0.25
v/c Ratio	0.90	0.08	0.01	0.47	0.16	1.31	0.61	0.83	0.12	0.51	0.38	0.42
Uniform Delay, d1	33.4	30.2	29.9	35.5	35.9	28.9	38.3	24.1	17.8	27.6	11.1	5.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	16.9	0.1	0.0	1.2	0.3	154.1	13.3	3.3	0.1	0.5	0.1	0.2
Delay (s)	50.3	30.3	30.0	36.7	36.2	183.0	51.6	27.4	17.9	28.1	11.2	5.5
Level of Service	D	C	C	D	D	F	D	C	B	C	B	A
Approach Delay (s)		48.0			154.4			27.0			12.4	
Approach LOS		D			F			C			B	
Intersection Summary												
HCM Average Control Delay			44.3				HCM Level of Service			D		
HCM Volume to Capacity ratio			1.03									
Actuated Cycle Length (s)			81.3				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			92.2%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

7: Woodward Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	5085	1583	3433	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	5085	1583	3433	5085	1583
Volume (vph)	200	311	40	83	537	514	20	925	30	137	315	690
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	211	327	42	87	565	541	21	974	32	144	332	726
RTOR Reduction (vph)	0	0	30	0	0	15	0	0	23	0	0	145
Lane Group Flow (vph)	211	327	12	87	565	526	21	974	9	144	332	581
Turn Type	Prot		Perm	Prot		pm+ov	Prot		Perm	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2		1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	6.0	17.9	17.9	3.4	15.3	21.3	1.1	18.0	18.0	6.0	22.9	28.9
Effective Green, g (s)	6.0	17.9	17.9	3.4	15.3	21.3	1.1	18.0	18.0	6.0	22.9	28.9
Actuated g/C Ratio	0.10	0.29	0.29	0.06	0.25	0.35	0.02	0.29	0.29	0.10	0.37	0.47
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	336	1033	462	190	883	653	62	1493	465	336	1900	850
v/s Ratio Prot	0.06	c0.09		0.03	0.16	c0.08	0.01	0.19		0.04	0.07	c0.07
v/s Ratio Perm			0.01			0.25			0.01			0.30
v/c Ratio	0.63	0.32	0.03	0.46	0.64	0.81	0.34	0.65	0.02	0.43	0.17	0.68
Uniform Delay, d1	26.6	16.9	15.5	28.1	20.5	18.1	29.7	18.9	15.4	26.0	12.9	12.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.6	0.2	0.0	1.7	1.5	7.2	3.2	1.0	0.0	0.9	0.0	2.3
Delay (s)	30.2	17.1	15.5	29.8	22.1	25.3	33.0	20.0	15.4	26.9	12.9	14.9
Level of Service	C	B	B	C	C	C	C	B	B	C	B	B
Approach Delay (s)		21.8			24.1			20.1			15.8	
Approach LOS		C			C			C			B	
Intersection Summary												
HCM Average Control Delay			20.2				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.76									
Actuated Cycle Length (s)			61.3				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			70.9%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

