

Initial Study Tesoro Apartments

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Acronyms and Abbreviations

af	acre-feet
afa/yr	af per acre per year
BMPs	best management practices
Cal-OSHA	California Occupational Safety and Health Administration
CBC	California Building Code
CEQA	California Environmental Quality Act
City General Plan	City of Manteca's 2023 General Plan
CNEL	Community Noise Equivalent Level
CO	carbon monoxide
CWA	federal Clean Water Act
dB	Decibel
dBA	A-Weighted Decibel
DBCP	dibromochloropropane
EC	electromagnetic conductivity
EIR	environmental impact report
EMT	Emergency Medical Technician
Farmland	Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance
FEMA	Federal Emergency Management Agency
g	acceleration due to gravity
IS	initial study
IS/MND	Initial Study/Mitigated Negative Declaration
ISR	Indirect Source Review
L_{dn}	Day-Night Level
L_{eq}	Equivalent Sound Level
L_{max} and L_{min}	Maximum and Minimum Sound Levels
L_n	Sound Level Percentiles
LOS	Level of Service
MFD	Manteca Fire Department
mg/L	milligrams per liter

mgd 3-63	million gallons per day
MPD	Manteca Police Department
MUSD	Manteca Unified School District
NAHC	Native American Heritage Commission
ND	negative declaration
NO ₂	nitrous oxide
NO _x	oxides of nitrogen
PM ₁₀	particulate matter less than or equal to 10 microns in diameter
PM _{2.5}	particulate matter less than or equal to 2.5 microns in diameter
ROG	reactive organic gases
SCSWSP	South County Surface Water Supply Project
SJCOG	San Joaquin Council of Governments
SJMSCP	San Joaquin County Multi-Species Habitat and Open Space Conservation Plan
SJVAB	San Joaquin Valley Air Basin
SJVAPCD	San Joaquin Valley Air Pollution Control District
SO ₂	sulfur dioxide
SR	State Route
SSJID	South San Joaquin Irrigation District
SVP	Society of Vertebrate Paleontology
SWPPP	Storm Water Pollution Prevention Plan
TDS	total dissolved solids
the City	City of Manteca
the project	Tesoro Apartment project
TMDL	Total Maximum Daily Load
µg/l	micrograms per liter
µmhos/cm	micromhos per centimeter
UPRR	Union Pacific Railroad
WQCF	Wastewater Quality Control Facility

Purpose of this Document

This initial study (IS) is a public document that assesses the environmental effects of the proposed Tesoro Apartment project (the project), as required by the California Environmental Quality Act (CEQA) and in compliance with the State CEQA Guidelines (14 California Code of Regulations [CCR] 15000 et seq.). It serves as a preliminary environmental analysis to determine whether an environmental impact report (EIR) or negative declaration (ND) is needed. The City of Manteca (the City) is the state lead agency under CEQA and must evaluate the environmental impacts of the proposed project when considering whether to approve the project.

Scope of this Document

This document evaluates the project's impacts on the following resource topics.

- Aesthetics
- Agricultural Resources
- Air Quality
- Biological Resources
- Cultural Resources
- Geology and Soils
- Hazards and Hazardous Materials
- Hydrology and Water Quality
- Land Use Planning
- Mineral Resources
- Noise
- Population and Housing
- Public Services

- Recreation
- Transportation/traffic
- Utilities and Service Systems.

Impact Terminology

The following terminology is used in this document to describe the levels of significance of impacts that would result from the project.

- The project is considered to have *no impact* if the analysis concludes the project would not affect a particular resource topic.
- An impact is considered *less than significant* if the analysis concludes the project would cause no substantial adverse change to the environment and impacts would not require mitigation.
- An impact is considered *less than significant with mitigation incorporated* if the analysis concludes the proposed project would cause no substantial adverse change to the environment with the inclusion of mitigation measures to which the applicant has agreed.
- An impact is considered *potentially significant* if the analysis concludes the proposed project has the potential to cause substantial adverse change to the environment and adequate mitigation has not been identified to reduce the level of impact.

Organization of this Document

The content and format of this document, described below, are designed to meet the requirements of CEQA.

- Chapter 1, “Introduction,” identifies the purpose, scope, and terminology of the document.
- Chapter 2, “Project Description,” identifies the project location and describes the project in detail, including existing and proposed land uses and public services and utilities; identifies the permits and approvals required for the project; and identifies related projects.
- Chapter 3, “Environmental Checklist,” presents the checklist responses for each resource topic. Setting information is included, on an as-needed basis, within the checklist discussions. Checklist discussions identify the project’s impacts on those resources topics.
- Chapter 4, “References Cited,” identifies all printed references and personal communications cited in this report.
- Chapter 5, “List of Preparers,” identifies the individuals involved in preparing this document and their areas of technical specialty.

Chapter 2

Project Description

Project Location

The proposed project is located in San Joaquin County in the southeast portion of the City of Manteca (Figure 2-1). The project site is located near the northeast corner of the Spreckels Road and Atherton Drive intersection at 1201 East Atherton Drive (Figure 2-2). The specific site plan is shown in Figure 2-3.

Project Background

The proposed Tesoro Apartments project area is located directly north of the Tesoro Subdivision. The Tesoro Subdivision project included the subdivision of 163 acres into 487 lots for 485 single-family homes and 284 condominiums with a school site, a park/basin, and a fire station. The subdivision project provided a 9.5-acre park/basin within the subdivision. The development was proposed as a Planned Unit Development and also involved a Development Agreement. The subdivision proposal included a reduction of the minimum lot size, a reduction of the side building setback, and a percentage limitation on the size of the homes. In addition to the 485 single-family lots, the original subdivision project included one lot for a proposed 248-unit condominium project. This lot is the site of the proposed Tesoro apartment project.

The Tesoro Subdivision was approved by the Manteca City Council on October 18, 2004. As a part of the approval, the City Council approved an Initial Study/Mitigated Negative Declaration (IS/MND) for the project (Appendix A). An application has been submitted to the City for site approval for the apartment project.

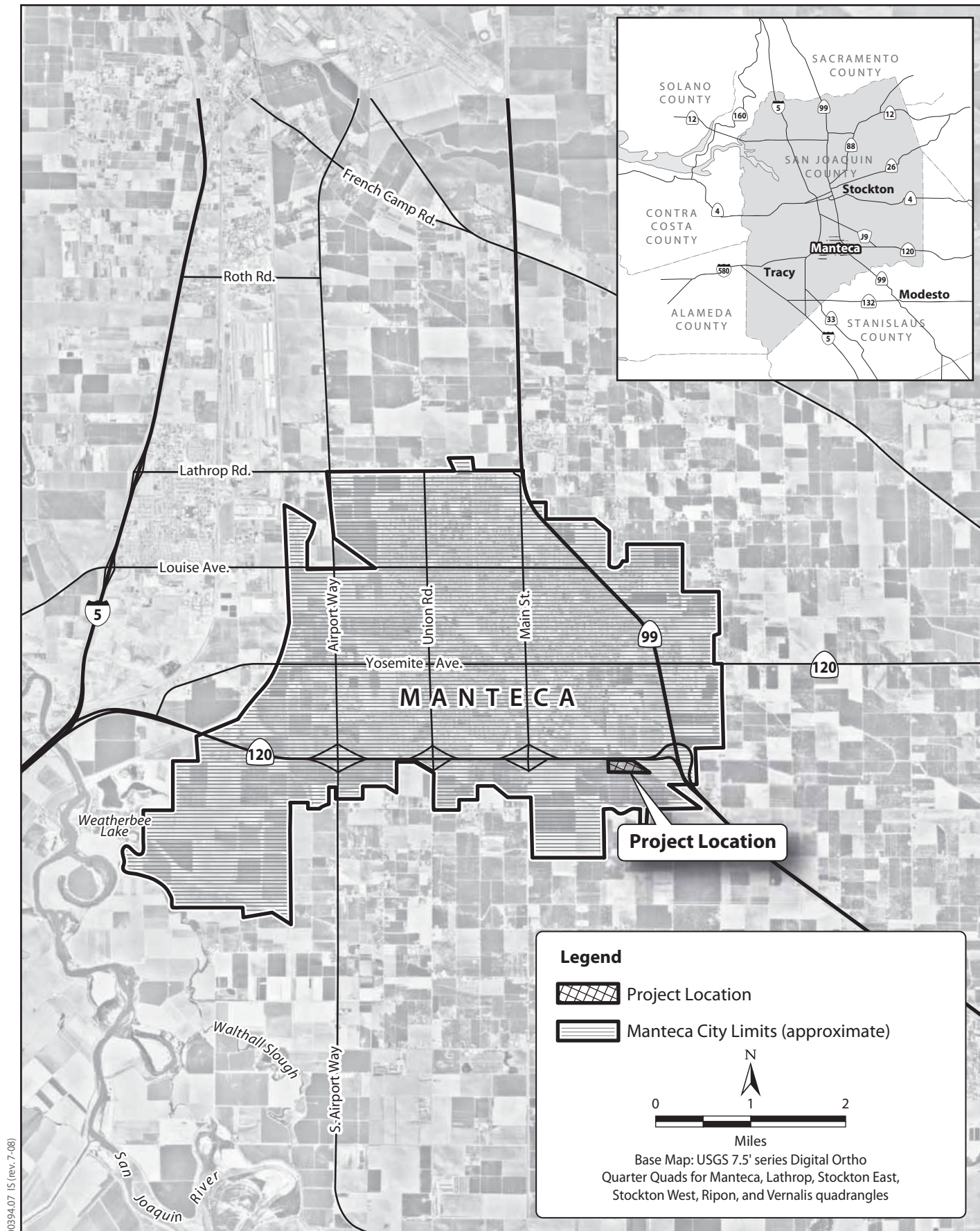
The proposed Tesoro Apartments project differs from the approved multi-family condominium project. Besides this fact, a number of changes to the proposed project and project area have occurred since the Council's 2004 approval. First, the proposed number of apartments for the project has increased from 284 to 300 units. Secondly, in May 2007, an extension of Industrial Park Drive opened which connects Spreckels Road to Industrial Park Drive about a quarter-mile before Moffat Boulevard. This road provides a link between industrial businesses in Spreckels Park and Manteca Industrial Park, as well as connecting

the center of Manteca to houses off Woodward Avenue. This long-awaited connection will increase traffic in the project vicinity. In sum, considering the previously mentioned changes and the fact that substantial progress on the development of the Tesoro Subdivision has occurred just south of the project site since the certification of the previous IS/MND, resulting in changed conditions, particularly in regard to traffic and water service, the previous IS/MND needs to be supplemented with new information and impact assessments.

Supplemental Negative Declaration Requirements

This section references State CEQA Guidelines Section 15162 for its discussion of the regulations pertaining to the preparation of a Supplemental Negative Declaration. Specifically, Section 15162(a) provides:

- (a) When an EIR has been certified or a negative declaration adopted for a project, no subsequent EIR shall be prepared for that project unless the lead agency determines, on the basis of substantial evidence in the light of the whole record, one or more of the following:
 - (1) Substantial changes are proposed in the project which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects;
 - (2) Substantial changes occur with respect to the circumstances under which the project is undertaken which will require major revisions of the previous EIR or Negative Declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects; or
 - (3) New information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous EIR, was certified as complete or the Negative Declaration was adopted, shows any of the following:
 - (A) The project will have one or more significant effects not discussed in the previous EIR or negative declaration;
 - (B) Significant effects previously examined will be substantially more severe than shown in the previous EIR;
 - (C) Mitigation measures or alternatives previously found not to be feasible would in fact be feasible, and would substantially reduce one or more significant effects of the project, but the project proponents decline to adopt the mitigation measure or alternative; or
 - (D) Mitigation measures or alternatives which are considerably different from those analyzed in the previous EIR would substantially reduce one or more significant effects on the environment, but the project proponents decline to adopt the mitigation measure or alternative.





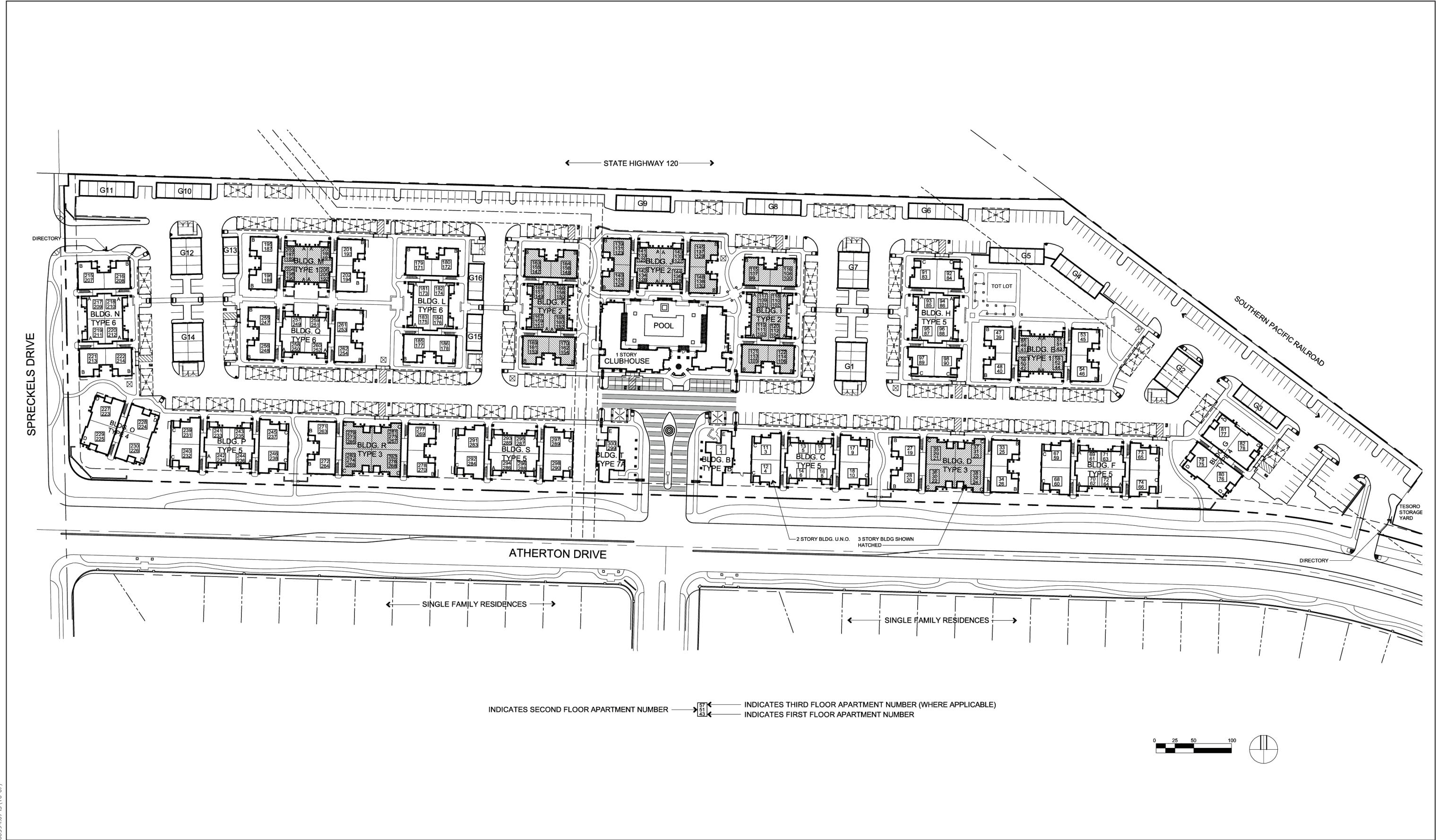


Figure 2-3
Tesoro Apartments Site Plan

Section 15162b specifies that a subsequent EIR must be prepared if any changes in a project or its circumstances occur or new information becomes available, as described in subsection (a) above. Section 15162 (b) provides:

- (b) If changes to a project or its circumstances occur or new information becomes available after adoption of a negative declaration, the lead agency shall prepare a subsequent EIR if required under supervision. Otherwise the lead agency shall determine whether to prepare a subsequent negative declaration, an addendum, or no further documentation.

Proposed Project

Existing Land Uses

The proposed project site is currently undeveloped. The surrounding land uses include existing apartments to the west, approved Tesoro subdivision to the south, Union Pacific Railroad to the east and Industrial lands to the north on Spreckels Road underneath State Route (SR) 120.

Proposed Land Uses

The proposed project consists of site approval for a 300-unit apartment complex on a 15.37-acre parcel located at 1201 East Atherton Drive. The project includes construction of 19 one, two, and three-story buildings housing 300 apartments of between 737 square feet and 1,574 square feet. The project will also include a 6,551 square-foot clubhouse for use by residents, a pool, a storage area, and parking in garages, carports, and open parking. A sound wall and a 100-foot setback for habitable structures are proposed as a part of the project on the property line adjoining the Union Pacific Railroad line to the northeast of the project site. Similarly, a sound wall is proposed as a part of the project on the northern property line, where the project site is located adjacent to SR 120.

Required Permits and Approvals

The proposed project would require the following local approvals and permits:

- approval of site plan; and
- approval of building and grading permits.

Chapter 3

Environmental Checklist

- 1. Project Title:** Tesoro Apartments
- 2. Lead Agency Name and Address:** City of Manteca
Community Development Department
1001 W. Center Street
Manteca, CA 95337
- 3. Contact Person and Phone Number:** Mark Meissner
(209) 239-8424
- 4. Project Location:** The proposed project is located in San Joaquin County (Figure 2-1) in the southeast portion of the City of Manteca (Figure 2-2). The project site is located near the northeast corner of the Spreckels Road and Atherton Drive intersection at 1201 East Atherton Drive (Figure 2-3).
- 5. Project Sponsor's Name and Address:** RLC Associates
250 Cherry Lane, #208
Manteca, CA 95337
- 6. General Plan Designation:** HDR (High Density Residential)
- 7. Zoning:** PD, Planned Development
- 8. Description of Project:** The proposed project consists of site approval for a 300-unit apartment complex on a 15.37-acre parcel located at 1201 East Atherton Drive. The project includes construction of 19 one-, two-, and three-story buildings housing 300 apartments of between 737 square feet and 1,574 square feet. The project will also include a 6,551 square-foot clubhouse for use by residents, a pool, a storage area, and parking in garages, carports, and open parking. A sound wall and a 100-foot setback for habitable structures are proposed as a part of the project on the property line adjoining the Union Pacific Railroad line to the northeast of the project site. Similarly, a sound wall is proposed as a part of the project on the northern property line, where the project site is located adjacent to SR 120.

9. Surrounding Land Uses and Setting: The proposed project site is currently undeveloped. The surrounding land uses include existing apartments to the west, approved Tesoro subdivision to the south, Union Pacific Railroad to the east and industrial lands to the north on Spreckels Road.