8: Yosemite Avenue & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3343	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	3433	3343	1583	1770	3539	1583
Volume (vph)	150	400	192	301	170	70	194	547	164	70	481	230
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	158	421	202	317	179	74	204	576	173	74	506	242
RTOR Reduction (vph)	0	0	161	0	0	53	0	0	119	0	0	171
Lane Group Flow (vph)	158	421	41	317	179	21	204	576	54	74	506	71
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	9.6	15.4	15.4	15.9	21.7	21.7	6.0	23.4	23.4	4.7	22.1	22.1
Effective Green, g (s)	9.6	15.4	15.4	15.9	21.7	21.7	6.0	23.4	23.4	4.7	22.1	22.1
Actuated g/C Ratio	0.13	0.20	0.20	0.21	0.29	0.29	0.08	0.31	0.31	0.06	0.29	0.29
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	225	723	323	373	1019	456	273	1037	491	110	1037	464
v/s Ratio Prot	0.09	c0.12		c0.18	0.05		c0.06	c0.17		0.04	0.14	
v/s Ratio Perm			0.03			0.01			0.03			0.04
v/c Ratio	0.70	0.58	0.13	0.85	0.18	0.05	0.75	0.56	0.11	0.67	0.49	0.15
Uniform Delay, d1	31.5	27.1	24.5	28.6	20.1	19.4	34.0	21.7	18.6	34.6	22.0	19.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.5	1.2	0.2	16.4	0.1	0.0	10.6	2.1	0.4	15.0	1.6	0.7
Delay (s)	41.0	28.3	24.7	45.0	20.2	19.4	44.6	23.8	19.0	49.6	23.6	20.4
Level of Service	D	C	C	D	C	B	D	C	B	D	C	C
Approach Delay (s)		29.9			33.9			27.4			25.0	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			28.6				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			75.4				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			60.1%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: Wawona St. & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.89		1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1667		1770	1732		1770	3343	1583	1770	3539	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1667		1770	1732		1770	3343	1583	1770	3539	1583
Volume (vph)	80	90	212	210	90	80	159	821	113	120	933	20
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	84	95	223	221	95	84	167	864	119	126	982	21
RTOR Reduction (vph)	0	99	0	0	36	0	0	0	75	0	0	14
Lane Group Flow (vph)	84	219	0	221	143	0	167	864	44	126	982	7
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	6.7	15.7		13.1	22.1		9.8	31.4	31.4	8.6	30.2	30.2
Effective Green, g (s)	6.7	15.7		13.1	22.1		9.8	31.4	31.4	8.6	30.2	30.2
Actuated g/C Ratio	0.08	0.19		0.15	0.26		0.12	0.37	0.37	0.10	0.36	0.36
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	140	309		273	451		205	1238	586	180	1260	564
v/s Ratio Prot	0.05	c0.13		c0.12	0.08		c0.09	0.26		0.07	c0.28	
v/s Ratio Perm									0.03			0.00
v/c Ratio	0.60	0.71		0.81	0.32		0.81	0.70	0.08	0.70	0.78	0.01
Uniform Delay, d1	37.8	32.4		34.6	25.3		36.6	22.7	17.3	36.9	24.3	17.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.8	7.5		16.0	0.4		21.4	3.3	0.2	11.3	4.8	0.0
Delay (s)	44.5	39.9		50.7	25.7		58.0	26.0	17.5	48.1	29.1	17.7
Level of Service	D	D		D	C		E	C	B	D	C	B
Approach Delay (s)		40.9			39.5			29.7			31.1	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM Average Control Delay			32.9			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			84.8			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			77.3%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

21: Union Road &

1/5/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	5	27	1503	633	16
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	5	28	1582	666	17
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)				729	530	
pX, platoon unblocked	0.71	0.94	0.94			
vC, conflicting volume	1523	342	683			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1093	245	606			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	97			
cM capacity (veh/h)	143	714	914			
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	5	28	791	791	444	239
Volume Left	0	28	0	0	0	0
Volume Right	5	0	0	0	0	17
cSH	714	914	1700	1700	1700	1700
Volume to Capacity	0.01	0.03	0.47	0.47	0.26	0.14
Queue Length 95th (ft)	1	2	0	0	0	0
Control Delay (s)	10.1	9.1	0.0	0.0	0.0	0.0
Lane LOS	B	A				
Approach Delay (s)	10.1	0.2			0.0	
Approach LOS	B					
Intersection Summary						
Average Delay		0.1				
Intersection Capacity Utilization		44.9%		ICU Level of Service		A
Analysis Period (min)		15				

SIMTRAFFIC LEVEL OF SERVICE REPORT

Project: Union Crossing EIR **HCM:** 2000
Scenario: Cumulative Mitigated **# of Runs:** 7
TOD: PM Peak **Analysis Period:** Hourly **PHF:** 0.95

Intersection: 4: SR 120 WB & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	1695	385	23	16	25.8	C	5.5
	R	463	106	23	4	9.9	A	1.3
	Subtotal	2158	491	23	--	22.4	C	--
SB	T	1383	323	23	10	21.9	C	2.6
	R	800	175	22	10	14.0	B	4.2
	Subtotal	2183	497	23	--	19.1	B	--
WB	L	879	201	23	17	27.7	C	3.8
	R	538	117	22	10	23.5	C	4.0
	Subtotal	1417	318	22	--	26.2	C	--
Total		5758	1306	23	--	22.1	C	--

Intersection: 5: SR 120 EB & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	1305	283	22	8	25.6	C	2.0
	R	1042	225	22	21	20.1	C	6.7
	Subtotal	2347	508	22	--	23.2	C	--
SB	T	1668	387	23	6	29.4	C	2.9
	R	594	131	22	8	9.7	A	1.5
	Subtotal	2262	518	23	--	24.4	C	--
EB	L	853	197	23	15	29.8	C	5.6
	R	1316	316	24	14	36.3	D	10.3
	Subtotal	2168	513	24	--	33.8	C	--
Total		6778	1539	23	--	27.1	C	--

SIMTRAFFIC LEVEL OF SERVICE REPORT

Project: Union Crossing EIR **HCM:** 2000
Scenario: Cumulative Mitigated **# of Runs:** 7
TOD: PM Peak **Analysis Period:** Hourly **PHF:** 0.95

Intersection: 10: Daniels Street & Union Road **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	184	42	23	8	34.1	C	7.0
	T	1668	391	23	10	6.8	A	2.4
	Subtotal	1853	433	23	--	9.4	A	--
SB	T	1224	283	23	15	18.3	B	3.8
	R	42	10	24	3	18.8	B	7.4
	Subtotal	1266	293	23	--	18.4	B	--
EB	L	42	12	29	3	40.3	D	12.2
	R	145	33	23	6	22.0	C	5.8
	Subtotal	187	45	24	--	26.8	C	--
Total		3306	771	23	--	13.8	B	--

Intersection: 11: SR 120 WB Ramps & Union Road **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	1389	316	23	17	21.5	C	5.6
	R	632	145	23	12	7.0	A	1.5
	Subtotal	2021	461	23	--	16.9	B	--
SB	T	1043	240	23	17	11.9	B	3.6
	R	326	77	24	4	5.5	A	1.3
	Subtotal	1369	317	23	--	10.3	B	--
WB	L	340	85	25	7	37.1	D	2.6
	R	463	113	24	5	33.2	C	5.2
	Subtotal	803	197	25	--	34.9	C	--
Total		4194	976	23	--	18.4	B	--

SIMTRAFFIC LEVEL OF SERVICE REPORT

Project: Union Crossing EIR **HCM:** 2000
Scenario: Cumulative Mitigated **# of Runs:** 7
TOD: PM Peak **Analysis Period:** Hourly **PHF:** 0.95

Intersection: 12: SR 120 EB Ramps & Union Road **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	1379	372	27	10	22.8	C	3.4
	R	323	76	24	13	4.6	A	1.7
	Subtotal	1702	449	26	--	19.7	B	--
SB	T	1067	249	23	18	39.9	D	7.9
	R	316	71	22	7	19.3	B	9.3
	Subtotal	1383	320	23	--	35.3	D	--
EB	L	642	144	22	14	25.0	C	6.3
	R	1166	271	23	21	32.9	C	9.5
	Subtotal	1808	415	23	--	30.2	C	--
Total		4894	1184	24	--	27.6	C	--

Intersection: 13: Atherton Dr. & Union Road **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	222	53	24	3	68.8	E	19.6
	T	544	129	24	11	32.9	C	3.7
	R	144	35	24	4	12.4	B	2.1
	Subtotal	911	217	24	--	38.4	D	--
SB	L	500	108	22	15	66.9	E	12.2
	T	1401	362	26	14	45.0	D	13.3
	R	152	37	24	6	25.4	C	13.0
	Subtotal	2053	507	25	--	48.2	D	--
EB	L	704	166	24	7	104.4	F	41.7
	T	37	8	22	5	61.9	E	40.0
	R	40	8	20	3	29.4	C	16.9
	Subtotal	781	182	23	--	99.0	F	--
WB	L	319	76	24	12	28.4	C	7.3
	T	27	6	22	3	32.9	C	17.9
	R	547	127	23	7	14.4	B	1.6
	Subtotal	894	208	23	--	20.0	C	--
Total		4638	1115	24	--	49.4	D	--

SIMTRAFFIC LEVEL OF SERVICE REPORT

Project: Union Crossing EIR **HCM:** 2000
Scenario: Cumulative Mitigated **# of Runs:** 7
TOD: PM Peak **Analysis Period:** Hourly **PHF:** 0.95

Intersection: 15: SR 120 WB Ramp & Main Street **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	1591	383	24	25	30.7	C	10.1
	R	400	94	24	8	3.2	A	0.9
	Subtotal	1991	477	24	--	25.3	C	--
SB	T	779	180	23	12	20.7	C	2.7
	R	844	202	24	9	20.7	C	2.8
	Subtotal	1623	382	24	--	20.7	C	--
WB	L	779	182	23	10	34.5	C	2.3
	R	368	88	24	6	23.2	C	4.1
	Subtotal	1147	270	24	--	30.8	C	--
Total		4761	1129	24	--	25.0	C	--

Intersection: 16: SR 120 EB Ramps & Main Street **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	832	213	26	15	10.8	B	1.0
	R	421	101	24	10	3.8	A	0.8
	Subtotal	1253	314	25	--	8.6	A	--
SB	T	1253	293	23	21	30.9	C	10.9
	R	305	76	25	8	20.3	C	11.0
	Subtotal	1558	369	24	--	28.7	C	--
EB	L	1159	276	24	22	34.3	C	4.5
	R	1000	240	24	17	21.6	C	3.1
	Subtotal	2159	515	24	--	28.4	C	--
Total		4969	1199	24	--	23.3	C	--

SIMTRAFFIC LEVEL OF SERVICE REPORT

Project: Union Crossing EIR **HCM:** 2000
Scenario: Cumulative Mitigated **# of Runs:** 7
TOD: PM Peak **Analysis Period:** Hourly **PHF:** 0.95