10. Other Public Agencies whose Approval Is Required: None

Environmental Factors Potentially Affected:

The environmental factors checked below would potentially be affected by this project (i.e., the project would involve at least one impact that is a “Potentially Significant Impact”), as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agricultural Resources	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Geology/Soils
☐ Hazards and Hazardous Materials	☐ Hydrology/Water Quality	☐ Land Use/Planning
☐ Mineral Resources	☐ Noise	☐ Population/Housing
☐ Public Services	☐ Recreation	☐ Transportation/Traffic
☐ Utilities/Service Systems	☐ Mandatory Findings of Significance	

Determination: (to be completed by the lead agency)

On the basis of this initial evaluation:

- ☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.
- ☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions to the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.
- ☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.
- ☐ I find that the proposed project MAY have an impact on the environment that is “potentially significant” or “potentially significant unless mitigated” but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards and (2) has been addressed by mitigation measures based on the earlier analysis, as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.
- ☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier ENVIRONMENTAL IMPACT REPORT or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier ENVIRONMENTAL IMPACT REPORT or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the project, nothing further is required.

Signature

Date

Printed Name

For

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than- Significant Impact	No Impact
I. AESTHETICS.	Would the project:				
a.	Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b.	Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings along a scenic highway?	☐	☐	☐	☒
c.	Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐
d.	Create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area?	☐	☒	☐	☐

Setting

The project site is located between the existing and under construction Tesoro Subdivision. To the east are the Union Pacific Railroad tracks, and to the north is SR 120, elevated 25 feet above the project site. The project site itself is vacant and graded, with surrounding streets already constructed.

Impact Discussion

The proposed project would result in the construction of one-, two-, and three-story buildings located between the Tesoro subdivision houses and Highway 120. A sound wall and a 100-foot setback for habitable structures are proposed as a part of the project on the property line adjoining the Union Pacific Railroad line to the northeast of the project site. Similarly, a sound wall is proposed as a part of the project on the northern property line, where the project site is located adjacent to SR 120.

- No scenic vistas occur in the area of the project site. The site is surrounded by urban developed lands. There would be no impact.
- No scenic resources occur in the area of the project site. The site is surrounded by urban developed lands. There would be no impact.
- The proposed multi-family housing is designed to be similar in character to the adjacent single-family residential development. While the apartments will be one-, two-, and three-story buildings and the houses will be one- and two-story structures, the difference in height will not be substantial and will

be similar to the height of the adjacent highway. Project landscaping will ensure that the project is visually compatible with the surrounding area. This impact would be less than significant.

- d. The proposed project will create new sources of nighttime lighting and daytime glare. This project will increase new light, including lighting of parking and common areas within the homes, and glare from the windows. Although the project would contribute light to the area, the increase would not be considered substantial or highly noticeable because it is comparable to the adjacent areas that have already been developed, including the highway and the Tesoro subdivision. The following mitigation measures will ensure that this impact is less than significant.

Mitigation Measure AES-1: Provide directional shielding for onsite lighting.

Mitigation Measure AES-2: Provide automatic shutoff or motion sensors for onsite lighting features.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than- Significant Impact	No Impact
II.	AGRICULTURAL RESOURCES. In determining whether impacts on agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation. Would the project:				
a.	Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b.	Conflict with existing zoning for agricultural use or conflict with a Williamson Act contract?	☐	☐	☐	☒
c.	Involve other changes in the existing environment that, due to their location or nature, could result in conversion of Farmland to non-agricultural use?	☐	☐	☐	☒

Setting

The project site is surrounded by urban developed lands and has not been used for agriculture for some time. The project site is zoned for and planned for development, as well as the subject of an approved development permit. The project will not result in the loss of farmland.

Impact Discussion

- a. The project will not result in the loss of farmland for the reasons described above.
- b. No land in the area of the project is subject to a Williamson Act contract.
- c. No farmland is located in the area of the project.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than- Significant Impact	No Impact
III.	AIR QUALITY. When available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a.	Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b.	Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☒	☐	☐
c.	Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is a nonattainment area for an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?	☐	☒	☐	☐
d.	Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
e.	Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐

Setting

Ambient air quality is affected by the climate, topography, and type and amount of pollutants emitted. The proposed location for the project is subject to a combination of topographical and climatic factors that result in high potential for regional and local accumulation of pollutants. The following discussion describes climatic and topographic characteristics of the San Joaquin Valley Air Basin (SJVAB), relevant air quality standards, and existing air quality conditions within the basin.

Climate and Topography

The project site is located in the SJVAB. The mountain ranges bordering the air basin near the proposed project site (the Coast Ranges to the west and Sierra Nevada to the east) influence wind directions and speeds and atmospheric inversion layers in the San Joaquin Valley. These mountain ranges channel

winds through the valley, affecting both the climate and dispersion of air pollutants.

Because of the mountain ranges bordering the air basin, temperature inversions occur frequently in the valley. Inversions occur when the upper air is warmer than the air beneath it, thereby trapping pollutant emissions near the surface and not allowing them to disperse upward. Inversions occur frequently throughout the year in the San Joaquin Valley, though they are more prevalent and of a greater magnitude in late summer and fall.

Air Quality Standards and Attainment Status

The federal and state governments have established ambient air quality standards for seven criteria pollutants: ozone, carbon monoxide (CO), nitrous oxide (NO₂), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns in diameter (PM₁₀), particulate matter less than or equal to 2.5 microns in diameter (PM_{2.5}), and lead. Ozone, PM₁₀, and PM_{2.5} are generally considered regional pollutants because they or their precursors affect air quality on a regional scale. Pollutants such as CO, NO₂, SO₂, and lead are considered local pollutants that tend to accumulate in the air locally. PM₁₀ and PM_{2.5} are considered both localized and regional pollutants. In the area where the proposed project site is located, PM₁₀, PM_{2.5}, and ozone are of particular concern.

The State of California has classified the SJVAB as being in severe nonattainment for ozone and in nonattainment for PM₁₀. The San Joaquin Valley Air Pollution Control District (SJVAPCD) has adopted an air quality improvement plan that addresses oxides of nitrogen (NO_x) and reactive organic gases (ROG), both of which are ozone precursors and contribute to the secondary formation of PM₁₀ and PM_{2.5}. The plan specifies that regional air quality standards for ozone and PM₁₀ concentrations can be met through the use of additional source controls and trip reduction strategies. It also establishes emission budgets for transportation and stationary sources. Those budgets, developed through air quality modeling, reveal how much air pollution can occur in an area before national ambient air quality standards are violated.

Impact Discussion

- a. A project is deemed inconsistent with air quality plans if it would result in population and/or employment growth that exceeds growth estimates included in the applicable air quality plan, which, in turn, would generate emissions not accounted for in the applicable air quality plan emissions budget. Therefore, proposed projects need to be evaluated to determine whether they would generate population and employment growth and, if so, whether that growth would exceed the growth rates included in the relevant air plans.

- b. This analysis can be determined by concluding whether the proposed project is consistent with the City of Manteca's 2023 General Plan (City General Plan). Because the General Plan is used to help forecast the emissions budget within the SJVAPCD's 2007 Ozone Plan, consistency with the City General Plan would mean that the proposed project does not conflict with the 2007 Ozone Plan. Information contained in the City General Plan indicates that the proposed project has been included in the General Plan. Consequently, operational emissions associated with implementation of the proposed project are not anticipated to conflict with the SJVAPCD's 2007 Ozone Plan and are considered less than significant.
- b. Implementation of the proposed project would result in construction and operational emissions. Modeling of construction and operational emissions was conducted using the URBEMIS 2007 (version 9.2.2) model to estimate emissions associated with implementation of the proposed project. Emissions were evaluated and compared to SJVAPCD thresholds to determine whether air quality impacts would occur. URBEMIS2007 is a computer program used to estimate emissions from construction, vehicle trips, and fuel use resulting from land use development projects. URBEMIS2007 estimates emissions based on the type of land use and area source and vehicular emissions typically associated with the land use. Emissions generated from construction and operation of the proposed project are discussed below.

Construction-Related Emissions

The SJVAPCD has specified significance thresholds within its *Guide for Assessing and Mitigating Air Quality Impacts* (San Joaquin Valley Air Pollution Control District 2002) to determine air quality impacts for projects located within the SJVAB. The SJVAPCD has determined that compliance with its Regulation VIII Fugitive PM10 Prohibitions, including implementation of all feasible control measures specified in its *Guide for Assessing And Mitigating Air Quality Impacts*, is sufficient mitigation to minimize adverse air quality effects from construction-related PM10 emissions to less-than-significant levels (San Joaquin Valley Air Pollution Control District 2002). Since the publication of the SJVAPCD's guidance manual, the SJVAPCD has revised various rules comprising Regulation VIII. Guidance from SJVAPCD staff indicates that implementation of a dust control plan would satisfy all of the requirements of SJVAPCD Regulation VIII (Cadrett pers. comm.). Further consultation with SJVAPCD staff indicates that, though explicit thresholds for construction-related emissions of ozone precursors are not enumerated in the *Guide for Assessing and Mitigating Air Quality Impacts*, the SJVAPCD considers a significant impact to occur when construction emissions of ROG or NO_x exceed 10 tons per year (Barber pers. comm.).

Emissions associated with project construction equipment include exhaust, fugitive dust emissions, energy consumption emissions, and mobile source emissions. To estimate construction emissions, URBEMIS2007 analyzes the type of construction equipment used and the duration of the construction period

associated with construction of each of the land uses. Because construction impacts vary substantially from day to day, construction is expected to be spread over a 7-month period beginning in October 2008. According to the URBEMIS2007 model setup, construction of any project generally is broken down into four phases: a grading phase, a paving phase, a building construction phase, and an architectural coating phase. A detailed inventory of construction equipment that will be used for the proposed was not provided. Therefore, the amount and type of construction equipment, the amount of acres disturbed per day, and emissions associated with worker travel to the construction site and construction truck deliveries were estimated based on default values in the URBEMIS2007 model. Criteria pollutant emissions from construction activities are presented in Table 3.3-1

Table 3.3-1. Emissions of Criteria Pollutants from Construction Activities (Tons per Year)

Construction phase	ROG	NO _x	CO	PM10	PM2.5	CO2
Site grading	0.04	0.36	0.19	0.79	0.18	30.65
Asphalt	0.04	0.2	0.12	0.02	0.02	16.94
Building Construction	0.19	0.96	1.49	0.06	0.06	169.70
Coating	3.69	0.0	0.05	0.0	0.0	4.40
Total	3.96	1.54	1.86	0.87	0.25	220.69
SJVAPCD threshold	10	10	NA	NA	NA	NA

As indicated in Table 3.3-1, construction-related emissions associated with implementation of the proposed project would be below the SJVAPCD's thresholds of significance.

As noted above, compliance with Regulation VIII through implementation of a dust control plan is sufficient to reduce any potentially significant air quality effects generated by construction-related emissions of PM10 to less-than-significant levels. Compliance with Regulation VIII through implementation of a dust control plan is sufficient to reduce any potentially significant air quality effects generated by construction activities to a less-than-significant level. Consequently, this impact is considered less than significant with the implementation of Mitigation Measure AQ-1.

Mitigation Measure AQ-1: Prepare and Implement a Dust Control Plan.

To control the generation of construction-related PM10 emissions, the City shall require construction contractors to prepare and submit a dust control plan to the SJVAPCD at least 48 hours prior to any earthmoving or construction activities.

On December 15, 2005, the SJVAPCD adopted Rule 9510—Indirect Source Review (ISR). This rule fulfills the SJVAPCD's emission reduction commitments in the PM10 and Ozone Attainment Plans through emission reductions from the construction and use of development projects through design features and onsite measures. Rule 9510 requires the implementation of control

measures or the purchase of emissions offsets to mitigate construction- and operation-related NO_x and PM₁₀ emissions in excess of 2.0 tons. Compliance with Rule 9510 is separate from the CEQA process, though the control measures used to comply with Rule 9510 may be used to mitigate CEQA impacts (Barber pers. comm.). As indicated in Table 3.3-1, construction emissions are below the ISR threshold of 2.0 tons per year. Consequently, construction emissions associated with implementation of the proposed project are not subject to mitigation and offset requirements of the SJVAPCD's ISR rule.

Operation-Related Emissions

Estimated emissions of area and mobile source emissions from project operations were also evaluated using the URBEMIS2007 model. The results of these calculations are summarized in Table 3.3-2.

Table 3.3-2. Emissions of Criteria Pollutants from Project Operations

Emission Source	Emissions at Full Project Buildout (2015) (Tons per Year)					
	ROG	NO _x	CO	PM ₁₀	PM _{2.5}	CO ₂
Area sources						
Natural gas	0.03	0.41	0.18	0.0	0.00	527.11
Hearth	0.00	0.00	0.00	0.00	0.00	0.26
Landscaping	0.1	0.0	0.15	0.00	0.00	0.25
Consumer products	2.68	—	—	—	—	—
Architectural coatings	0.37	—	—	—	—	—
Mobile sources						
Vehicular emissions	4.36	6.38	48.55	4.82	0.98	2,767.90
Total	7.54	6.79	48.88	4.82	0.98	3,295.52
SJVAPCD Threshold	10	10	NA	NA	NA	NA

As indicated in Table 3.3-2, project emissions are not anticipated to exceed the SJVAPCD's ROG or NO_x thresholds of 10 tons per year under 2008 conditions. Therefore, this impact is considered less than significant. Although this impact is considered less than significant, the SJVAPCD encourages innovation in measures to further reduce air quality impacts, as described below under Mitigation Measure AQ-2.

While operational emissions associated with implementation of the proposed project are below the SJVAPCD's thresholds and are considered less than significant, the project is still subject to the SJVAPCD's ISR rule. Rule 9510

requires reductions of 33.3% of the project's operational baseline NO_x and 50% of the project's operational baseline PM₁₀ emissions over a period of 10 years. This would equate to emissions reductions of 2.5 tons of NO_x and 2.4 tons of PM₁₀. Compliance with Rule 9510 is separate from the CEQA process, although the control measures used to comply with Rule 9510 may be used to mitigate CEQA impacts, where applicable. Therefore, the control measures listed under Mitigation Measure AQ-2, which are recommended by the SJVAPCD, will help to reduce the generation of ozone precursor concentrations within the air basin and satisfy a portion of the control measures that may be implemented to comply with Rule 9510.

Mitigation Measure AQ-2: Incorporate SJVAPCD Recommended Additional Measures to Reduce Air Quality Impacts.

The SJVAPCD encourages innovation in measures to reduce air quality impacts. Several measures will be incorporated into the design and operation of the proposed project to provide additional reductions in the overall level of emissions, where feasible. These measures include the following.

- Energy-efficient design will be provided for homes and buildings, including automated control systems for heating and air conditioning and energy efficiency beyond California Code of Regulations Title 24 (California Building Standards Code) requirements, lighting controls and energy-efficient lighting in buildings, increased insulation beyond Title 24 requirements, and light-colored roof materials to reflect heat.
- Large canopy trees will be carefully selected and located to protect buildings from energy-consuming environmental conditions and shade paved areas. Trees will be selected to shade 50% of paved areas within 15 years.
- Plant deciduous trees on the south- and west-facing sides of buildings.
- The City will implement measures to reduce the amount of vehicle traffic to and from the project area to further reduce air pollution in the valley. This could include provisions such as encouraging employees to rideshare or carpool to the project site, or incentives for employees to use alternative transportation.
- If transit service is available to the project site, improvements will be made to encourage its use. If transit service is not currently available but is planned for the area in the future, easements will be reserved to provide for future improvements. These include bus turnouts, loading areas, route signs, and shade structures. Pedestrian access will be directed to the main entrance of the project from existing or potential public transit stops, and appropriately designed sidewalks will be provided. Such access will consist of paved walkways or ramps and will be separated physically from parking areas and vehicle access routes. Appropriations made to facilitate public or mass transit will help mitigate trips generated by the project.
- Sidewalks and bicycle paths will be provided throughout as much of the project as possible and connect to any nearby open space areas, parks, schools, and commercial areas to encourage walking and bicycling. Connections to nearby public uses and commercial areas will be made as

direct as possible to promote walking for some trips. Sidewalks and bikeways will be designed to separate pedestrian and bicycle pathways from vehicle paths. Sidewalks and bikeways will be designed to be accommodating and appropriately sized for anticipated future pedestrian and bicycle use. Such pathways will be easy to navigate and designed to facilitate pedestrian movement through the project and create a safe environment for all potential users (pedestrian, bicycle, and disabled) from obstacles and automobiles. Pedestrian walkways will be created to connect all buildings throughout the project. The walkways will create a safe and inviting walking environment for people wishing to walk from one building to another. Walkways will be installed to direct pedestrians from the street sidewalk to the buildings. Safe and convenient pathways will be provided for pedestrian movement in large parking lots. Mid-block paths will be installed to facilitate pedestrian movement through long blocks (more than 500 feet in length) and cul-de-sacs. Sidewalks will be designed for high visibility (e.g., brightly painted or a different color of concrete) when crossing parking lots, streets, and similar vehicle paths. Pathways through the project will be built in anticipation of future growth/development.

- Exits to adjoining streets will be designed to reduce time to re-enter traffic from the project site.
- Efficient interior circulation and pedestrian access within the project area and logical connection points for future development on the surrounding properties will be provided.
- Measures will be implemented to reduce the amount of vehicle traffic to and from the residential area(s) that further reduce air pollution in the SJVAB. This could include providing an information center for residents to coordinate carpooling.
- As many energy-conserving features as possible will be incorporated into the design and operation of the proposed project. These include:
 - ❑ increased energy efficiency;
 - ❑ increased wall and ceiling insulation (beyond building code requirements);
 - ❑ energy-efficient windows (double-paned or Low-E);
 - ❑ high-albedo (reflecting) roofing materials;
 - ❑ cool paving;
 - ❑ radiant heat barriers;
 - ❑ energy-efficient lighting, appliances, and heating and cooling systems;
 - ❑ installation of solar water-heating systems;
 - ❑ provision of low NO_x-emitting or high-efficiency, energy-efficient water heaters;
 - ❑ installation of clean-energy features that promote energy self-sufficiency (e.g., photovoltaic cells, solar thermal electricity systems and small wind turbines);

- ☐ installation of geothermal heat pump systems;
 - ☐ installation of programmable thermostats for all heating and cooling systems;
 - ☐ awnings or other shading mechanisms for windows;
 - ☐ porch, patio, and walkway overhangs;
 - ☐ ceiling fans or whole-house fans;
 - ☐ passive solar cooling and heating designs (e.g., natural convection and thermal flywheels);
 - ☐ daylighting (natural lighting) systems such as skylights, light shelves, and interior transom windows;
 - ☐ electrical outlets around the exterior of units to encourage the use of electric landscape maintenance equipment;
 - ☐ bicycle parking facilities for patrons and employees in covered secure areas (conveniently located at each destination point);
 - ☐ use of low and no-VOC (volatile organic content) coatings and paints;
 - ☐ natural gas fireplaces (instead of wood burning fireplaces or heaters) and natural gas lines (if available to the project area) in backyard or patio areas to encourage the use of gas barbecues;
 - ☐ onsite employee cafeterias or eating areas;
 - ☐ pre-wired units with high-speed modem connections/DSL and extra phone lines;
 - ☐ employee shower and locker areas for bicycle and pedestrian commuters; and
 - ☐ use of low or nonpolluting landscape maintenance equipment (e.g., electric lawn mowers, reel mowers, leaf vacuums, and electric trimmers and edgers).
- c. Please see discussion under “b.”
- d. Sensitive receptors include land uses, such as schools, day care centers, medical facilities, recreational facilities, and others that could contain young children, elderly persons, or people with existing respiratory health problems. The proposed project could result in significant air pollutant emissions, which could expose sensitive receptors to substantial pollutant concentrations. As stated in the *SJVAPCD Guide for Assessing and Mitigating Air Quality Impacts* (San Joaquin Valley Air Pollution Control District 2002), a preliminary screening can be used to determine the effect that a project will have on intersections, and whether or not they could potentially result in a CO hotspot. The two criteria include the following situations.

- ❑ A traffic study for the project indicates that the Level of Service (LOS) on one or more streets or at one or more intersections in the project vicinity will be reduced to LOS E or F.
- ❑ A traffic study indicates that the project will substantially worsen an already existing LOS F on one or more streets or at one or more intersections in the project vicinity.

According to the traffic study conducted in May 2008 (Fehr & Peers 2008), the proposed project would worsen several intersections in the project vicinity from an already existing LOS F to a worse LOS F.

CO modeling was conducted to evaluate whether the project would cause or contribute to localized violations of the state or federal ambient standards in the project vicinity. CO concentrations at sensitive receptors near congested intersections were estimated using CALINE4 dispersion modeling. Table 3.3-3 summarizes CO modeling results for existing year (2008), existing plus project, and future year (2020) with and without the project. No violations of the state or federal 1 or 8 hour CO standards are anticipated in the project area under design-year with-project conditions. Although roadway volumes increase in future years, intersection congestion and volumes are not sufficient to result in CO levels that exceed state and federal standards. In addition, it is anticipated that vehicle emissions in future years will be lower than existing years because of continuing improvements in engine technology and the retirement of older, higher-emitting vehicles. Therefore, the impact of project traffic conditions on ambient CO levels in the project area is considered less than significant and no mitigation is required.

- e. The proposed project may cause temporary odors from diesel exhaust. However, these odors would cease after construction is completed. Residential uses are generally not considered to be a source of offensive odors. Therefore, operation of the proposed project is not likely to generate odors or expose receptors to offensive odors. This is considered a less-than-significant impact.

Table 3.3-3. Modeled Carbon Monoxide Levels Measured at Receptors in the Vicinity of the Project Area

Intersection ^a	Receptor	Existing (2008)		Existing Plus Project (2008)		2020 No Project		2020 with Project	
		1-Hour CO ^b	8-Hour CO ^c	1-Hour CO ^b	8-Hour CO ^c	1-Hour CO ^b	8-Hour CO ^c	1-Hour CO ^b	8-Hour CO ^c
Main Street/SR 120 EB Ramp	1	5.9	3.6	5.9	3.6	8.6	5.2	9.0	5.4
	2	6.1	3.7	6.2	3.7	8.9	5.4	8.7	5.2
	3	5.8	3.5	5.9	3.6	8.1	4.9	8.7	5.2
	4	5.8	3.5	5.9	3.6	8.6	5.2	8.4	5.1
Main Street/Woodward Ave	5	5.7	3.4	5.8	3.5	7.6	4.6	8.4	5.1
	6	5.6	3.4	5.8	3.5	8.2	4.9	8.4	5.1
	7	5.5	3.3	5.6	3.4	7.9	4.8	8.5	5.1
	8	5.8	3.5	6.0	3.6	8.0	4.8	8.3	5.0
SR 99 SB Ramp/Yosemite Ave	9	6.7	4.0	6.8	4.1	7.5	4.5	7.5	4.5
	10	6.6	4.0	6.5	3.9	7.7	4.6	7.7	4.6
	11	6.7	4.0	6.7	4.0	7.6	4.6	7.7	4.6
	12	6.5	3.9	6.5	3.9	7.8	4.7	7.9	4.8
SR 99 NB Ramp/Yosemite Ave	13	5.3	3.2	5.4	3.3	5.9	3.6	5.9	3.6
	14	5.6	3.4	5.7	3.4	5.6	3.4	6.2	3.7
	15	5.2	3.1	5.3	3.2	5.5	3.3	5.7	3.4
	16	5.4	3.3	5.5	3.3	5.3	3.2	6.0	3.6
	17	6.2	3.7	6.4	3.9	7.5	4.5	7.4	4.5

^a Receptors 1 through 17 are located approximately 35.4 feet from the center of each intersection diagonal, 25 feet from the roadway centerline, and 3 feet from the boundary of the mixing zone.

^b Background concentrations of 4.1 ppm and 2.5 ppm were added to the modeling 1-hour and 8-hour results, respectively.

^c The federal and state 1-hour standards are 35 and 20 ppm, respectively.

^d The federal and state 8-hour standards are 9 and 9.0 ppm, respectively.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than- Significant Impact	No Impact
IV. BIOLOGICAL RESOURCES.	Would the project:				
a.	Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
b.	Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
c.	Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marshes, vernal pools, coastal wetlands, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d.	Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e.	Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f.	Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan?	☐	☒	☐	☐

Setting

The project site is vacant and graded. It is surrounded by existing development. At the time of preparation of the environmental document for the Tesoro Subdivision, prior to development of the lands surrounding the project site, the entire area was found not to include biological resources. There is no substantial evidence that this has changed.

San Joaquin County Multi-Species Habitat and Open Space Conservation Plan

The San Joaquin County Multi-Species Habitat and Open Space Conservation Plan (SJMSCP) has been prepared by the County and its cities (including the City of Manteca) to provide a regional approach to mitigating development impacts on the 100 listed and nonlisted plant, fish, and wildlife species covered by the SJMSCP, compensating for the conversion of open space to non-open-space uses. In addition, the SJMSCP provides some compensation to offset the impacts of open space land conversions on other beneficial open space uses, such as recreation, agriculture, scenic values, educational purposes, flood control, and use by common plant, fish, and wildlife species that are not included in the list of SJMSCP-covered species. The plan allows a development impact fee to be paid by project applicants whose projects would cause the loss of biological resources or conversion of habitats.

For the purpose of determining the appropriate fees and mitigation ratios, habitat types have been divided into the following three categories (as of 2005):

- multipurpose open space,
- agriculture and natural land, and
- vernal pools (including upland habitat and wetted habitat).

As development occurs and participants choose to mitigate through the SJMSCP, development fees are charged and used in most cases to preserve large contiguous areas of plant and wildlife habitat. Conversion of multipurpose open space lands does not result in incidental take and does not require compensation in the form of preserve acquisition. Instead, compensation for multipurpose open space land is triggered by the requirement to assist in financing the SJMSCP preserve system by supporting a portion of the enhancement, management, and administration costs associated with the preserve system. The fees are paid to the San Joaquin Council of Governments (SJCOC) and adjusted annually.

Impact Discussion

At the time of preparation of the environmental document for the Tesoro Subdivision, including the subject project site, prior to development of the lands surrounding the project site, the entire area was found not to include biological resources. There is no substantial evidence that this has changed.

- a. At the time of preparation of the environmental document for the Tesoro Subdivision, prior to development of the lands surrounding the project site, the entire area was found not to include biological resources. There is no substantial evidence that this has changed.
- b. At the time of preparation of the environmental document for the Tesoro Subdivision, prior to development of the lands surrounding the project site,

the entire area was found not to include wetlands. There is no substantial evidence that this has changed.

- c. At the time of preparation of the environmental document for the Tesoro Subdivision, prior to development of the lands surrounding the project site, the entire area was found not to include biological resources. There is no substantial evidence that this has changed.
- d. No trees would be removed as a part of this project.
- e. The environmental document for the Tesoro Subdivision, including the project site, stated:

The project is located within the area covered by the San Joaquin Multi-Species Habitat Conservation and Open Space Plan (SJMSCP). The Plan, of which the City is part, was developed to minimize and mitigate impacts to plant and wildlife habitat resulting from the conversion of 109,302 acres of open space to non-open space use to occur in San Joaquin County between 2001 and 2051. Ninety-seven species are covered by the SJMSCP, which is intended to provide comprehensive mitigation, pursuant to local, state and federal regulations, for impacts to these species from SJMSCP permitted activities. No conflict will occur relative to such plan.

- f. Implementation of the following mitigation measure will ensure that this impact is less than significant:

Mitigation Measure BIO-1: The project proponent will provide compensation for the conversion of approximately 15.37 acres of agricultural habitat lands (i.e., fund acquisition of preserve lands) at a ratio of 1:1 (acres acquired to acres lost), as outlined in the SJMSCP (Section 4.1.2[A]). The final cost to fulfill project compensation requirements will be determined during coordination with SJCOG. Compensation fees must be paid before any ground-disturbing activities, including grading (SJMSCP Section 5.3.2.3[A]).

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than- Significant Impact	No Impact
V. CULTURAL RESOURCES.	Would the project:				
a.	Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?	☐	☐	☐	☒
b.	Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	☐	☐	☒	☐
c.	Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☒	☐

Setting

At the time of preparation of the environmental document for the Tesoro Subdivision, including the subject project site, prior to development of the lands surrounding the project site, the entire area was found not to include cultural resources. There is no substantial evidence that this has changed.

Impact Discussion

- a. No buildings or structures exist on the project site.
- b. The project may result in substantial adverse change to archaeological resources within the project area. Though no known archeological resources are located within the project area, this may a result of the absence of any inventory data for the area. Archaeological resources are generally not visible from a distance and are only located as a result of an intensive pedestrian survey. It is possible that significant archaeological resources, both with and without surface manifestations, are present within the project area. Project activities that may affect such resources include grading and excavation. Any impact on these resources would be a significant impact, but implementation of the following mitigation measure would reduce this impact to a less-than-significant level.

Mitigation Measure CR-1: Stop Work in Case of Accidental Discovery of Buried Archeological Resources.

If buried archeological resources, such as chipped or ground stone, historic debris, building foundations, or human bone, are inadvertently discovered during ground-disturbing activities, work would stop in that area and within 100 feet of the find until a qualified archaeologist can assess the significance of the find and,

if necessary, develop appropriate treatment measures in consultation with the City and other appropriate agencies (see also Implementation Measure RC-I-46 of the General Plan [City of Manteca 2003a]).

- c. No known human remains are present within the project area. It is possible that buried human remains would not be located as a result of this study due to a lack of surficial evidence. However, it is possible that human remains, particularly those outside a designated cemetery, may be encountered during ground-disturbing activities associated with project construction. This impact would be significant, but implementation of Mitigation Measure CR-2 would reduce this impact to a less-than-significant level.

Mitigation Measure CR-2: Stop Work in Case of Accidental Discovery of Buried Human Remains.

If human remains of Native American origin are discovered during project construction, it is necessary to comply with state laws relating to the disposition of Native American burials, which fall within the jurisdiction of the Native American Heritage Commission (NAHC) (PRC 5097). If any human remains are discovered or recognized in any location other than a dedicated cemetery, there will be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until:

- the county coroner has been informed and has determined that no investigation of the cause of death is required; and
- if the remains are of Native American origin,
 - the descendants of the deceased Native Americans have made a recommendation to the landowner or the person responsible for the excavation work for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in PRC 5097.98; or
 - the NAHC was unable to identify a descendant, or the descendant failed to make a recommendation within 24 hours after being notified by the commission.

According to the California Health and Safety Code, six or more human burials at one location constitute a cemetery (Section 8100), and disturbance of Native American cemeteries is a felony (Section 7052). Section 7050.5 requires that construction or excavation be stopped in the vicinity of discovered human remains until the coroner can determine whether the remains are those of a Native American. If the remains are determined to be Native American, the coroner must contact the NAHC.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than- Significant Impact	No Impact
VI. GEOLOGY AND SOILS. Would the project:				
a. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
1. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☒	☐
2. Strong seismic groundshaking?	☐	☐	☒	☐
3. Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
4. Landslides?	☐	☐	☒	☐
b. Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c. Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in an onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☐	☒
d. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒
e. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒
f. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☒	☐	☐

Setting

San Joaquin Valley Geologic Framework

The San Joaquin Valley is a deep, structurally controlled trough flanked by the Coast Ranges uplift on the west and by the Sierra Nevada on the east (Norris and Webb 1990).

The San Joaquin Valley is floored by a thick sequence of sedimentary deposits that range in age from Jurassic through Quaternary. Under the eastern and central portions of the valley, the base of the sequence likely rests on Mesozoic crystalline rock allied to the plutons of the Sierra Nevada; to the west, basement rocks are believed to be Franciscan metasediments and/or *mélange*. Mesozoic sedimentary rocks now in the subsurface record marine deposition. They are overlain by Tertiary strata reflecting marine, estuarine, and terrestrial conditions, which are in turn overlain by Quaternary fluvial and alluvial strata recording uplift and erosion of the Sierra Nevada and Coast Ranges to approximately their present shape (e.g., Norris and Webb 1990).

To the west, the Coast Ranges geomorphic province is characterized by en echelon northwest-trending mountain ranges formed over the past 10 million years or less by active uplift related to complex tectonics of the San Andreas fault/plate boundary system (Norris and Webb 1990, Busing and Walker 1995, Atwater and Stock 1998). The eastern range front is defined by faults that have been interpreted as contractile features associated with shortening along an axis approximately normal to the range front (Wong et al. 1988, Sowers et al. 1992, Unruh et al. 1992; see also Jennings 1977 for regional mapping), but may also locally accommodate a right-lateral component of motion (Richesin 1996).

East of the San Andreas fault, the Coast Ranges are broadly antiformal. The core of the uplift consists primarily of metasedimentary rocks and *mélange* of the Mesozoic Franciscan Complex (Jennings 1977). Outcrops of mafic and ultramafic units belonging to the Jurassic Coast Range Ophiolite are also locally present, and are particularly well developed along the Ortigalita fault in the vicinity of Del Puerto Canyon (Wagner et al. 1990, Evarts et al. 1999). Mesozoic ultramafic rocks are also well exposed in the vicinity of San Benito Mountain. The eastern Coast Range range front is flanked by a generally eastward-younging sequence of Cretaceous through Quaternary clastic sedimentary strata. The lower portion of this sequence, where it is present, typically records deep marine deposition, while the upper portion reflects progressive growth and erosional dissection of the Coast Range uplift (Unruh et al. 1992, Richesin 1996). Quaternary alluvial strata accumulated on essentially modern topography buttress against the range front, and are locally folded and/or faulted, particularly along the southern portion of the range front. Active alluvium and older Quaternary terrace deposits are present in the larger active stream valleys throughout the eastern portion of the Coast Ranges (Jennings 1977, Wagner et al. 1990, Richesin 1996).

To the east of the San Joaquin Valley, the Sierra Nevada preserves the dissected remnants of a Mesozoic volcanic arc system similar to the modern Andes. The core of the range consists of plutonic rocks representing the roots of the arc. It is bordered on the eastern margin of the action area by generally westward-younging metavolcanic and metasedimentary rocks ranging in age from Paleozoic to Mesozoic. These strata are in turn overlain by Miocene through Quaternary fluvial and alluvial sediments that pass laterally into valley floor strata, and reflect erosional dissection of the progressively uplifting Sierran massif (Jennings 1977, Bartow 1991).

Manteca Area Geology and Paleontology

The City and surrounding area are immediately underlain by sedimentary units of Quaternary age, including the Modesto Formation of probable Late Pleistocene (Rancholabrean) age, and overlying deposits of Holocene age (Bartow 1985, Wagner et al. 1990, Marchand and Allwardt 1981) for a geologic time scale illustration).

The Modesto Formation consists of poorly indurated and sorted brown sandstone and siltstone with interbeds of pebble to cobble conglomerate, and has been interpreted as recording alluvial/fluvial deposition (Marchand and Allwardt 1981). It has yielded vertebrate fossils at a number of localities outside the immediate project vicinity, including remains of the extinct giant ground sloth (*Megalonyx jeffersonii*), Columbian mammoth (*Mammuthus columbi*), and giant Ice Age bison (*Bison latifrons*), as well as a variety of rodents and at least one species of snake (University of California, Berkeley, Museum of Paleontology 2007). Because of its potential to contain vertebrate fossils, the Modesto Formation is considered highly sensitive for paleontological resources.

The Modesto Formation is overlain by sandy deposits interpreted as recording sand dune deposition. Because Holocene units are too young to contain fossil materials, which are by definition older than 10,000 years, their paleontological sensitivity is considered low except in unusual circumstances. No fossil finds have been reported from Holocene units in San Joaquin County (University of California, Berkeley, Museum of Paleontology 2007). Thus, the paleontological sensitivity of the dune sands is considered low.

Impact Discussion

- a-1 The project site is not located within any Earthquake Fault Zone delineated by the State of California pursuant to the Alquist-Priolo Act, nor is it traversed by any faults recognized as active by the Uniform Building Code (Hart and Bryant 1997, International Conference of Building Officials 1997). Accordingly, the risk of surface fault rupture at the project site is considered low, and the potential for impacts related to surface fault rupture is evaluated as less than significant. No mitigation is required.