Intersection: 17: Atherton Drive & Main Street **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	179	43	24	7	42.2	D	4.8
	T	663	161	24	6	7.5	A	1.1
	Subtotal	842	204	24	--	14.9	B	--
SB	T	1747	424	24	11	20.7	C	2.6
	R	505	114	23	14	10.0	A	2.4
	Subtotal	2253	538	24	--	18.5	B	--
EB	L	621	149	24	16	37.5	D	6.7
	R	295	71	24	5	16.7	B	2.2
	Subtotal	916	220	24	--	30.8	C	--
Total		4011	961	24	--	20.5	C	--

HCM Signalized Intersection Capacity Analysis

1: Yosemite Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5085	1583	3433	5085	1583	3433	4988	1583	3433	4988	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5085	1583	3433	5085	1583	3433	4988	1583	3433	4988	1583
Volume (vph)	560	352	187	275	352	334	222	1189	280	283	638	320
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	589	371	197	289	371	352	234	1252	295	298	672	337
RTOR Reduction (vph)	0	0	150	0	0	183	0	0	197	0	0	239
Lane Group Flow (vph)	589	371	47	289	371	169	234	1252	98	298	672	98
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	15.4	18.1	18.1	10.1	12.8	12.8	9.2	23.1	23.1	8.0	21.9	21.9
Effective Green, g (s)	15.4	18.1	18.1	10.1	12.8	12.8	9.2	23.1	23.1	8.0	21.9	21.9
Actuated g/C Ratio	0.20	0.24	0.24	0.13	0.17	0.17	0.12	0.31	0.31	0.11	0.29	0.29
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	702	1222	381	460	864	269	419	1530	486	365	1451	460
v/s Ratio Prot	c0.17	0.07		0.08	0.07		0.07	c0.25		c0.09	0.13	
v/s Ratio Perm			0.03			c0.11			0.06			0.06
v/c Ratio	0.84	0.30	0.12	0.63	0.43	0.63	0.56	0.82	0.20	0.82	0.46	0.21
Uniform Delay, d1	28.8	23.4	22.4	30.8	28.0	29.0	31.1	24.2	19.3	32.9	21.9	20.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.7	0.1	0.1	2.7	0.3	4.6	1.6	5.0	0.9	13.2	1.1	1.1
Delay (s)	37.4	23.6	22.5	33.5	28.3	33.6	32.8	29.2	20.2	46.1	22.9	21.2
Level of Service	D	C	C	C	C	C	C	C	C	D	C	C
Approach Delay (s)		30.5			31.6			28.1			27.8	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			29.2			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			75.3			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			69.6%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Wawona St. & Airport Way

1/5/2009

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			  			  
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.91	1.00	1.00	0.91
Frpb, ped/bikes	1.00	0.99	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1560	4988	1545	1770	4988
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1560	4988	1545	1770	4988
Volume (vph)	110	40	1651	350	80	1020
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	116	42	1738	368	84	1074
RTOR Reduction (vph)	0	36	0	144	0	0
Lane Group Flow (vph)	116	6	1738	224	84	1074
Confl. Peds. (#/hr)		2		2		
Heavy Vehicles (%)	2%	2%	4%	2%	2%	4%
Turn Type	Perm		Perm		Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	10.3	10.3	41.4	41.4	4.4	49.8
Effective Green, g (s)	10.3	10.3	41.4	41.4	4.4	49.8
Actuated g/C Ratio	0.15	0.15	0.61	0.61	0.06	0.73
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	268	236	3032	939	114	3648
v/s Ratio Prot	c0.07		c0.35		c0.05	0.22
v/s Ratio Perm		0.00		0.14		
v/c Ratio	0.43	0.03	0.57	0.24	0.74	0.29
Uniform Delay, d1	26.2	24.6	8.0	6.1	31.3	3.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1	0.0	0.3	0.1	21.7	0.0
Delay (s)	27.4	24.7	8.3	6.3	53.0	3.2
Level of Service	C	C	A	A	D	A
Approach Delay (s)	26.7		7.9			6.8
Approach LOS	C		A			A
Intersection Summary						
HCM Average Control Delay			8.4		HCM Level of Service	A
HCM Volume to Capacity ratio			0.56			
Actuated Cycle Length (s)			68.1		Sum of lost time (s)	12.0
Intersection Capacity Utilization			52.9%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

6: Atherton Dr & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.91	1.00	0.97	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	5085	1583	3433	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	5085	1583	3433	5085	1583
Volume (vph)	730	45	38	162	55	625	59	875	152	790	1485	560
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	768	47	40	171	58	658	62	921	160	832	1563	589
RTOR Reduction (vph)	0	0	34	0	0	3	0	0	123	0	0	179
Lane Group Flow (vph)	768	47	6	171	58	655	62	921	37	832	1563	410
Turn Type	Prot		Perm	Prot		pm+ov	Prot		Perm	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2		1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	20.2	12.2	12.2	13.5	5.5	26.7	3.4	18.9	18.9	21.2	36.7	56.9
Effective Green, g (s)	20.2	12.2	12.2	13.5	5.5	26.7	3.4	18.9	18.9	21.2	36.7	56.9
Actuated g/C Ratio	0.25	0.15	0.15	0.17	0.07	0.33	0.04	0.23	0.23	0.26	0.45	0.70
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	848	528	236	567	238	594	74	1175	366	890	2281	1179
v/s Ratio Prot	c0.22	0.01		0.05	0.02	c0.29	0.04	c0.18		0.24	0.31	0.09
v/s Ratio Perm			0.00			0.13			0.02			0.17
v/c Ratio	0.91	0.09	0.03	0.30	0.24	1.10	0.84	0.78	0.10	0.93	0.69	0.35
Uniform Delay, d1	29.9	30.0	29.7	30.0	36.2	27.5	38.9	29.5	24.8	29.6	18.0	5.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	13.1	0.1	0.0	0.3	0.5	68.0	53.0	3.5	0.1	16.5	0.9	0.2
Delay (s)	43.0	30.1	29.8	30.3	36.7	95.6	91.9	33.0	24.9	46.1	18.8	5.2
Level of Service	D	C	C	C	D	F	F	C	C	D	B	A
Approach Delay (s)		41.6			79.1			35.1			23.7	
Approach LOS		D			E			D			C	
Intersection Summary												
HCM Average Control Delay			36.9				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.96									
Actuated Cycle Length (s)			81.8				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			86.4%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

7: Woodward Avenue & Airport Way

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	5085	1583	3433	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	5085	1583	3433	5085	1583
Volume (vph)	480	493	30	74	420	296	40	310	53	530	1030	125
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	505	519	32	78	442	312	42	326	56	558	1084	132
RTOR Reduction (vph)	0	0	22	0	0	61	0	0	45	0	0	63
Lane Group Flow (vph)	505	519	10	78	442	251	42	326	11	558	1084	69
Turn Type	Prot		Perm	Prot		pm+ov	Prot		Perm	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2		1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	12.5	22.0	22.0	4.6	14.1	27.5	3.3	14.0	14.0	13.4	24.1	36.6
Effective Green, g (s)	12.5	22.0	22.0	4.6	14.1	27.5	3.3	14.0	14.0	13.4	24.1	36.6
Actuated g/C Ratio	0.18	0.31	0.31	0.07	0.20	0.39	0.05	0.20	0.20	0.19	0.34	0.52
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	613	1112	498	226	713	712	162	1017	317	657	1751	918
v/s Ratio Prot	c0.15	0.15		0.02	c0.12	0.07	0.01	0.06		c0.16	c0.21	0.01
v/s Ratio Perm			0.01			0.09			0.01			0.03
v/c Ratio	0.82	0.47	0.02	0.35	0.62	0.35	0.26	0.32	0.04	0.85	0.62	0.08
Uniform Delay, d1	27.7	19.3	16.6	31.3	25.5	15.0	32.2	23.9	22.6	27.3	19.1	8.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.8	0.3	0.0	0.9	1.6	0.3	0.9	0.2	0.0	10.0	0.7	0.0
Delay (s)	36.5	19.6	16.6	32.2	27.1	15.3	33.0	24.1	22.6	37.3	19.8	8.3
Level of Service	D	B	B	C	C	B	C	C	C	D	B	A
Approach Delay (s)		27.6			23.2			24.8			24.5	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			25.0				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.70									
Actuated Cycle Length (s)			70.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			61.9%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