- a-2 During the lifespan of the proposed project, the project site is likely to experience strong seismic groundshaking as a result of earthquakes on any of several active faults located at varying distances to the west of the site, including the Ortigalita, Greenville, Calaveras, Hayward, and San Andreas faults. The principal concern related to seismic groundshaking is the potential for structural damage and related hazards to life and safety, which represent a potentially significant impact. However, all new structures would be designed and constructed to meet or exceed relevant requirements of the current California Building Code (CBC), as required by the City General Plan 2023 and Municipal Code. Adherence to CBC requirements would not entirely eliminate risks related to groundshaking damage, but would mitigate such risks consistent with the prevailing standard of care. Consequently, this impact is considered less than significant, and no mitigation is required.
- a-3 The project site could be subject to strong seismic groundshaking as a result of earthquakes on a number of active faults located at varying distances to the west of the site, including the Ortigalita, Greenville, Calaveras, Hayward, and San Andreas faults. As discussed above, there is some potential for liquefaction at the site, but no substantial hazard has been identified (Kleinfelder 2007a). Therefore, impacts related to liquefaction, if any, are expected to be less than significant. No mitigation is required.
- a-4 Topography at and surrounding the project site is very gentle, and the existing risk of landslide at the site is considered minimal. Creation of cut slopes and fill embankments during project construction could lead to a risk of localized slope failure if the slopes are improperly designed or implemented. However, design and construction of the proposed project would conform with Appendix Chapter 33 requirements of the CBC, along with any specific recommendations of the site-specific geotechnical investigation (Kleinfelder 2007a). Conformance to the Appendix Chapter 33 standards and good grading and excavation practices would minimize the potential for failure of cut slopes and fill embankments, and impacts are expected to be less than significant. No mitigation is required.
- b. Preparation and implementation of a Storm Water Pollution Prevention Plan (SWPPP) that provides best management practices (BMPs) to control soil erosion during project construction and compliance with CBC standards regarding finished site contouring and drainage is expected to effectively manage post-construction (operational) runoff to avoid excessive erosion once the proposed development is in use. Consequently, impacts related to increased soil erosion are expected to be less than significant.
- c. At the time of preparation of the environmental document for the Tesoro Subdivision the entire area was found not to be subject to unstable soils. There is no substantial evidence that this has changed; therefore, there is no impact.
- d. At the time of preparation of the environmental document for the Tesoro Subdivision, the entire area was found not to be subject to unstable soils, and there is no impact.

- e. The proposed Tesoro development is planned to connect to City sewer service and storm drains. There would be no impact related to septic system or alternative wastewater disposal needs.
- f. The project site may be underlain by the Modesto Formation, which is known to contain vertebrate fossils, including remains of mammoth, bison, rodents, and reptiles. Thus, the formation is considered highly sensitive for paleontological resources. Earthwork required to construct the proposed project could involve the Modesto Formation, with the potential to damage and/or disturb vertebrate and other fossil resources. Depending on the degree of loss, disturbance, or damage affecting vertebrate fossils could represent a significant impact. Implementation of Mitigation Measures GEO-1 through GEO-4 would reduce impacts on paleontological resources to a less-than-significant level and would be consistent with the current standard of care for paleontological resources. Any residual impact would be considered less than significant.

Mitigation Measure GEO-1: Conduct Preconstruction Survey, Salvage, and Protection.

Before site preparation (including vegetation clearing) and project earthwork begin, the project proponent will retain a qualified professional paleontologist, as defined by the Society of Vertebrate Paleontology (SVP) Conformable Impact Mitigation Guidelines Committee (1995), to conduct a pedestrian surface survey and, if necessary, a paleontological salvage operation. The goal of the salvage operation, if needed, will be to ensure that any paleontological materials exposed at the surface are recovered and properly prepared and curated, or protected from damage using exclusion fencing or other appropriate means. The completed survey will be submitted to the City. Protection will be designed and installed in consultation with the City and the project engineering consultant to ensure that it is appropriate and effective but does not unduly impede construction activities.

Mitigation Measure GEO-2: Retain a Qualified Professional Paleontologist to Monitor during Ground-Disturbing Activities.

The project proponent will retain a qualified professional paleontologist, as defined by the SVP Conformable Impact Mitigation Guidelines Committee (1995), to monitor during any activities with the potential to disturb the Modesto Formation or any other substrate units of Pleistocene age.

Mitigation Measure GEO-3: Provide Worker Sensitivity Training for Paleontological Resources.

The project proponent will ensure that all construction personnel receive training provided by a qualified professional paleontologist, experienced in teaching nonspecialists, to ensure that they can recognize fossil materials in the event any are discovered during construction.

Mitigation Measure GEO-4: Stop Work and Implement Evaluation and Treatment Measures if Macrofossil Remains are Encountered during Construction.

If paleontological materials are discovered during any site preparation, excavation, or project-related activities, work will stop in the area of the find, and

the contractor will notify the City's project manager and the qualified paleontologist retained to perform project monitoring. The paleontologist will assess the nature and importance of the find and recommend appropriate treatment, consistent with the SVP's 1995 guidelines and all other applicable standards of care. If the paleontologist identifies a need, a state-licensed professional geologist (California PG) will also be retained to assist with evaluating the potential for project work to further disturb the geologic units in which the find was made. Work will not resume in the area of the find until the find has been assessed by the paleontologist and any treatment identified as necessary has been implemented. However, with the paleontologist's approval, work may resume on other portions of the site during evaluation and treatment of the find. Depending on the nature of the find, on site-specific geologic conditions, and on the project activities planned for the site, treatment may include paleontological monitoring, preparation, and recovery of fossil materials so that they can be housed in an appropriate museum or university collection. Treatment also may include preparation of a report for publication describing the finds, or may include other approaches developed for the site. The project proponent will be responsible for ensuring that the paleontologist's recommendations regarding treatment and reporting are implemented.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than- Significant Impact	No Impact
VII. HAZARDS AND HAZARDOUS MATERIALS.					
	Would the project:				
a.	Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☒	☐	☐
b.	Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☒	☐	☐
c.	Emit hazardous emissions or involve handling hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d.	Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☒	☐	☐
e.	Be located within an airport land use plan area or, where such a plan has not been adopted, be within two miles of a public airport or public use airport, and result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f.	Be located within the vicinity of a private airstrip and result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g.	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☒	☐	☐
h.	Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

Setting

The project site is surrounded by existing developed areas, including improved site access.

Impact Discussion

a, b. Construction of the proposed project could expose construction workers, the public, or the environment to hazardous materials through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment. Small quantities of potentially toxic substances (e.g., petroleum and other chemicals used to operate and maintain construction equipment) would be used and disposed of at the project site and transported to and from the site during construction. Accidental releases of small quantities of these substances could contaminate soils and degrade the quality of surface water and groundwater, resulting in a public safety hazard.

In addition, construction of the proposed project site requires excavation and movement of soils. Although the General Plan EIR (City of Manteca 2003b) indicated that no Superfund or Cortese sites are present within Manteca, it is possible that potentially hazardous sites are located within the area of the project site. No hazardous records searches have been performed for the project site. Unknown hazardous sites have the potential to create a significant hazard to construction workers, the public, and the environment if they are encountered during construction of the proposed project. This impact is potentially significant. Mitigation Measures HAZ-1a through 1c and HAZ-2 will reduce these impacts to a less-than than-significant level.

Mitigation Measure HAZ-1a: Follow Manteca Fire Department and Other Guidelines for Storage and Handling of Hazardous Materials.

The City shall require that contractors transport, store, and handle hazardous materials required for construction in a manner consistent with relevant regulations and guidelines, including those recommended and enforced by the Manteca Fire Department (MFD).

Mitigation Measure HAZ-1b: Immediately Contain Spills, Excavate Spill-Contaminated Soil, and Dispose of It at an Approved Facility.

In the event of a spill of hazardous materials in an amount reportable to the MFD (as established by MFD guidelines), the contractor shall immediately control the source of the leak and contain the spill. If required by the MFD or other regulatory agencies, contaminated soils will be excavated and disposed of off site, at a facility approved to accept such soils.

Mitigation Measure HAZ-1c: Perform Hazards Records Search Prior to Development of Project Site and Implement Necessary Remediation.

Prior to development of project site, the City will perform hazardous records searches to determine whether the site is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, could create a significant hazard to the public or the environment. If any hazardous sites are discovered, the City will implement necessary remediation actions as required by law before developing the site.

Mitigation Measure HAZ-2: Develop and Implement Plans to Reduce Exposure of People and the Environment to Hazardous Conditions during Construction Activities.

The City shall require the applicant to develop plans to prevent the pollution of surface water and groundwater and to promote the health and safety of workers and other people in the project vicinity. These programs shall include an operations and maintenance plan, a site-specific safety plan, and a fire prevention plan, in addition to the SWPPP required for hydrology impacts. The programs are required by law and shall require approval by several responsible agencies. Required approvals are as follows: the SWPPP shall be approved by the Regional Water Quality Control Board; the site-specific safety plan and the operations and maintenance plan shall be approved by the California Occupational Safety and Health Administration (Cal-OSHA). The fire safety plan shall be approved by the MFD.

The City shall also require the applicant to develop and implement a hazardous materials management plan that addresses public health and safety issues by providing safety measures, including release prevention measures; employee training, notification, and evacuation procedures; and adequate emergency response protocols and cleanup procedures.

Finally, the City shall require the applicant and its designated contractors to comply with Cal-OSHA and federal standards, for the storage and handling of fuels, flammable materials, and common construction-related hazardous materials and for fire prevention. Cal-OSHA requirements can be found in the California Labor Code, Division 5, Chapter 2.5. Federal standards can be found in Occupational Safety and Health Administration Regulations, Standards (29 CFR).

- c. The project, a residential development, would not involve the handling of hazardous materials or the creation of hazardous emissions. There would be no impact.
- d. As noted in checklist discussion “a, b,” though the General Plan EIR indicated that no Superfund or Cortese sites are present within Manteca, it is possible that potentially hazardous sites are located within the area of the project site. No hazardous records searches have been performed for the project site. Locating the project on a listed site would be a potentially significant impact. Performance of such a search as required in Mitigation Measure HAZ-1c would allow determination of whether there are hazardous

sites known to be located on the site. Compliance with existing state regulations would ensure that impacts would not be significant.

- e., f. The project site is not located within 2 miles of any public airports or private airstrips, and does not fall within an airport land-use plan area. There would be no impacts. No mitigation is required.
- g. The proposed project is not expected to result in long-term modifications to existing circulation. Short-term lane closures or slight detours during project construction may be required, which have the potential to interfere with the implementation of emergency response or evacuation plans. This impact is potentially significant. Mitigation Measure HAZ-3 would reduce the impact to a less-than-significant level.

Mitigation Measure HAZ-3: Incorporate Emergency Access Routes during Construction.

The MFD shall have oversight on emergency access during construction of the program elements. The MFD will verify that adequate emergency access throughout the program area continues during project construction. The MFD and other emergency service providers will be notified of lane closures and detours at least 1 week in advance of the closure so that adequate alternate routes can be determined.

- h. The proposed project site is currently vacant graded land surrounded by developed lands. No wildlands are located within or adjacent to the project site. There would be no impact.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than- Significant Impact	No Impact
VIII. HYDROLOGY AND WATER QUALITY.					
	Would the project:				
a.	Violate any water quality standards or waste discharge requirements?	☐	☐	☒	☐
b.	Substantially deplete groundwater supplies or interfere substantially with groundwater recharge, resulting in a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☒	☐
c.	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation onsite or offsite?	☐	☐	☒	☐
d.	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding onsite or offsite?	☐	☐	☒	☐
e.	Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☒	☐
f.	Otherwise substantially degrade water quality?	☐	☒	☐	☐
g.	Place housing within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h.	Place within a 100-year flood hazard area structures that would impede or redirect floodflows?	☐	☐	☐	☒
i.	Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than- Significant Impact	No Impact
j.	Contribute to inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

Setting

Surface Water Hydrology

The San Joaquin River is the major drainage feature in the area. Manteca is located on the relatively higher ground between Lone Tree Creek to the north and the Stanislaus River to the south, with the San Joaquin River to the southwest and west. Walthall Slough is a tributary to the San Joaquin River and is the southwestern boundary for Manteca. The South San Joaquin Irrigation District (SSJID) operates drainage facilities that pass through Manteca and carry a portion of the city's drainage. Because of topography, drainage facilities generally follow an east-to-west alignment.

Groundwater Hydrology

The proposed project lies within the Eastern San Joaquin Subbasin, which is part of the San Joaquin Valley Groundwater Basin. The Eastern San Joaquin Subbasin has a surface area of 707,000 acres, or 1,110 square miles (California Department of Water Resources 2006). The subbasin is drained by the San Joaquin River and several of its major tributaries, including the Stanislaus, Calaveras, and Mokelumne Rivers (California Department of Water Resources 2006). Water bearing formations of significance in this subbasin include: Alluvium and Modesto/Riverbank Formations, flood basin deposits, Laguna Formation, and Mehrten Formation (California Department of Water Resources 2006).

Groundwater levels have seen a decline over the last 40 years of monitoring. Data show that levels have declined at an average rate of 1.7 feet per year and have dropped as much as 100 feet in some areas (California Department of Water Resources 2006). According to Bulletin 118, overdraft during the last 40 years has reduced storage by as much as 2 million acre-feet (af). Manteca contains areas of locally high groundwater, with shallow groundwater encountered in certain locations at depths of 2 to 10 feet below ground surface (California Department of Water Resources 2006). At the proposed project site, groundwater levels have been shown to vary at depths between 10 and 20 feet (San Joaquin County 2006).

Surface Water Quality

Beneficial use impairments result from several factors but are generally due to point-source and non-point-source pollutants. Point-source pollutants include discharges of wastewater from municipal sewage treatment plants, and industrial and commercial facilities. Non-point sources include urban runoff containing oils, greases, and toxic chemicals; construction runoff; livestock and animal wastes; and runoff from agricultural and residential areas.

Generally, surface water quality in Manteca's boundaries is considered sufficient for municipal and agricultural activities, wildlife, and recreation; however, the San Joaquin and Stanislaus Rivers that surround Manteca are listed as impaired according to Section 303(d) of the federal Clean Water Act (CWA)(see the "Regulatory Setting" section). CWA Section 303(d) establishes the Total Maximum Daily Load (TMDL) process to assist in guiding the application of state water quality standards, requiring states to identify streams with "impaired" water quality (those affected by the presence of pollutants or contaminants) and establish the TMDL or the maximum quantity of a particular constituent that a water body can assimilate without experiencing adverse effects. The San Joaquin River, from the Merced River to the south Delta boundary (the reach that passes to the west of Manteca), is 303(d)-listed for boron, DDT, electrical conductivity, Group A pesticides, mercury, and unknown toxicity (Central Valley Regional Water Quality Control Board 2006). The lower Stanislaus River is 303(d)-listed as impaired for Diazinon, Group A pesticides, and mercury (Central Valley Regional Water Quality Control Board 2006).

Groundwater Quality

The majority of the groundwater in the Eastern San Joaquin Subbasin is characterized by calcium-magnesium-bicarbonate- or calcium-sodium-bicarbonate-type water. Large areas of chloride-type water are located along the western portion of the subbasin (California Department of Water Resources 2006). Water quality samples were taken from 174 wells in the subbasin. The results showed that the total dissolved solids (TDS) ranged from 30 to 1,632 milligrams per liter (mg/L) and averaged about 310 mg/L. Specific conductance or electromagnetic conductivity (EC) in the groundwater ranged from 78 to 5,390 micromhos per centimeter ($\mu\text{mhos/cm}$) (California Department of Water Resources 2006). Some of the highest EC values were found along the western part of the subbasin along the San Joaquin River alignment.

As a result of declining water levels, poor-quality water has been moving east along a 16-mile front on the east side of the Delta (California Department of Water Resources 2006). This saline water has continued to move eastward from the Stockton area. In addition, large areas of elevated nitrate in the groundwater exist within the subbasin located southeast of Lodi, south of Stockton, and east of Manteca (California Department of Water Resources 2006). The elevated nitrate is likely a source of dairy practices.

In the Manteca area, groundwater wells produce water that generally meets or exceeds all Title 22 Reclamation Criteria primary drinking-water standards. Some wells have exhibited taste and odor problems as a result of high iron and manganese levels. In addition, one well in the eastern portion of Manteca has produced water containing dibromochloropropane (DBCP), an agricultural pesticide; however, a wellhead treatment system has been installed on this well so that it meets state drinking water standards. Finally, recent changes in federal drinking water standards have reduced the maximum contaminant level for arsenic from 50 micrograms per liter ($\mu\text{g/l}$) to 10 $\mu\text{g/l}$; Manteca's wells average about 12.4 $\mu\text{g/l}$ and will require additional treatment.

Flooding

The Federal Emergency Management Agency (FEMA) categorizes flood prone areas based on the frequency of occurrence. The primary flood hazard is the San Joaquin River (approximately 2 miles from the project area) and its tributaries, most notably Walthall Slough. None of the project site is subject to flooding.

Water Supply

Manteca receives its water supply from two sources: groundwater from local wells and surface water supplied by the SSJID. The local groundwater basin is considered to be subject to "critical conditions of overdraft." Overdraft conditions have existed for many years. The maximum sustained yield of the basin is estimated at 1 af per acre per year (afa/yr); currently, groundwater pumping in the Manteca area is approximately 2.4 afa/yr, contributing to this condition of overdraft.

The SSJID's surface-water supplies are obtained from the Stanislaus River through pre-1914 water rights and post-1914 appropriative rights for direct diversion and diversion to storage. The SSJID operates a water treatment plant near the SSJID's Woodward Reservoir; treated water is conveyed to Manteca through a series of pipelines. The planned use of surface water will reduce Manteca's demand for ground water to the safe aquifer yield of 1 afa/yr.

Historically, the city has relied upon groundwater as its sole supply of potable water. Groundwater has provided a safe, reliable, and sustainable supply for decades. However, as growth has continued, the groundwater basin has exhibited overdraft, resulting in declining water tables throughout San Joaquin County. The SSJID, in conjunction with the Cities of Manteca, Tracy, Lathrop, and Escalon, has undertaken the construction of a surface water supply project, including a new water treatment plant and transmission infrastructure, to address basin overdraft.

Impact Discussion

- a. The proposed project will be implemented in accordance with all applicable water quality standards and waste discharge requirements, which will ensure that the quality and quantity of surface water flowing from the site would not be substantially affected. The project involves residential development, which would not discharge any hazardous materials into surface or subsurface water bodies. Household hazardous wastes would be disposed of in accordance with local waste requirements and programs. Implementation of Mitigation Measure HAZ-2 will ensure that this impact is less than significant.
- b. The City has adopted its 2005 Urban Water Management Plan, which includes an assessment of water supply and demand through 2030. With improvements under construction and planned in the future, including increased access to surface water, the City has adequate water supplies to serve all planned development under the General Plan, which includes the proposed project, without contributing to the overdraft of the regional aquifer. There will be no significant impact.
- c. As noted in section VI, "Geology and Soils," of this chapter, soil erosion can accelerate the delivery of sediment to surface waters, degrading water quality. It can also contribute to loss of topsoil resources. However, implementation of a SWPPP that provides BMPs to control soil erosion during project construction and compliance with UBC standards regarding finished site contouring and drainage is expected to effectively manage post-construction (operational) runoff to avoid excessive erosion once the proposed development is in use. Consequently, project-related increases in soil erosion are expected to be less than significant.
- d. The proposed project would result in a substantial increase in impervious surfaces from streets and buildings. Because of this, the project has the potential to substantially increase the rate or amount of surface runoff in a manner that could result in flooding on site or off site. The applicant will be required to design and construct onsite drainage facilities to City standards, and connect to the City storm drain system. According to the previous Initial Study (IS), the City storm drain system contains adequate capacity to serve the project site.
- e. The project site is currently vacant and undeveloped and contains permeable soils. The proposed project would substantially increase the amount of impermeable surfaces on the project site through development of the proposed project. The project would contribute to increased sources of polluted runoff during wet weather conditions from urban pollutants that are collected and transported to local drainage infrastructure, including trash, debris, rubber, greases, oils, and other vehicular fluids that leak on surface parking areas. This impact is potentially significant. The applicant will be required to design and construct onsite drainage facilities to City standards, and connect to the City storm drain system. According to the previous IS,

the City storm drain system contains adequate capacity to serve the project site.