8: Yosemite Avenue & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3343	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	3433	3343	1583	1770	3539	1583
Volume (vph)	290	520	310	201	550	120	291	640	153	130	633	230
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	305	547	326	212	579	126	306	674	161	137	666	242
RTOR Reduction (vph)	0	0	212	0	0	98	0	0	117	0	0	176
Lane Group Flow (vph)	305	547	114	212	579	28	306	674	44	137	666	66
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	14.9	20.1	20.1	12.1	17.3	17.3	8.0	21.1	21.1	7.9	21.0	21.0
Effective Green, g (s)	14.9	20.1	20.1	12.1	17.3	17.3	8.0	21.1	21.1	7.9	21.0	21.0
Actuated g/C Ratio	0.19	0.26	0.26	0.16	0.22	0.22	0.10	0.27	0.27	0.10	0.27	0.27
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	342	921	412	277	793	355	356	914	433	181	963	431
v/s Ratio Prot	c0.17	c0.15		0.12	c0.16		c0.09	c0.20		0.08	0.19	
v/s Ratio Perm			0.07			0.02			0.03			0.04
v/c Ratio	0.89	0.59	0.28	0.77	0.73	0.08	0.86	0.74	0.10	0.76	0.69	0.15
Uniform Delay, d1	30.4	25.0	22.8	31.2	27.8	23.7	34.0	25.5	21.0	33.7	25.2	21.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	24.0	1.0	0.4	11.9	3.5	0.1	18.2	5.3	0.5	16.4	4.1	0.8
Delay (s)	54.3	26.0	23.1	43.1	31.3	23.8	52.3	30.8	21.4	50.1	29.3	22.1
Level of Service	D	C	C	D	C	C	D	C	C	D	C	C
Approach Delay (s)		32.5			33.0			35.3			30.3	
Approach LOS		C			C			D			C	
Intersection Summary												
HCM Average Control Delay			32.8			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			77.2			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			70.4%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: Wawona St. & Union Road

1/5/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.92		1.00	0.92		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1707		1770	1705		1770	3343	1583	1770	3539	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1707		1770	1705		1770	3343	1583	1770	3539	1583
Volume (vph)	110	100	125	128	100	130	214	1040	238	160	880	110
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	116	105	132	135	105	137	225	1095	251	168	926	116
RTOR Reduction (vph)	0	62	0	0	65	0	0	0	150	0	0	74
Lane Group Flow (vph)	116	175	0	135	177	0	225	1095	101	168	926	42
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%	2%
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	6.0	12.4		7.0	13.4		11.0	29.1	29.1	8.0	26.1	26.1
Effective Green, g (s)	6.0	12.4		7.0	13.4		11.0	29.1	29.1	8.0	26.1	26.1
Actuated g/C Ratio	0.08	0.17		0.10	0.18		0.15	0.40	0.40	0.11	0.36	0.36
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	146	292		171	315		269	1342	635	195	1274	570
v/s Ratio Prot	0.07	0.10		c0.08	c0.10		c0.13	c0.33		0.09	0.26	
v/s Ratio Perm									0.06			0.03
v/c Ratio	0.79	0.60		0.79	0.56		0.84	0.82	0.16	0.86	0.73	0.07
Uniform Delay, d1	32.6	27.8		32.0	26.9		29.9	19.3	13.9	31.7	20.1	15.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	25.0	3.3		21.1	2.3		19.7	5.6	0.5	30.1	3.7	0.2
Delay (s)	57.6	31.0		53.1	29.2		49.5	24.9	14.4	61.8	23.8	15.5
Level of Service	E	C		D	C		D	C	B	E	C	B
Approach Delay (s)		39.8			37.7			26.7			28.2	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM Average Control Delay			29.8			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			72.5			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			71.0%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

21: Union Road &

1/5/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	14	41	774	1550	60
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	15	43	815	1632	63
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)				729	530	
pX, platoon unblocked	0.67	0.65	0.65			
vC, conflicting volume	2157	847	1695			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2077	235	1533			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	85			
cM capacity (veh/h)	26	501	281			
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	15	43	407	407	1088	607
Volume Left	0	43	0	0	0	0
Volume Right	15	0	0	0	0	63
cSH	501	281	1700	1700	1700	1700
Volume to Capacity	0.03	0.15	0.24	0.24	0.64	0.36
Queue Length 95th (ft)	2	13	0	0	0	0
Control Delay (s)	12.4	20.1	0.0	0.0	0.0	0.0
Lane LOS	B	C				
Approach Delay (s)	12.4	1.0			0.0	
Approach LOS	B					
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization			54.8%		ICU Level of Service	A
Analysis Period (min)			15			

APPENDIX H2

Fair-Share Calculations for Mitigation Recommended

**APPENDIX H2
ESTIMATED FAIR SHARE PERCENTAGES**

Mitigation	Estimated Fair Share
Mitigation Measure 4.11-6a: Atherton Drive between Union Road and Main Street	7%
Mitigation Measure 4.11-6b: Airport Way between Yosemite Avenue and Daniels Street	4%
Mitigation Measure 4.11-6c: Airport Way between Daniels Street and SR 120	3%
Mitigation Measure 4.11-6d: Airport Way between Atherton Drive and Woodward Road	2%
Mitigation Measure 4.11-6e: Airport Way between Woodward Road and McKinley Avenue	3%
Mitigation Measure 4.11-6f: Union Road between Wawona Street and SR 120	26%
Mitigation Measure 4.11-6g: Union Road between SR 120 and Atherton Drive	36%
Mitigation Measure 4.11-6h: Union Road between Woodward Road and Peach Avenue	16%
Mitigation Measure 4.11-6i: Woodward Road between McKinley Avenue and Airport Way	6%
Mitigation Measure 4.11-6j: Woodward Road between Airport Way and Oleander Road	10%
Mitigation Measure 4.11-6k: Woodward Road between Oleander Road and Union Road	13%
Mitigation Measure 4.11-6l: Woodward Road between Tinnin Road and Main Street	11%
Mitigation Measure 4.11-7a: Airport Way / Yosemite Avenue	3%
Mitigation Measure 4.11-7b: Airport Way / Wawona Street	2%
Mitigation Measure 4.11-7c / 7d: Airport Way / State Route 120 Interchange	1%
Mitigation Measure 4.11-7e: Airport Way / Atherton Drive	1%
Mitigation Measure 4.11-7f: Airport Way / Woodward Road	4%
Mitigation Measure 4.11-7g: Union Road / Yosemite Avenue	14%
Mitigation Measure 4.11-7h: Union Road / Wawona Street	22%
Mitigation Measure 4.11-7i: Union Road / Daniels Street	27%
Mitigation Measure 4.11-7j / 7k: Union Road / State Route 120 Interchange	32%
Mitigation Measure 4.11-7l: Union Road / Woodward Road	13%
Mitigation Measure 4.11-7m / 7n: Main Street / State Route 120 Interchange	2%
Mitigation Measure 4.11-7o: Main Street / Woodward Road	4%
Mitigation Measure 4.11-7p: Union Road / Project Access Driveway (Study intersection #21)	22%
Source: Fehr & Peers, 2009	

APPENDIX I

Central California Information Center Records Search Results



CENTRAL CALIFORNIA INFORMATION CENTER

California Historical Resources Information System

Department of Anthropology – California State University, Stanislaus

One University Circle, Turlock, California 95382

(209) 667-3307 - FAX (209) 667-3324

Alpine, Calaveras, Mariposa, Merced, San Joaquin, Stanislaus & Tuolumne Counties

Date: September 24, 2008

CCIC File #: 7187 L

Project: Union Crossing Project, San Joaquin County, California
(Supplement to previous record search #5829 L)

Richard Deis, Project Archaeologist
EDAW, Inc.
2022 J Street
Sacramento, CA 95811

Dear Mr. Deis,

We have conducted a records search (update/supplement) as per your request for the above-referenced project area located on the Manteca USGS 7.5-minute quadrangle map in San Joaquin County.

Search of our files includes review of our maps for the specific project area and a one-quarter-mile radius of the project area (as specified by the client), and review of the National Register of Historic Places, the California Register of Historical Resources, the *California Inventory of Historic Resources* (1976), the *California Historical Landmarks* (1996), and the *California Points of Historical Interest* listing (May 1992 and updates), the Directory of Properties in the Historic Property Data File (HPDF) and the Archaeological Determinations of Eligibility (ADOE) (Office of Historic Preservation current computer lists dated 8/18/2008 and 8/08/2008), the CALTRANS State and Local Bridge Survey (1989 and updates), the *Survey of Surveys* (1989), GLO Plats, and other pertinent historic data available at the CCIC for each specific county.

The following details the results of the records search: (Information not supplied in the previous record search only)--

Prehistoric or historic resources within the project area:

No prehistoric or historic archaeological resources or historic properties have been reported to the Information Center. However, some of the historic map data supplied in the previous record search may apply.

The following maps are attached; not sent in the previous record search; buildings and canals or ditches are shown in the project and the search radius:

- 1952 Manteca USGS 15' map
- 1952/Photorevised 1968 Manteca USGS 7.5' map

Prehistoric or historic resources within a one-quarter-mile radius of the project area:

None have been reported to the Information Center. However, see historic map data supplied with the previous record search.

Resources known to have value to local cultural groups:

None have been formally reported to the Information Center.

Previous investigations within the project area:

Two have been submitted to the Information Center subsequent to the previous search; full copies attached except as indicated:

CCIC Report #	Author/Date	
SJ- 6322	Jensen (2006)	Full report copy attached
6625	ASI (Werner?) (1998)	

Not received at the CCIC until this year. Full text attached. Only one map attached (the one pertinent to your study area); report Study Area maps consist of a slew of oversize record search maps with highlighting hastily applied by the report author. "Windshield survey" included area along Woodward Avenue.

Previous investigations within a one-quarter-mile radius of the project area:

One other that was not included in the previous search (my oversight); full report copy attached:

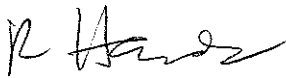
CCIC Report #	Author/Date
SJ- 729	Chavez (1981)

Comments: In accordance with State law, if any historical resources are found during construction, work is to stop and the lead agency and a qualified professional are to be consulted to determine the importance and appropriate treatment of the find.