- f. The proposed project would not otherwise substantially degrade water quality. Implementation of Mitigation Measure HAZ-2, requiring the project applicant to conform to all applicable water quality standards and waste discharge requirements relative to construction activities and runoff from parking lots or other onsite facilities, will ensure that this impact is less than significant. No other potential sources would contribute to water quality degradation.
- g., h. The proposed project site is not located within a 100-year flood zone. There would be no impacts.
- i. The proposed project site is not located in the 500-year flood zone. There would be no impacts.
- j. The project site is not located near any significantly sized enclosed body of water or coastal area and is therefore not susceptible to a seiche or tsunami. The site is not located at the foot of any significant topographical feature with the potential to be subject to a mudflow. There would be no impact.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than- Significant Impact	No Impact
IX. LAND USE AND PLANNING.	Would the project:				
a.	Physically divide an established community?	☐	☐	☐	☒
b.	Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c.	Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☒	☐	☐

Setting

The proposed project is consistent with the City General Plan and zoning designations for the project site.

Impact Discussion

- a. The proposed project would result in residential development that would complete the planned development of the Tesoro Subdivision site. The project would not divide any existing community. There would be no impact.
- b. The proposed project is consistent with the City General Plan and zoning designations for the project site.
- c. With the implementation of Mitigation Measure BIO-1, the project would be consistent with the SJMSCP.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than- Significant Impact	No Impact
X.	MINERAL RESOURCES. Would the project:				
a.	Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b.	Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒

Impact Discussion

- a., b. The California Geological Survey classifies Manteca, including the proposed project area, as Mineral Resource Zone 1. This classification indicates areas where adequate information indicates that no significant mineral deposits are present (California Division of Mines and Geology 1988). For this reason, there would be no impacts on mineral resources.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than- Significant Impact	No Impact
XI. NOISE.	Would the project:				
a.	Expose persons to or generate noise levels in excess of standards established in a local general plan or noise ordinance or applicable standards of other agencies?	☐	☒	☐	☐
b.	Expose persons to or generate excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c.	Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☒	☐	☐
d.	Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☒	☐	☐
e.	Be located within an airport land use plan area, or, where such a plan has not been adopted, within two miles of a public airport or public use airport and expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f.	Be located in the vicinity of a private airstrip and expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

Information in this section is based on information in the document entitled *Environmental Noise Assessment: Tesoro Apartments* prepared by j.c. brennan & associates (2007).

Setting

The following is a brief background discussion of noise terminology.

- **Sound.** A vibratory disturbance created by a vibrating object, which, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone.
- **Noise.** Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
- **Decibel (dB).** A unitless measure of sound. A sound level measurement in decibels describes the logarithmic ratio of a measured sound pressure level to a reference sound pressure level of 20 micropascals.

- **A-Weighted Decibel (dBA).** An overall frequency-weighted sound level that approximates the frequency response of the human ear.
- **Sound Level Percentiles (L_n).** The sound level exceeded a certain percentage of time during a specified interval, where the subscript “n” is the percentile value. For example, L_{90} is the sound level exceeded 90% of the time and L_{10} is the sound level exceeded 10% of the time.
- **Maximum and Minimum Sound Levels ($L_{\max}$ and $L_{\min}$).** The maximum or minimum sound level measured during a specified interval.
- **Equivalent Sound Level (L_{eq}).** L_{eq} represents an average of the sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level containing the same acoustical energy as the time-varying sound that actually occurs during the same period. The duration of the measurement is commonly indicated in the subscript; for example, a one-hour L_{eq} sound level would be indicated as dBA $L_{eq,1h}$.
- **Day-Night Level (L_{dn}).** The energy average of A-weighted sound levels occurring during a 24-hour period, with a 10-dB penalty added to sound levels occurring between 10:00 p.m. and 7:00 a.m.

Community Noise Equivalent Level (CNEL). Similar to L_{dn} , CNEL is the energy average of A-weighted sound levels occurring during a 24-hour period, with a 10-dB penalty added to sound levels occurring between 10:00 p.m. and 7:00 a.m. In addition, a 5-dB penalty is applied to sound levels during the evening hours of 7:00 p.m. to 10:00 p.m.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear is able to discern 1-dB changes in sound levels, when exposed to steady, single-frequency (“pure-tone”) signals in the mid-frequency (1,000 Hz to 8,000 Hz) range. However, it is widely accepted that people are able to begin to detect sound level changes of 3 dB for typical noisy environments. Further, a 10-dB increase is generally perceived as a doubling of loudness. Therefore, doubling sound energy (e.g., doubling the volume of traffic on a highway) would generally be perceived as a detectable, but not a substantial increase in sound level.

Noise Sensitive Land Uses

Sensitive land uses are generally defined as locations where people reside or where the presence of noise could adversely affect the use of the land. Typical sensitive receptors include residents, school children, hospital patients, the elderly, etc. Sensitive land uses in the project area that could be affected by the project includes single-family residences in the subdivision located directly west of the proposed project site along Spreckles Road. In addition, residences are planned directly south of the proposed project site along the proposed Atherton Drive.

Existing Noise Environment

The proposed project is located south of SR 120 and west of the Union Pacific Railroad (UPRR) on the northeast corner of Spreckels Road and the proposed Atherton Drive. The project site is bordered by SR 120 to the north, the UPRR tracks to the east, existing multi-family residences to the west, and proposed single family residences to the south. The predominant sources of noise in the vicinity of the proposed project area are traffic on adjacent roadways (primarily SR 120) and rail traffic on the UPRR tracks.

The existing noise environment in the project area has been characterized both with sound level measurements taken in the project area and traffic noise modeling as described below.

Noise Monitoring

Short-term and long-term noise monitoring was conducted at the proposed project site by j.c. brennan & associates. Short-term noise monitoring was conducted on February 6, 2007 approximately 270 feet from the centerline of SR 120, while Long-term noise monitoring was 120 feet from the centerline of the exiting UPRR tracks. Short-term noise monitoring indicates the noise level 270 feet from SR 120 is 62 dBA, L_{eq} , while long-term noise monitoring indicates the noise level 120 feet from the UPRR tracks is 67 dBA, L_{dn} .

City of Manteca General Plan Noise Element

The City's Noise Element establishes policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise-sensitive land uses. The City has established performance standards for exposure from mobile/transportation and stationary noise sources. The City's standards for mobile/transportation noise sources are indicated in Table 3.11-1, while Table 3.11-2 summarizes the City's standards for stationary noise sources. The standards indicated in Table 3.11-2 also apply to construction-related noise on adjacent land uses.

Table 3.11-1. City of Manteca Maximum Allowable Noise Exposure from Mobile/Transportation Noise Sources¹

Land Use ²	Outdoor activity areas ³	Interior spaces	
		L _{dn} /CNEL, dBA	L _{eq} , dBA ⁴
Residential	60 ⁵	45	--
Transient lodging	60 ⁵	45	--
Hospitals, nursing homes	60 ⁵	45	--
Theaters, auditoriums, music halls	--	--	35
Churches, music halls	60 ⁵	--	40
Office buildings	65	--	45
Schools, libraries, museums	--	--	45
Playgrounds, neighborhood parks	70	--	--

Noise from new transportation projects, such as rail or public transit routes, may be allowed to exceed these standards if the City Council finds that there are special overriding circumstances.

¹ Where a proposed use is not specifically listed on the table, the use shall comply with the noise exposure standards for the nearest similar use as determined by the City.

² Outdoor activity areas for residential development are considered to be backyard patios or decks of single family dwellings, and the common areas where people generally congregate for multi-family developments. Outdoor activity areas for non-residential developments are considered to be those common areas where people generally congregate, including pedestrian plazas, seating areas, and outside lunch facilities. Where the location of outdoor activity areas is unknown, the exterior noise level standard shall be applied to the property line of the receiving land use.

³ Determined for a typical worst-case hour during periods of use.

⁴ In areas where it is not possible to reduce exterior noise levels to 60 dB L_{dn} or below using a practical application of the best noise-reduction technology, an exterior noise level of up to 65 dB L_{dn} will be allowed.

Source: City of Manteca 2003

Table 3.11-2. City of Manteca Performance Standards for Stationary Noise Sources and Construction Noise^{1,2}

Noise level descriptor	Daytime	Nighttime
	7:00 a.m. to 10:00 p.m.	10:00 p.m. to 7:00 a.m.
Hourly L_{eq} , dB	50	45
Maximum level, dB	70	65

¹ Each of the noise levels specified below should be lowered by five (5) dB for simple noise tones, noises consisting primarily of speed or music, or recurring impulsive noises. Such noises are generally considered by residents to be particularly annoying and are a primary source of noise complaints.

² No standards have been included for interior noise levels. Standard construction practices should, with exterior noise levels identified, result in acceptable interior noise levels.

Source: City of Manteca 2003

The City's Noise Element further stipulates that new development in residential areas with noise levels in excess of 60 dBA, L_{dn} must incorporate mitigation measures to reduce noise levels below 60 dBA, L_{dn} . In addition, when determining impacts under CEQA, the City has identified a substantial noise increase as being a 10 dB or greater increase in the ambient noise level. In addition, an increase in noise levels between 5 and 10 dB may be also be substantial. For increases in noise between 5 and 10 dB, the following factors should be taken into account when determining whether a substantial noise increase would occur:

- the resulting noise levels;
- duration and frequency of the noise;
- the number of people affected;
- the land use designation of the affected receptor sites;
- public reactions or controversy as demonstrated at workshops or hearings, or by correspondence; and
- prior CEQA determinations, specific to the program, by other agencies.

City of Manteca Noise Ordinance

The City's noise ordinance states that noise levels may not exceed the City's maximum permissible sound pressure levels (Table 3.11-3) at the lot line of any establishment or use for all districts, except M-1 and M-2 districts. For M-1 and M-2 districts, this standard applies at the district boundary of 500 hundred feet to the exterior wall of the establishment or use, whichever is less. However, normal household appliances or equipment in use during the hours of 7:00 a.m. to 7:00 p.m. are not subject to this requirement.

Table 3.11-3. City of Manteca Maximum Permissible Sound Pressure Levels

Receiving Land Use Category	Time Period	Maximum Exterior Noise Level (dBA)
Single and limited multiple family	10:00 p.m. - 7:00 a.m.	50
	7:00 a.m. - 10:00 p.m.	60
Multiple family, public institutional and neighborhood commercial	10:00 p.m. - 7:00 a.m.	55
	7:00 a.m. - 10:00 p.m.	60
Medium and heavy commercial	10:00 p.m. - 7:00 a.m.	60
	7:00 a.m. - 10:00 p.m.	65
Light industrial	Anytime	70
Heavy industrial	Anytime	75

Notes: The following corrections are applicable*:

Daytime operation only (7:00 a.m. - 7:00 p.m.) +5 decibels

Noise source operates less than:

20% of any one hour period +5 decibels

5% of any one hour period +10 decibels

1% of any one hour period +15 decibels

Noise of impulsive character (hammering, etc.) -5 decibels

Noise rising or falling in pitch or volume (hum, screech, etc.) -5 decibels

* apply only one of these corrections

Source: City of Manteca Municipal Code

Further, the City's municipal code also establishes limits for groundborne vibration. The ordinance stipulates that no vibration shall be produced which is transmitted through the ground and is discernible without the aid of instruments at the lot line of any establishment or use for all districts, except M-1 and M-2 districts. For M-1 and M-2 districts, this standard applies at the district boundary of 500 hundred feet to the exterior wall of the establishment or use, whichever is less. In addition, vibration may not exceed an acceleration of 0.002 g (acceleration due to gravity) peak for frequencies up to 50 cycles per second, as measured at the distances referenced above using either seismic or electronic vibration measuring equipment. Vibration occurring at higher frequencies than 50 cycles per second frequency of a periodic vibration shall not induce accelerations exceeding 0.001g. Single impulse periodic vibrations occurring at an average interval greater than 5 minutes shall not induce accelerations exceeding 0.01g.

Impact Discussion

- a. Temporary noise impacts could occur from construction of the project. A project of this magnitude would require extensive construction activities on site for several months at a time and future residents may be exposed to excessive noise levels from SR 120 and the UPRR.

Noise Impacts from Construction

Temporary noise impacts could occur from construction of the project. A project of this magnitude would require extensive construction activities on site for several months at a time and nearby residents may be exposed to ongoing construction activities.

The assessment of potential construction noise levels was based on methodology developed by the Federal Transit Administration (FTA) (Federal Transit Administration 2006). Table 3.11-4 summarizes noise levels produced by typical construction equipment expected to be used for this project. Individual types of construction equipment are expected to generate noise levels ranging from 74 to 89 dBA at a distance of 50 feet. The construction noise level at a given receiver depends on the type of construction activity, the noise level generated by that activity, and the distance and shielding between the activity and noise-sensitive receivers.

Table 3.11-4. Construction Equipment Noise Emission Levels

Equipment	Typical Noise Level (dBA) 50 feet from Source
Scraper	89
Backhoe	80
Concrete Truck	85
Paver	89
Roller	74
Rough Terrain Forklift	85
Source: Federal Transit Administration 2006.	

Potential noise levels resulting from construction of the proposed project were evaluated by summing the noise levels of the three loudest pieces of equipment that would likely operate at the same time (scraper, paver, and concrete truck), and multiplying by a usage factor (percent of time equipment is in operation). The combined noise level is 89 dBA, L_{eq} at 50 feet.

Noise from construction activity typically attenuates at a rate of 6 dB per doubling of distance. Assuming a nominal worst-case construction noise level of 89 dBA at 50 feet for several pieces of equipment operating simultaneously,

construction noise can be expected to be as high as the following levels at various distances from the construction activity.

- 89 dBA, L_{eq} at 50 feet
- 83 dBA, L_{eq} at 100 feet
- 77 dBA, L_{eq} at 200 feet
- 71 dBA, L_{eq} at 400 feet
- 65 dBA, L_{eq} at 800 feet
- 59 dBA, L_{eq} at 1600 feet
- 53 dBA, L_{eq} at 3200 feet
- 47 dBA, L_{eq} at 6400 feet

Residential land use is located west and south of the proposed project site, and construction activities are expected to occur within 1,000 feet of noise-sensitive receivers at any given time. As indicated above, residences located within approximately 3,000 feet of an active construction site could be exposed to construction noise in excess of the City's daytime noise standard of 50 dBA (Table 3.11-1).

This impact is considered significant because construction noise levels could exceed the City's performance standards between the hours of 7:00 p.m. and 7:00 a.m. Implementation of the Mitigation Measures NOI-1 through NOI-4 would reduce this impact to a less-than-significant level by limiting noise from construction activity between the hours of 7:00 p.m. and 7:00 a.m. to construction noise limits specified in the City's Noise Element.

Mitigation Measure NOI-1: Employ Noise-Reducing Construction Practices.

The project applicant shall employ noise-reducing construction practices so that construction noise does not exceed 50 dBA L_{eq} between the hours of 7:00 p.m. and 10:00 p.m. Measures that can be used to limit noise include, but are not limited to:

- prohibiting noise-generating construction activities between the hours of 7:00 p.m. and 7:00 a.m.;
- locating equipment as far a practical from noise sensitive uses;
- requiring that all construction equipment powered by gasoline or diesel engines have sound-control devices that are at least as effective as those originally provided by the manufacturer and that all equipment be operated and maintained to minimize noise generation;
- prohibiting gasoline or diesel engines from having unmuffled exhaust;
- selecting haul routes that affect the fewest number of people;
- using noise-reducing enclosures around noise-generating equipment; and

- constructing barriers between noise sources and noise sensitive land uses or taking advantage of existing barrier features (terrain, structures) to block sound transmission.

Mitigation Measure NOI-2: Prepare a Noise Control Plan.

The construction contractor shall prepare a detailed noise control plan based on the construction methods proposed. This plan will identify specific measurements that will be taken to ensure compliance with the noise limits specified above. The noise control plan shall be reviewed and approved by City staff before any noise-generating construction activity begins.

Mitigation Measure NOI-3: Disseminate Essential Information to Residences and Implement a Complaint/Response Tracking Program.

Before construction begins, the construction contractor shall notify residences within 500 feet of the construction areas of the construction schedule in writing. The construction contractor will designate a noise disturbance coordinator who will be responsible for responding to complaints regarding construction noise during the full term of construction. The coordinator will determine the cause of the complaint and will ensure that reasonable measures are implemented to correct the problem. A contact telephone number for the noise disturbance coordinator will be conspicuously posted on construction site fences and will be included in the written notification of the construction schedule sent to nearby residents. The noise disturbance coordinator shall submit to the City of Manteca a weekly summary of any noise complaints that have been received. The summary shall include, but is not limited to, the name of the complainant and their location, the nature of their complaint, and the action being taken to address the complaint.

Mitigation Measure NOI-4: Implement Additional Mitigation Measures, as Needed and/or Required.

Throughout the construction period, the contractor will implement additional noise mitigation measures at the request of the city or county. Additional measures may include changing the location of stationary noise-generating equipment, shutting off idling equipment, rescheduling construction activity, installing acoustic barriers around stationary sources of construction noise, temporarily relocating residents where feasible, using alternative equipment or construction methods that produce less noise, and other site-specific measures as appropriate.

Noise Impacts from Operation

Existing residential receptors would be exposed to noise increases associated with traffic increases from the proposed project, and future residents could potentially be impacted by noise from major arterial roadways and the UPRR adjacent to the proposed residential development.

As stated in the City General Plan, the maximum allowable noise exposure for mobile source noises in residential areas is 60dBA, L_{dn} for outdoor activities, and

45 dBA, L_{dn} for interior spaces. Outdoor activity areas for multi-family developments are considered the common areas where people generally congregate. In areas where it is not possible to reduce exterior noise levels to 60dBA, L_{dn} or below, an exterior noise level of up to 65 dBA, L_{dn} will be allowed. Outdoor activity areas for the proposed Tesoro Apartments would include the tot lot and swimming pool areas (Wade Associates 2003).

According to the Environmental Noise Assessment (j.c. brennan & associates 2007), the pool area would be exposed to future noise levels of 60 dBA, L_{dn} , which complies with the City of Manteca's 60 dBA, L_{dn} exterior noise level standard. For the tot lot, compliance with the City's conditionally acceptable 65 dBA, L_{dn} exterior noise level standard could be achieved through the use of a 13-foot tall sound wall. The sound wall would need to be continuous without significant gaps or openings.

As stated above, the maximum allowable noise exposure for interior spaces is 45 dBA, L_{dn} . Standard construction practices, consistent with the UBC, typically provides an exterior-to-interior noise level reduction of approximately 25 dB, assuming air conditioning is included for each unit. Therefore, as long as exterior noise levels at the building facades will not exceed 70 dBA, L_{dn} , interior noise levels will typically comply with an interior noise level standard of 45 dBA, L_{dn} . The proposed project is predicted to be exposed to traffic noise levels of 72-75 dBA, L_{dn} at the 1st, 2nd, and 3rd floor building facades. Therefore, interior noise reduction measures would be required to achieve compliance with the City of Manteca 45 dBA L_{dn} interior noise level standard. This impact is considered less than significant with implementation of Mitigation Measure NOISE-5.

Mitigation Measure NOI-5: Employ Interior Noise Reduction Measures.

For the first row of residential buildings adjacent to SR 120, all residential windows or glass doors with a direct view of SR 120 shall be fitted with STC 35 rated assemblies. Building facades parallel to SR 120 shall be constructed utilizing resilient channels for attachment of interior gypsum board.

- b. Construction activities associated with the proposed project may result in a minor amount of ground vibration. Vibration from construction activity is typically below the threshold of perception when the activity is more than about 50 feet from the receiver. Standard construction activities, such as grading and site preparation, are not expected to generate significant vibration or groundborne noise. In addition, vibration from these activities will be short-term and will end when construction is completed. Because construction activity would not involve high-impact activities (i.e., pile driving) and would be short-term in nature, this impact is less than significant. No mitigation is required.
- c. See discussion under "a" above.
- d. See discussion under "a" above.

- e. The proposed project is not located within an airport land use plan or within 2 miles of a public use airport. Therefore, the project would not have the potential to expose people to excessive noise levels from aircraft. No impacts would occur.
- f. The proposed project is not located within the vicinity of the private airstrip. Therefore, the project would not have the potential to expose people to excessive noise levels. No impacts would occur.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than- Significant Impact	No Impact
XII. POPULATION AND HOUSING.	Would the project:				
a.	Induce substantial population growth in an area, either directly (e.g., by proposing new homes and businesses) or indirectly (e.g., through extension of roads or other infrastructure)?	☐	☐	☒	☐
b.	Displace a substantial number of existing housing units, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c.	Displace a substantial number of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

Impact Discussion

a. The proposed project would represent an increase of 300 multi-family homes in the area. This would represent the addition of approximately 921 people to Manteca, using the average household size of 3.07 people cited in the City General Plan (City of Manteca 2003a) multiplied by 300 residential units. The General Plan designates the project area as High Density Residential, and the project implements planned growth as detailed in the General Plan. Surrounding areas are already developed. Therefore, the proposed project will not induce population growth beyond that specified in the General Plan. Because the project would be consistent with the City's growth plans, this impact is considered less than significant on a project level.

b., c. No housing exists on the proposed project site. Consequently, there would be no impact.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than- Significant Impact	No Impact
XIII. PUBLIC SERVICES. Would the project:				
a. Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities or a need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the following public services:				
Fire protection?	☐	☐	☒	☐
Police protection?	☐	☐	☒	☐
Schools?	☐	☒	☐	☐
Parks?	☐	☐	☒	☐
Other public facilities?	☐	☐	☒	☐

Setting

At the time of preparation of the environmental document for the Tesoro Subdivision, including the subject project site, prior to development of the lands surrounding the project site, adequate public services were found to be available. There is no substantial evidence that this has changed.

Impact Discussion

- a1. The MFD serves Manteca, including the project area (City of Manteca 2005a). The Insurance Services Office has rated Manteca as a Class 3 on a scale of 9. Manteca shares the second-best rating in the county and is rated in the top 15% of fire departments in San Joaquin County.

The MFD responds to emergencies and calls for service from three fire stations located within the city limits. It is also the responsibility of the MFD to provide emergency medical services to customers. To maintain a standard level of care, all fire personnel are trained and certified Emergency Medical Technician-1 (EMT) and EMT-D.

MFD goals are to maintain a 5-minute response time for all emergencies and to keep all engine and ladder companies staffed with a minimum of three personnel (City of Manteca 2003a). A fire station is planned in the immediate area. This impact is less than significant.

- a2. The Manteca Police Department (MPD) serves Manteca, including the project area, with more than 70 sworn officers, 30 civilian staff members, and volunteer workers (City of Manteca 2005b). The MPD provides crime prevention for the residents of Manteca through community policing, neighborhood watch, proactive enforcement, and citizen involvement.

There are no known issues with officers responding in a timely manner to calls south of SR 120 and the proposed project area (Halford pers. comm.).

- a3. Within the urban area of Manteca, the Manteca Unified School District (MUSD) contains three high schools, 20 elementary schools, one adult education school, and two continuation high schools. An elementary school is planned for the immediate area.

According to the City General Plan EIR, the MUSD will select the location of additional new schools based on the location of new residential developments in the area. Implementation of the following mitigation measure will ensure that this impact is less than significant.

Mitigation Measure PUB-1: Require Payment of School Development Fees.

The project proponent shall pay the required school development fees.

- a4., a5. The City's Parks and Recreation Department operates and maintains 275 acres of neighborhood and community parks, along with the Tidewater Bike Way, skate park, and senior center. It also oversees the operations of the 18-hole municipal golf course and library services for the City. The closest park facility to the proposed project area will be that planned for the Tesoro Subdivision. Woodward Community Park is also located in the vicinity.

To offset the demands placed on existing recreational and other public facilities in the City, the proposed project includes a 6,551 square-foot clubhouse for use by residents, and a pool. In addition, according to Chapter 3.20, "Park Acquisition and Improvements Fees," of the City's Municipal Code, all new developers will pay the City a park acquisition and improvement fee to finance systemwide improvements. As a result, these impacts are considered less than significant.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than- Significant Impact	No Impact
XIV. RECREATION.	Would the project:				
a.	Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☒	☐
b.	Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☒	☐

Impact Discussion

- a., b. To offset the demands placed on existing recreational and other public facilities in the City, the proposed project includes a 6,551 square-foot clubhouse for use by residents, and a pool. In addition, according to Chapter 3.20, "Park Acquisition and Improvements Fees," of the City's Municipal Code, all new developers will pay the City a park acquisition and improvement fee to finance systemwide improvements. As a result, these impacts are considered less than significant.

The construction of the project recreational facilities will be done as a part of construction of the entire project and will not result in additional impacts.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than- Significant Impact	No Impact
XV. TRANSPORTATION/TRAFFIC.	Would the project:				
a.	Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections)?	☐	☒	☐	☐
b.	Cause, either individually or cumulatively, exceedance of a level-of-service standard established by the county congestion management agency for designated roads or highways?	☐	☒	☐	☐
c.	Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d.	Substantially increase hazards because of a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☒	☐
e.	Result in inadequate emergency access?	☐	☐	☒	☐
f.	Result in inadequate parking capacity?	☐	☐	☒	☐
g.	Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☒	☐	☐

A Traffic Impact Study was prepared for this project and is attached to this document as Appendix B. The following summarizes the findings of the Traffic Impact Study.

The purpose of this analysis is to identify potential transportation impacts caused by the proposed project and to determine measures to mitigate project-generated significant impacts.

Existing Conditions Summary

The LOS analyses performed under Existing and Existing Plus Project Conditions indicated that all study intersections and freeway ramp junctions

operate at acceptable levels with and without the proposed Tesoro Apartments project.

Cumulative Conditions Summary

The LOS analysis performed under Cumulative Conditions identified potential impacts at the following locations.

Intersections

- Main Street / Westbound SR 120 Ramps
- Main Street / Eastbound SR 120 Ramps
- Main Street / Woodward Avenue
- Atherton Drive / Van Ryn Avenue

Roadway Segments

- Main Street between SR 120 and Woodward Avenue

Freeway Mainline Segments

- Northbound SR 99 south of Austin Road in the AM peak hour
- Northbound SR 99 between Austin Road and SR 120 in the AM peak hour
- Southbound SR 99 between SR 120 and Austin Road in the PM peak hour
- Southbound SR 99 south of Austin Road in the PM peak hour

All of the freeway segments identified above experience unacceptable operating conditions under Cumulative Plus Project conditions. However, because a relatively small number of project trips are expected to access the impacted freeway mainline segments (the majority of project trips access the freeway at Main Street and head to or from the west), none of the segments had a measurable increase in density during the AM or PM peak hours. Because the freeway mainline segment was the same under cumulative conditions with and without the project, the project's impact to the facilities listed above is less-than-significant.

Freeway Ramp Junctions

The LOS calculations indicate that all ramp junctions currently operate at an acceptable LOS D or better during both AM and PM peak hours, except for the following locations:

- Northbound SR 99 off-ramp to Austin Road during the AM peak hour
- Northbound SR 99 off-ramp to SR 120 during the AM peak hour
- Southbound SR 99 off-ramp to Moffat Boulevard during the PM peak hour
- Southbound SR 99 on-ramp from Moffat Boulevard during the PM peak hour

All of the ramps identified above experience unacceptable operating conditions under Cumulative Plus Project conditions. However, there is not a significant project impact on all ramp junctions because some of the ramps are not expected to have a measurable change in density related to the additional project trips during the AM or PM peak hours.

Project impacts were also identified on the pedestrian, bicycle, and transit systems. The impacts to the pedestrian and bicycle systems were mitigated to a less-than-significant level by providing fair-share funding toward pedestrian and bicycle improvements along the project frontage.

Impact Discussion

Impact TRN-1: Project trips Exacerbate a Transportation System Deficiency under Cumulative Conditions at the Main Street/Westbound SR 120 Off-Ramp Intersection. (Less than Significant with Mitigation Incorporated)

Mitigation Measure TRN-1: The City of Manteca and Caltrans are currently preparing a Project Study Report (PSR) for future interchange improvements at Main Street/SR 120. As part of the improvements, the ramp terminal intersections would be designed to provide acceptable LOS D or better operations under 2020 conditions. The future design of the ramp terminal intersections is not yet finalized, but based on the PSR for the Union Road/SR 120 interchange (which is very similar), the design would either be a spread diamond design with dual left-turn lanes, and dedicated right-turn lanes, or a partial cloverleaf design with a northbound to westbound loop on-ramp.

As mentioned above, this improvement is considered a Tier 1 funded improvement in the SJCOG RTP; however, it is dependent on the adoption of the PFIP by the City Council. Since the PFIP has not yet been adopted, the project can mitigate its impact as follows:

- Pay the current PFIP fee in place at time of building permit approval;

- If the PFIP fee in place at time of building permit approval is known by the City to not fully fund the cost of the interchange improvements, then the project applicant shall also pay his fair-share of the unfunded portion of the interchange improvements.

By completing the mitigations described above, the project will be contributing its fair share toward mitigating the project's cumulative impact at this location. Therefore this impact is considered **less than significant with mitigation**.

Impact TRN-2: Project trips Exacerbate a Transportation System Deficiency under Cumulative Conditions at the Main Street/Eastbound SR 120 Off-ramp Intersection (Less than Significant with Mitigation Incorporated)

Mitigation Measure TRN-2: The City of Manteca and Caltrans are currently preparing a Project Study Report (PSR) for future interchange improvements at Main Street/SR 120. As part of the improvements, the ramp terminal intersections would be designed to provide acceptable LOS D or better operations under 2020 conditions. The future design of the ramp terminal intersections is not yet finalized, but based on the PSR for the Union Road/SR 120 interchange (which is very similar), the design would likely include dual left-turn lanes and dedicated right-turn lanes.

As mentioned above, this improvement is considered a Tier 1 funded improvement in the SJCOG RTP; however, it is dependent on the adoption of the PFIP by the City Council. Since the PFIP has not yet been adopted, the project can mitigate its impact as follows:

- Pay the current PFIP fee in place at time of building permit approval;
- If the PFIP fee in place at time of building permit approval is known by the City to not fully fund the cost of the interchange improvements, then the project applicant shall also pay his fair-share of the unfunded portion of the interchange improvements.

By completing the mitigations described above, the project will be contributing its fair share toward mitigating the project's cumulative impact at this location. Therefore this impact is considered **less than significant with mitigation**.

Impact TRN-3: Project trips Exacerbate a Transportation System Deficiency under Cumulative Conditions at the Main Street/Woodward Avenue Intersection (Less than Significant with Mitigation Incorporated)

Mitigation Measure TRN-3: The updated PFIP includes improvements at this intersection that would provide acceptable operations under 2020 conditions. The proposed improvements are as follows:

- Traffic signal.
- Two through lanes and dual left-turn lanes on northbound and westbound approaches.
- Two through lanes with a single left- and right-turn lane on the eastbound approach.
- Two through lanes, dual left-turn lanes, and a right-turn lane the southbound approach.

Since the PFIP has not yet been adopted, the project can mitigate its impact as follows:

- Pay the current PFIP fee in place at time of building permit approval;
- If the PFIP fee in place at time of building permit approval is known by the City to not fully fund the cost of the intersection improvements listed above, then the project applicant shall also pay his fair-share of the unfunded portion of the improvements.

By completing the mitigations described above, the project will be contributing its fair share toward mitigating the project's cumulative impact at this location. Therefore this impact is considered **less than significant with mitigation**.

Impact TRN-4: Project trips Degrade Intersection Operations to an Unacceptable Level under Cumulative Conditions at the Van Ryn Avenue/Atherton Drive Intersection. (Less than Significant with Mitigation Incorporated)

Mitigation Measure TRN-4: The updated PFIP includes signalization at this intersection, which would provide acceptable operations. Since the PFIP has not yet been adopted, the project can mitigate its impact as follows:

- Pay the current PFIP fee in place at time of building permit approval;
- If the PFIP fee in place at time of building permit approval is known by the City to not fully fund the cost of the intersection improvements listed above, then the project applicant shall also pay his fair-share of the unfunded portion of the improvements.

By completing the mitigations described above, the project will be contributing its fair share toward mitigating the project's cumulative impact at this location. Therefore this impact is considered **less than significant with mitigation**.

Impact TRN-5: Project trips exacerbate a transportation system deficiency under Cumulative conditions on Main Street between SR 120 and Woodward Avenue. (Less than Significant with Mitigation Incorporated)

Mitigation Measure TRN-5: The PFIP includes a project to widen the segment of Main Street between SR 120 and Woodward Avenue to six lanes. Since the PFIP has not yet been adopted, the project can mitigate its impact as follows:

- Pay the current PFIP fee in place at time of building permit approval;
- If the PFIP fee in place at time of building permit approval is known by the City to not fully fund the cost of the improvement listed above, then the project applicant shall also pay his fair-share of the unfunded portion of the improvements.

By completing the mitigations described above, the project will be contributing its fair share toward mitigating the project's cumulative impact at this location. Therefore this impact is considered **less than significant with mitigation**

Impact TRN-6: Generation of Bicycle and Pedestrian Trips Not Served by Any Infrastructure along Atherton Drive (Less than Significant with Mitigation Incorporated)

Mitigation Measure TRN-6: The project applicant shall pay the fair share cost of extending the Class 1 bicycle path along the north side of Atherton Drive along the project frontage. In addition the project shall pay a fair share toward the installation of a sidewalk along the south side of Atherton Drive and the east side of Van Ryn Avenue along the project frontage. By paying a fair share toward the construction of bicycle and pedestrian facilities near the project site, this impact would be **less than significant with mitigation**.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than- Significant Impact	No Impact
XVI. UTILITIES AND SERVICE SYSTEMS.	Would the project:				
a.	Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☒	☐
b.	Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☒	☐
c.	Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☒	☐
d.	Have sufficient water supplies available to serve the project from existing entitlements and resources, or would new or expanded entitlements be needed?	☐	☐	☒	☐
e.	Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☒	☐
f.	Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
g.	Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☒	☐

Setting

At the time of preparation of the environmental document for the Tesoro Subdivision, including the subject project site, prior to development of the lands surrounding the project site, adequate public utilities services were found to be available. There is no substantial evidence that this has changed.

Impact Discussion

- a., b. The City's Wastewater Quality Control Facility (WQCF) is a 6.95-million gallons per day (mgd) rated, combined biofilter-activated sludge plant. Secondary effluent is land-applied during spring and summer (flood irrigation for alfalfa) and discharged into the San Joaquin River during fall and winter. Improvements to increase the capacity of the treatment facility to 10 mgd are slated for completion by December 2005. Ultimately, the City has plans to expand the WQCF to the capacity of 25 mgd. Future expansions will also bring higher treatment standards that will produce treated wastewater suitable for landscape irrigation. This impact would be less than significant.

The proposed project calls for sewage disposal to be connected to the City sewer system.

- c. The City operates and maintains the storm drainage system, which serves the existing community. The system consists of approximately 170 miles of pipeline, 36 pump stations, and 35 detention basins. The SSJID operates drainage facilities that pass through Manteca and carry a portion of the City's drainage. Water from the SSJID, along with drainage pumped by the City, flows west into French Camp Canal, which eventually flows into French Camp Slough. Storm drainage is gravity-discharged from the project area north to French Camp Canal. As noted above, the applicant will be required to design and construct onsite drainage facilities to City standards, and connect to the City storm drain system. According to the previous IS, the City storm drain system contains adequate capacity to serve the project site. This impact would be less than significant.
- d. The City provides water service for the existing community. Approximately 15,000 connection customers are served, with an average daily usage of 11 million gallons.

The City of Manteca, along with the Cities of Escalon, Tracy, and Lathrop, are participating in the South County Surface Water Supply Project (SCSWSP). This project was developed to address future water needs through construction of a water treatment plant, transmission mains, surface storage reservoirs, and booster pump stations (Jones & Stokes 2005). The surface water and groundwater will be utilized in a conjunctive use program in which the surface water becomes the primary source of domestic water for the City. Groundwater will then be allowed to naturally recharge and replenish the groundwater basin. Wells will be operated only for ongoing maintenance and to augment the surface water supply during peak demand periods, though some new supplemental wells will be needed in developing areas (Kennedy/Jenks Consultants 2004). Manteca began receiving deliveries of water from SCSWSP in August 2005 (Jones & Stokes 2005). Further discussion of water supply is found in the "Hydrology and Water Quality" section above.

To provide service to the growth planned for in the City General Plan, including the proposed project area, the existing City water distribution system will be required to be extended. The proposed development will be connected to the Manteca water system. This impact would be less than significant.