We understand that you will be conducting an archaeological study of the proposed project that is the subject of this records search. We look forward to receiving one copy of your report of findings which should include two copies each of site records for all historical resources documented.

We thank you for contacting this office regarding historical resource preservation. Please let us know when we can be of further service. Please sign and return the attached **Access Agreement** form. Billing is attached, payable within 60 days of receipt of the invoice.

Sincerely,

A handwritten signature in black ink, appearing to read 'R. Hards', written in a cursive style.

Robin Hards, Assistant Research Technician
Central California Information Center
California Historical Resources Information System

CENTRAL CALIFORNIA INFORMATION CENTER

California Historical Resources Information System

Department of Anthropology - California State University, Stanislaus

801 W. Monte Vista Avenue, Turlock, California 95382

(209) 667-3307 - FAX (209) 667-3324

Alpine, Calaveras, Mariposa, Merced, San Joaquin, Stanislaus & Tuolumne Counties

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JUL 08 2005

Date: July 6, 2005

CCIC File #: 5829L

Project: Sundance/Oleander Estates

Brian Ludwig
EDAW, Incorporated
2022 J Street
Sacramento, CA 95814

Dear Mr. Ludwig,

We have conducted a records search as per your request for the above-referenced project area located on the Manteca and Lathrop USGS 7.5-minute quadrangle maps in San Joaquin County.

Search of our files includes review of our maps for the specific project area and a one-quarter-mile radius of the project area (as specified by the client), and review of the National Register of Historic Places, the California Register of Historical Resources, the *California Inventory of Historic Resources* (1976), the *California Historical Landmarks* (1996), and the *California Points of Historical Interest* listing (May 1992 and updates), the Historic Property Data File (Office of Historic Preservation current computer list dated 5/02/2005), the CALTRANS State and Local Bridge Survey (1989 and updates), the *Survey of Surveys* (1989), GLO Plats, and other pertinent historic data available at the CCIC for each specific county.

The following details the results of the records search:

Prehistoric or historic resources within the project area:

No prehistoric or historic archaeological resources or evaluated historic properties have been reported to the CCIC. But see other historic map information below (copies attached)—

The GLO Plat map for T2S/R7E (sheet #44-111, dated 1854) shows three roads passing through the project area.

Map Number Three from *History of San Joaquin County, Illustrated* (Thompson and West 1879; 1968 reprint) shows the following estates in section 7: L. P. Whitman, 160 acres; C. T. Blanchard, 520 acres. Also attached is p. 136 (Business Directory for Castoria Township).

Prehistoric or historic resources within a one-quarter-mile radius of the project area:

No prehistoric or historic archaeological resources or evaluated historic properties have been reported to the CCIC. But see other historic information below (copies attached)—

The GLO Plat map for T2S/R6E (sheet #44-110, dated 1851-1869) shows a road or trail segment in sections 12 and 7.

The 1915 edition of the Lathrop, CA USGS quadrangle map (1:31680 scale) shows one building that may be immediately adjacent to the project, and shows 2 others within ¼-mile.

"Rustic School" is discussed in the attached page 196 of *Public Schools of San Joaquin County, 1852-1900* (San Joaquin County Superintendent of Schools 1991).

Resources known to have value to local cultural groups:

None have been formally reported to the CCIC.

Previous investigations within the project:

Three have been reported to the CCIC; title pages attached—

SJ-1900	Napton (1993)	Sensitivity study
SJ-4786	Windmiller and Napoli (2002)	Overview/assessment for the Manteca General Plan Update
SJ-5309	Baloian, Baloian, and Nettles (2004)	Portions of the study within your search area are sensitivity analyses only (for future distribution lines); surveyed areas are outside your search area.

Previous investigations within a one-quarter-mile radius of the project Area:

No others reported to the CCIC.

Recommendations/Comments: Please be advised that a historical resource is defined as a building, structure, object, prehistoric or historic archaeological site, or district possessing physical evidence of human activities over 45 years old. There may be unidentified features 45 years or older within your project that are considered as historical resources requiring further study and evaluation by a qualified professional of the appropriate discipline.

In accordance with State law, if any historical resources are found during construction, work is to stop and the lead agency and a qualified professional are to be consulted to determine the importance and appropriate treatment of the find.

We understand that you will be conducting an archaeological survey of the proposed project that is the subject of this records search. We look forward to receiving one copy of your report of findings which should include two copies each complete site record for all historical resources discovered as a result of the survey.

We thank you for contacting this office regarding historical resource preservation. Please let us know when we can be of further service. Please sign and return the attached Agreement of Confidentiality form. Billing is attached, payable within 60 days of receipt of the invoice.

Sincerely,



Robin Hards, Assistant Research Technician
Central California Information Center
California Historical Resources Information System