- e. The City will provide waste water service to the project site through existing lines within Atherton Drive. The City has recently transferred capacity from projects throughout the City where uses have changed requiring less capacity, otherwise referred to as “Housing Relief”, will be allocated to the project and is sufficient to serve the 300 proposed apartment units.
- f. Solid waste is collected throughout the city by the City’s Solid Waste Division and dumped at the Lovelace Solid Waste Transfer Station. Recyclable materials are sorted there, and green waste is delivered to the Austin Road/Forward Landfill. This landfill has a closure date of 2053 and has a remaining capacity of 1,608,752 cubic yards, which is adequate to serve the solid waste removal need of the project area (City of Manteca 2003b). This impact is less than significant.
- g. The proposed project calls for the building of residential units only; therefore, solid waste generated by the project will be limited to construction waste and household wastes. This waste is collected by the City and deposited at the Lovelace Solid Waste Transfer Station. Recyclable materials are sorted there, and green waste is delivered to the Austin Road/Forward Landfill. Residential uses should not produce hazardous materials; therefore, the project will comply with all federal, state, and local statutes and regulations related to solid waste. This impact is less than significant.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than- Significant Impact	No Impact
XVII. MANDATORY FINDINGS OF SIGNIFICANCE.					
a.	Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b.	Does the project have impacts that are individually limited but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☐	☒	☐	☐
c.	Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☒	☐	☐

Impact Discussion

- a. The proposed project has a low potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory.
- b. The proposed project will not have potentially significant impacts in these areas that cannot be reduced to a less-than-significant level through mitigation measures identified in this document. Cumulative impacts are considered less than significant.
- c. As described throughout the preceding checklist sections, the proposed project would not result in any environmental impacts that would cause substantial adverse effects to human beings, either directly or indirectly.

Chapter 4

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Chapter 5

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John Duman, Graphic Artist	Preparation of Graphics and Figures	Website Design Musical Composition Biochemistry	6 years
William O'Daly, Technical Editor	Technical Editing, Word Processing	M.F.A., Creative Writing, Poetry and Translation B.A. English	30 years
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Appendix A

Environmental Initial Study (September 2004)

APPENDIX A. AIR QUALITY TECHNICAL INFORMATION

Carbon Monoxide Modeling

Dispersion Modeling

Predicting the ambient air quality impacts of pollutant emissions requires an assessment of the transport, dispersion, chemical transformation, and removal processes that affect pollutant emissions after their release from a source. Gaussian dispersion models are frequently used for such analyses. The term "Gaussian dispersion" refers to a general type of mathematical equation used to describe the horizontal and vertical distribution of pollutants downwind from an emission source.

Gaussian dispersion models treat pollutant emissions as being carried downwind in a defined plume, subject to horizontal and vertical mixing with the surrounding atmosphere. The plume spreads horizontally and vertically with a reduction in pollutant concentrations as it travels downwind. Mixing with the surrounding atmosphere is greatest at the edge of the plume, resulting in lower pollutant concentrations outward (horizontally and vertically) from the center of the plume. This decrease in concentration outward from the center of the plume is treated as following a Gaussian ("normal") statistical distribution. Horizontal and vertical mixing generally occur at different rates. Because turbulent motions in the atmosphere occur on a variety of spatial and time scales, vertical and horizontal mixing also vary with distance downwind from the emission source.

The CALINE4 Model

The ambient air quality effects of traffic emissions were evaluated using the CALINE4 dispersion model (Benson 1989). CALINE4 is a Gaussian dispersion model specifically designed to evaluate air quality impacts of roadway projects. Each roadway link analyzed in the model is treated as a sequence of short segments. Each segment of a roadway link is treated as a separate emission source producing a plume of pollutants which disperses downwind. Pollutant concentrations at any specific location are calculated using the total contribution from overlapping pollution plumes originating from the sequence of roadway segments.

When winds are essentially parallel to a roadway link, pollution plumes from all roadway segments overlap. This produces high concentrations near the roadway (near the center of the overlapping pollution plumes), and low concentrations well away from the roadway (at the edges of the overlapping pollution plumes). When winds are at an angle to the roadway link, pollution plumes from distant roadway segments make essentially no contribution to the pollution concentration observed at a receptor location. Under such cross-wind situations, pollutant concentrations near the highway are lower than under parallel wind conditions (fewer overlapping plume contributions), while pollutant concentrations away from the highway may be greater than would occur with parallel winds (near the center of at least some pollution plumes).

The CALINE4 model employs a "mixing cell" approach to estimating pollutant

concentrations over the roadway itself. The size of the mixing cell over each roadway segment is based on the width of the traffic lanes of the highway (generally 12 feet per lane) plus an additional turbulence zone on either side (generally 10 feet on each side). Parking lanes and roadway shoulders are not counted as traffic lanes. The height of the mixing cell is calculated by the model.

Pollutants emitted along a highway link are treated as being well mixed within the mixing cell volume due to mechanical turbulence from moving vehicles and convective mixing due to the temperature of vehicle exhaust gases. Pollutant concentrations downwind from the mixing cell are calculated using horizontal and vertical dispersion rates which are a function of various meteorological and ground surface conditions.

Modeling Procedures

Roadway and Traffic Conditions. Traffic volumes and operating conditions used in the modeling were obtained from the traffic analysis prepared for this project by Fehr & Peers (2007). CO emissions were modeled for existing year (2008) with and without project conditions, and future year (2020) with and without project conditions. Free flow traffic speeds were assumed at a speed of 1.0 miles per hour (mph) for vehicles entering intersection segments, and 10 mph for vehicles exiting intersection segments to represent a worst-case scenario. CO modeling was conducted at the following intersections, as they represent intersections with the worst LOS and delay and highest traffic volumes of any intersections analyzed in the project area:

- Main Street/SR 120 EB Ramp
- Main Street/Woodward Ave
- SR 99 SB Ramp/Yosemite Ave
- SR 99 NB Ramp/Yosemite Ave

Vehicle Emission Rates. Vehicle emission rates were determined using the California Air Resources Board's EMFAC2007 (version 2.3) emission rate program. EMFAC2007 modeling procedures followed the guidelines recommended by Caltrans (California Department of Transportation 2003). The program assumed San Joaquin County regional traffic data operating during the winter months. A mean January temperature of 37 degrees Fahrenheit and humidity of 30% were assumed.

Receptor Locations. CO concentrations were estimated at 4 receptor locations located at each of the intersections analyzed, for a total of 28 receptors. The receptors were placed approximately 35.4 feet from the center of each intersection diagonal, 25 feet from the roadway centerline, and 3 feet from the boundary of the mixing zone to represent a worst-case scenario. Receptor heights were set at 5.9 feet.

Meteorological Conditions. Meteorological inputs to the CALINE4 model were determined using methodology recommended in Air Quality Technical Analysis Notes (California Department of Transportation 1988). The meteorological conditions used in the

modeling represent a calm winter period. Worst-case wind angles were modeled to determine a worst-case concentration for each receptor. The meteorological inputs include: 0.5 meters per second wind speed, ground-level temperature inversion (atmospheric stability class G), wind direction standard deviation equal to five degrees, ambient temperature of 2.8 degrees centigrade, altitude above sea level of approximately 125 feet, and a mixing height of 1,000 meters.

Background Concentrations and Eight-Hour Values. To account for sources of CO not included in the modeling, a background concentration of 4.1 ppm was added to the modeled cumulative 1-hour values, while a background concentration of 2.473 ppm was added to the modeled cumulative 8-hour values. Background concentration data for 1- and 8-hour values were obtained from the EPA's Air Data webpage (U.S. Environmental Protection Agency 2007). Maximum 1- and 8-hour values for the years 2005-2007 were averaged to obtain a background concentration. Eight-hour modeled values were calculated from the 1-hour values using a persistence factor of 0.6. Background concentrations for future 2008 and 2020 years were assumed to be the same as those for the current year. Actual 1- and 8-hour background concentrations in future years would likely be lower than those used in the CO modeling analysis because the trend in CO emissions and concentrations is decreasing because of continuing improvements in engine technology and the retirement of older, higher-emitting vehicles.

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Appendix B

Traffic Impact Study



FEHR & PEERS
TRANSPORTATION CONSULTANTS



DRAFT
TESORO APARTMENTS
TRANSPORTATION IMPACT STUDY

June 2008

*Prepared for:
City of Manteca*



RS07-2452

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EXECUTIVE SUMMARY

This study presents the results of the transportation impact analysis prepared for the proposed Tesoro Apartments Project, which includes construction of 300 multi-family apartment homes in Manteca, California. The project site is approximately 15 acres and is located on the northeast corner of the Atherton Drive/Van Ryn Avenue intersection. The purpose of this analysis is to identify potential transportation impacts caused by the proposed project and to determine measures to mitigate project-generated significant impacts.

Existing Conditions Summary

The level of service (LOS) analysis performed under existing conditions indicates that all study intersections, roadway segments, freeway mainline segments, and freeway ramp junctions operate at acceptable an LOS with and without the proposed Tesoro Apartments project.

Cumulative Conditions Summary

Under cumulative conditions, the LOS analysis identified impacts at the locations described below; no impacts were identified on the freeway mainline or at freeway ramp junctions.

Intersections

- Main Street / Westbound SR 120 Ramps
- Main Street / Eastbound SR 120 Ramps
- Main Street / Woodward Avenue
- Atherton Drive / Van Ryn Avenue

Roadway Segments

- Main Street between SR 120 and Woodward Avenue

Since trips generated by the proposed project would either exacerbate unacceptable operations or degrade operations to an unacceptable level, the impacts identified above are considered to be significant.

The impacts described above can be mitigated through the improvements proposed in the Manteca Public Facilities Implementation Plan (PFIP), which is currently being updated. However, since the PFIP has not yet been adopted by the City Council, the following mitigation measure is proposed for each impact:

- Pay the current PFIP fee in place at time of building permit approval;
- If the PFIP fee in place at time of building permit approval is known by the City to not fully fund the cost of the necessary improvement, then the project applicant shall also pay his fair-share of the unfunded portion of the improvement cost.

Through paying the fees above, the project will be contributing its fair share toward mitigating cumulative impacts. Therefore all impacts traffic impacts identified in this report are considered **less than significant with mitigation**.

Project impacts were also identified on the pedestrian and bicycle system. The impacts to the pedestrian system can be mitigated to a less-than-significant level by providing fair share funding toward the construction of a

sidewalk along the south side of Atherton Drive and the east side of Van Ryn Avenue in front of the project site. The impacts to the bicycle system can be mitigated to a less-than-significant level by providing fair share funding toward the construction of a Class I bike path along Atherton Drive in front of the project site.

1. INTRODUCTION

BACKGROUND AND PURPOSE

This study presents the results of the transportation impact analysis prepared for the Tesoro Apartments Project, which proposes to construct 300 multi-family apartment homes in Manteca, California. The project site is approximately 15 acres and is located on the northeast corner of the Atherton Drive/Van Ryn Avenue intersection. The purpose of this analysis is to identify potential transportation impacts caused by the proposed project and to determine measures to mitigate project-generated significant impacts. Figure 1 presents the location of the project site and study intersections, and Figure 2 presents the tentative project site plan.

STUDY AREA

Study Intersections

After a preliminary investigation of the existing traffic circulation patterns and a review of the City of Manteca Transportation Impact Analysis Guidelines, the following study intersections, roadway segments, and freeway facilities were identified.

Study Area Intersections

1. Main Street / SR 120 Westbound Ramps	8. Van Ryn Avenue / Atherton Drive
2. Main Street / SR 120 Eastbound Ramps	9. Project Driveway #1 / Atherton Drive (future intersection)
3. Main Street / Atherton Drive (future intersection)	10. Project Driveway #2 / Atherton Drive (future intersection)
4. Main Street / Woodward Avenue	
5. Spreckels Avenue / Yosemite Avenue	
6. Spreckels Avenue / Moffat Boulevard	
7. Project Driveway #3 / Van Ryn Avenue	

Study Area Roadway Segments

1. Main Street north of SR 120
2. Main Street between SR 120 and Woodward Avenue
3. Woodward Avenue west of Main Street
4. Main Street south of Woodward Avenue
5. Woodward Avenue between Main Street and Van Ryn Avenue
6. Woodward Avenue between Van Ryn Avenue and Atherton Drive
7. Yosemite Avenue west of Spreckels Avenue
8. Yosemite Avenue between Spreckels Avenue and SR 99
9. Spreckels Avenue between Yosemite Avenue and Moffat Boulevard
10. Van Ryn Avenue between Industrial Park Drive and Atherton Drive
11. Van Ryn Avenue between Atherton Drive and Woodward Avenue

Study Area Freeway Mainline Segments

1. Eastbound SR 120 between Union Road and Main Street
2. Westbound SR 120 between Main Street and Union Road
3. Eastbound SR 120 between Main Street and SR 99
4. Westbound SR 120 between SR 99 and Main Street

Study Area Freeway Ramps

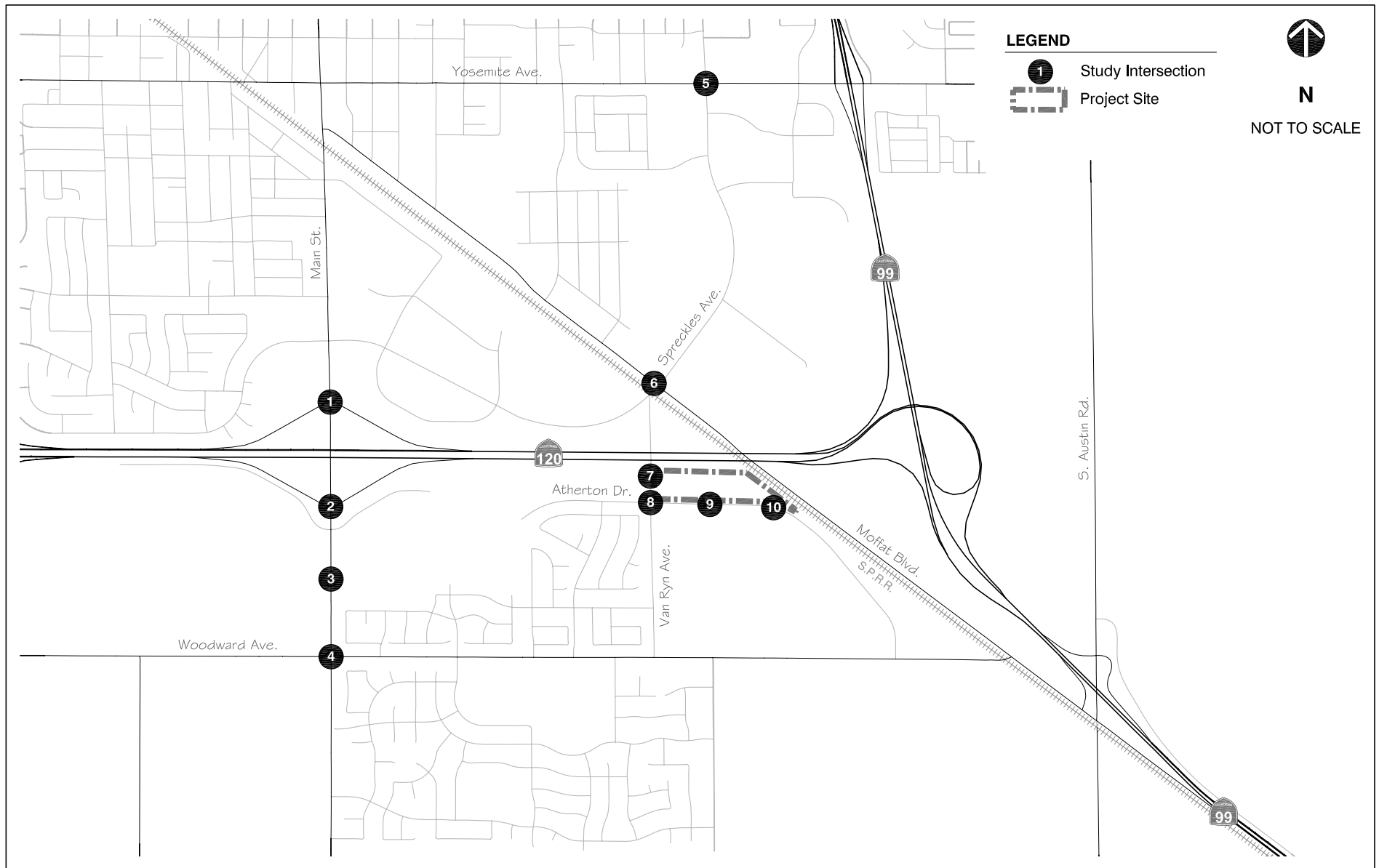
1. Westbound SR 120 off-ramp to Main Street
2. Westbound SR 120 on-ramp from Main Street
3. Eastbound SR 120 off-ramp to Main Street
4. Eastbound SR 120 on-ramp from Main Street

ANALYSIS SCENARIOS

Existing and future conditions were evaluated with level of service (LOS) calculations at the intersections, freeway facilities, and roadway segments listed above. Project impacts were determined according to guidelines provided by the City of Manteca (City) and Caltrans.

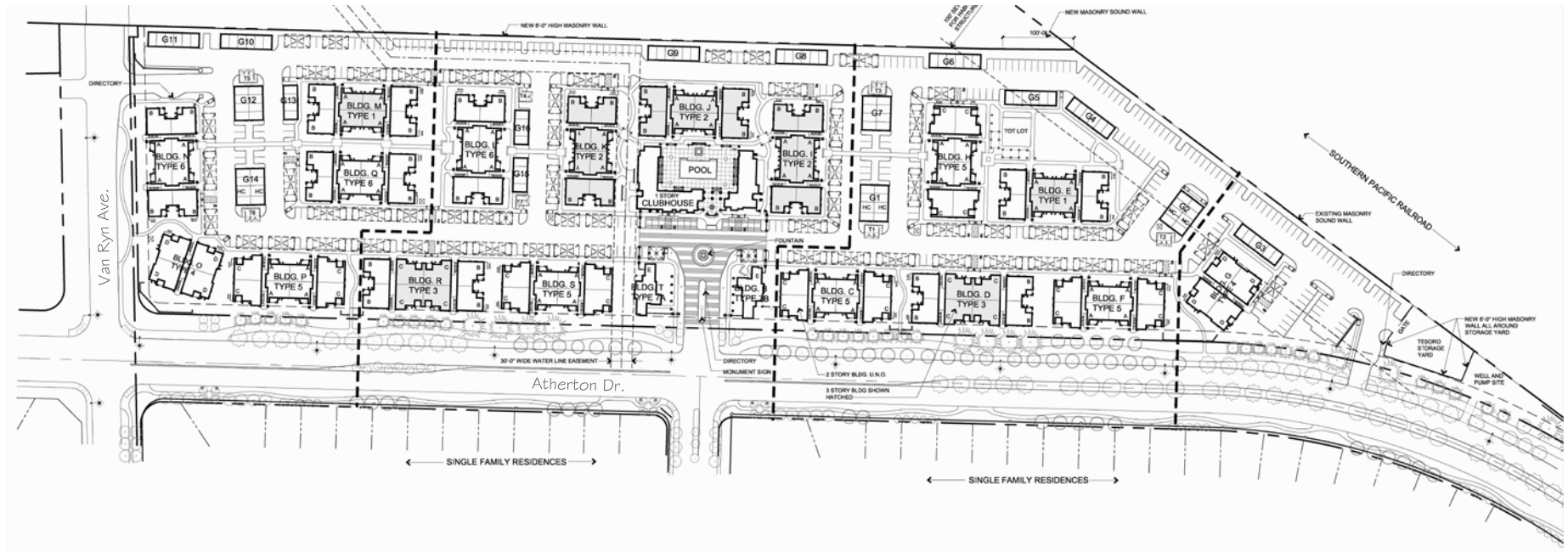
The operations of the study intersections and freeway facilities were evaluated during weekday morning (AM) peak hour and evening (PM) peak hour conditions. The operations of the arterial roadway segments were evaluated using Average Daily Traffic (ADT) volumes. Each intersection, roadway segment, freeway mainline segment, on-ramp, and off-ramp was evaluated under the following four scenarios:

- **Scenario 1 – Existing Conditions:** Existing volumes obtained from traffic counts.
- **Scenario 2 – Existing Plus Project Conditions:** Existing volumes plus traffic generated by the proposed Tesoro Apartments Project.
- **Scenario 3 – Cumulative No-Project Conditions:** Volumes obtained from the City's General Plan Transportation Analysis (GPTA) model for the future horizon year (2020).
- **Scenario 4 – Cumulative Plus Project Conditions:** Tesoro Apartments Project-generated traffic added to Scenario 3 traffic volumes.





N
NOT TO SCALE



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May 16, 2008 MJC
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PROJECT SITE PLAN

FIGURE 2

2. ENVIRONMENTAL SETTING

REGIONAL TRANSPORTATION NETWORK

This section describes the existing conditions of the local roadway facilities, regional freeway system, pedestrian and bicycle facilities, and transit service.

Roadway System

Figure 1 presents the project site and the surrounding local and regional roadway network. Interstate 5 (I-5), State Route 99 (SR 99), and State Route 120 (SR 120) provide regional access. The Main Street interchange with SR 120 provides the primary access from the project site to the regional freeway network. Atherton Drive, Van Ryn Avenue, and other local roads provide local access. Following are descriptions of these roadways.

SR 120 is an east-west, four-lane freeway that primarily serves as a connection between I-5 and SR 99. SR 120 has interchanges at Airport Way, Union Road, and Main Street near the project site. SR 120 has an existing average daily traffic (ADT) volume of 75,000 vehicles near the Main Street interchange.

Van Ryn Avenue is a north-south two-lane road with a two-way left turn lane near the project site. Van Ryn extends north from Woodward Avenue and ends at Industrial Park Drive. Van Ryn Avenue provides access to downtown Manteca via Moffat Boulevard and connects to Yosemite Avenue to the north via Spreckels Avenue.

Atherton Drive is an east-west, four-lane local street that runs along the southern edge of the project site. Atherton Drive currently ends just east of Van Ryn Avenue; however, the City's General Plan ultimately shows Atherton Drive extended to McKinley Avenue on the west side of the City. A recently completed easterly extension of Atherton Drive extends from Van Ryn Avenue to Woodward Avenue.

Woodward Avenue is an east-west, two- to four-lane roadway that extends along the southern edge of Manteca. It extends from Oakwood Lake in the west to Moffat Boulevard in the east. Near the project site, the roadway is four lanes from Main Street to Bridewell Avenue. Woodward Avenue is three lanes (two westbound and one eastbound) between Bridewell Avenue and Atherton Drive. East of Atherton Drive, Woodward Avenue is a two-lane rural road with an at-grade railroad crossing immediately west of Moffat Boulevard.

Yosemite Avenue is an east-west, two- to four-lane roadway that provides access to downtown Manteca and the commercial areas near the SR 99 interchange. It extends from SR 120 in the west, to SR 99 in the east, where it becomes concurrent with SR 120, which extends eastward toward Yosemite National Park.

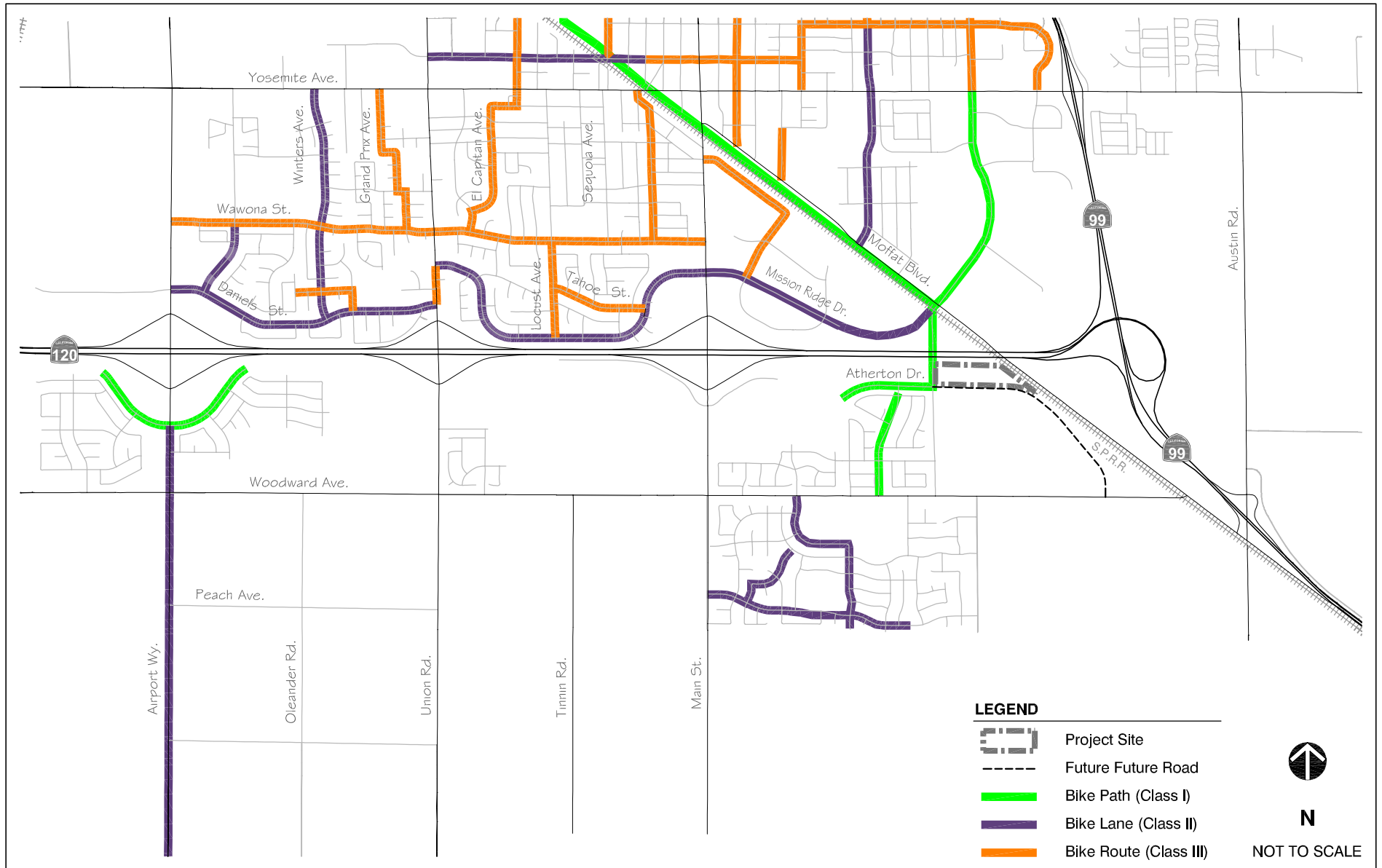
Main Street is a north-south, two- to four-lane local street located west of the project site. Main Street provides access to SR 120 and downtown Manteca. Main Street is four lanes north of the westbound SR 120 ramp intersection and two lanes to the south.

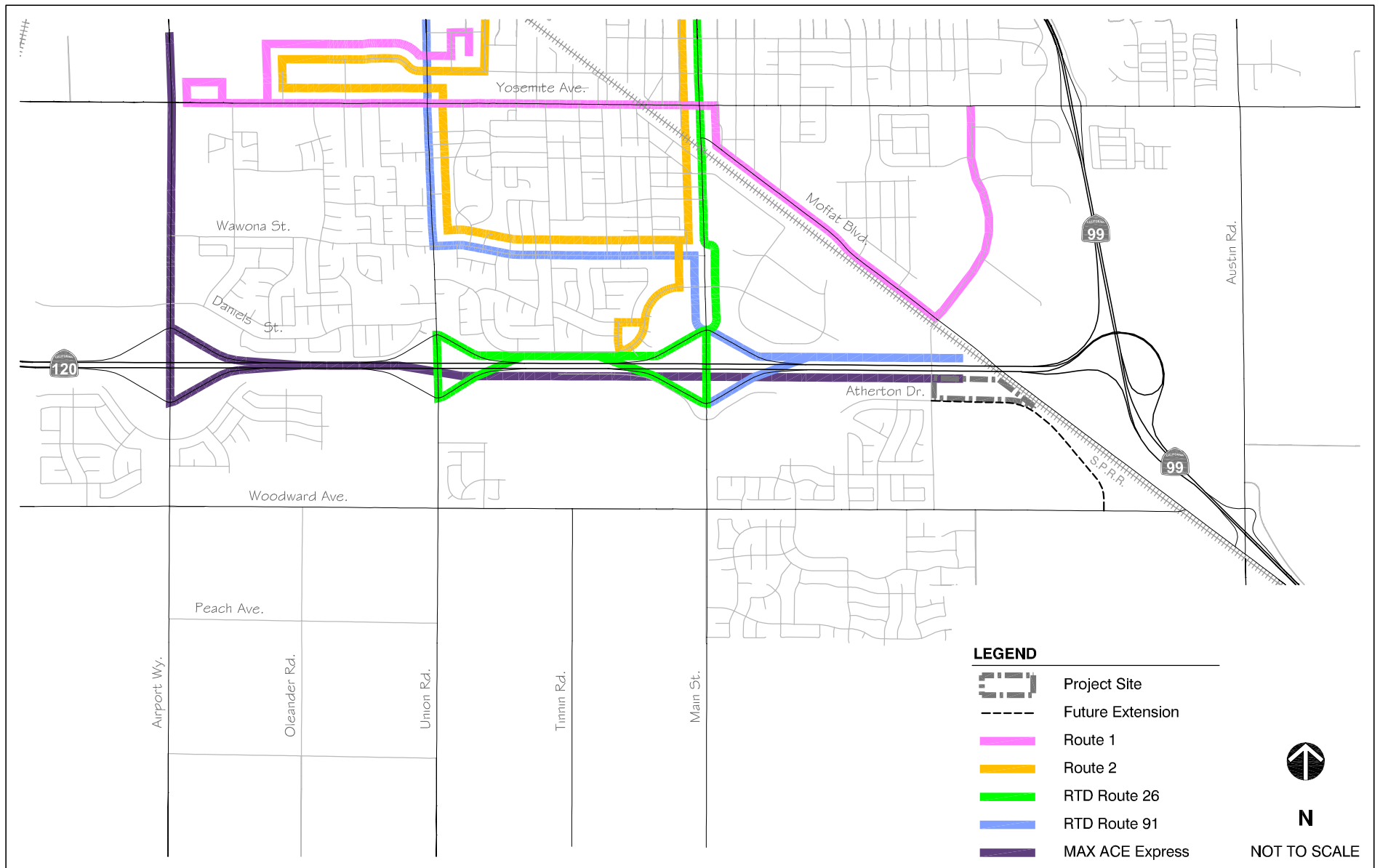
Pedestrian and Bicycle Network

Pedestrian facilities include sidewalks, crosswalks, and pedestrian signals at signalized intersections. Currently, the project frontage does not include pedestrian facilities. However, Van Ryn Avenue has sidewalks on both sides of the street south of Atherton Drive and a Class 1 bicycle path on the west side of the street north of Atherton Drive. West of Van Ryn Avenue, Atherton Drive has a sidewalk on the south side of the street and a Class 1 bicycle path on the north side of the street. Figure 3 shows the existing bicycle facilities throughout Manteca.

Transit System

No existing transit facilities run immediately adjacent to the project site. However, several transit routes provide service to and within the City of Manteca, as described below. These routes include Manteca Transit, which provides two fixed-route services that operate on 60 minute headways between 6:00 AM and 7:00 PM and a Dial-A-Ride component. The nearest Manteca Transit stops are along Moffat Boulevard and Spreckels Avenue north of the project site. The San Joaquin Regional Transit District (SJRTD) with fixed-route and flexible-response bus service in San Joaquin County; the Altamont Commuter Express (ACE), which operates a commuter rail service; and the Modesto Area Express (MAX), which operates fixed-route bus service between Modesto and the Lathrop-Manteca ACE Rail Station. Figure 4 shows the existing transit facilities near the project site.





3. REGULATORY SETTING

FEDERAL AND STATE

Caltrans is responsible for planning, designing, constructing, operating, and maintaining all state-owned roadways in San Joaquin County. Federal highway standards are implemented in California by Caltrans.

LOCAL

San Joaquin County Regional Transportation Plan

San Joaquin County, through the San Joaquin Council of Governments (SJCOG), periodically updates the Regional Transportation Plan, which outlines countywide transportation expenditures based on funding from sources like the federal government, the State of California, and locally collected funds. The current SJCOG Regional Transportation Plan (2007) contains several proposed improvements that would benefit the regional roadway network near the project. These improvements include widening SR 99 from four to six lanes between SR 120 in Manteca and SR 4 in Stockton and widening SR 120 from four to six lanes between I-5 and SR 99.

San Joaquin County Congestion Management Program

The San Joaquin County Congestion Management Program requires that SJCOG to create, manage, and update a countywide Congestion Management Plan (CMP). The purpose of the CMP is to establish LOS standards for a defined set of freeways, highways, and local roads; and to maintain or achieve those standards by increasing capacity of these roads and/or managing travel demand.

The facilities governed by the CMP near the Tesoro Apartments site are listed with their LOS standard below:

- SR 120 between Yosemite Avenue and SR 99 – LOS F

San Joaquin County Regional Traffic Impact Fee

SJCOG has implemented a regional traffic impact fee that would be assessed on developments throughout San Joaquin County. An Assembly Bill (AB) 1600 nexus study was conducted to determine the cost of needed improvements and the level of contribution required from types of development and different areas of the county. The adopted fee is \$1.00 per square foot for retail development and \$1.25 per square foot for office development.

Measure K

Measure K is a County measure that funds transportation projects through sales tax revenue and was reauthorized on the November 2006 ballot. Measure K includes funds for expanding SR 99 to six lanes between Manteca and Stockton, expanding SR 120 to six lanes between I-5 and SR 99.

City of Manteca General Plan

The City of Manteca General Plan (2003) includes the following policies related to transportation and circulation that are relevant to this analysis:

Street System

- Policy C-P-1: The City shall strive to attain the highest possible traffic levels of service (LOS) consistent with the financial resources available and the limits of technical feasibility. The impact of new development and land use proposals on LOS should be considered in the review process.
- Policy C-P-2: Manteca's target for transportation LOS is to provide a Citywide average of LOS of C or better, and a minimum of LOS D at any individual location. This "C average, D minimum" shall be accomplished by attempting to provide LOS C at all locations, but accepting LOS D under the following circumstances:
 - a. Where constructing facilities with enough capacity to provide LOS C is found to be unreasonably expensive. This applies to facilities, for example, on which it would cost significantly more per dwelling unit equivalent (DUE) to provide LOS C than to provide LOS D.
 - b. Where it is difficult or impossible to maintain LOS C because surrounding facilities in other jurisdictions operate at LOS D or worse.
 - c. Where free-flowing roadways or interchange ramps would discourage use of alternate travel modes.
 - d. Where maintaining LOS C will be a disincentive to use of existing alternative modes or to the implementation of new transportation modes that would reduce vehicle travel.

Because of the Tesoro Apartment's proximity to the state highway system, LOS D operations are considered acceptable for City facilities in this study.

- Policy C-P-3: Streets shall be dedicated, widened, extended, and constructed according to the Street cross-section diagrams established in the City Improvement Standards. Dedication and improvement of full rights-of-way as shown in the Street Standards shall not be required in existing developed areas where the City determines that such improvements are either infeasible or undesirable.
- Policy C-P-5: Development that would necessitate roadway improvements prior to the development of lands abutting those roadway improvements shall be required to make such improvements, or participate in such improvements, as a condition of approval.
- Policy C-P-6: New development will pay a fair share of the costs of street and other traffic and transportation improvements based on traffic generation and impacts on levels of service in conformance with the standards and policies established in the Public Facilities Implementation Plan (PFIP).
- Policy C-P-18: In accord with the PFIP, the City shall assess development fees for traffic signals and highway interchanges sufficient to fund system-wide improvements. The development fee schedule for these traffic improvements shall be periodically reviewed, and revised as necessary.

The City also requires new development to participate in funding and construction of collector and arterial street improvements identified in the City's Street Master Plan.

Traffic Safety

- Policy C-P-21: The creation or continuance of traffic hazards shall be discouraged in new development and other proposals requiring the City to exercise its discretionary authority.
- Policy C-P-22: In the development of new projects, the City shall give special attention to maintaining adequate corner-sight distances at city street intersections and at intersections of city streets and private access drives and roadways.
- Policy C-P-23: The City shall identify and remove, as feasible, obstacles limiting corner-sight distances at city street corners.

Parking

- Policy C-P-26: The City shall require all new development to provide an adequate number of off-street parking spaces to accommodate the typical parking demands of the type of development on the site.
- Policy C-P-29: Ensure that there is adequate parking for normal commercial activities.
- Policy C-P-30: Ensure that there is adequate parking for special events.
- Policy C-P-31: Coordinate the parking area locations with the roadway, transit, pedestrian, and bikeway systems.

Bikeways and Pedestrian Paths

- Policy C-P-33: The City shall establish a safe and convenient network of identified bicycle routes connecting residential areas with recreation, shopping, and employment areas within the City.
- Policy C-P-35: Route sidewalks so that they connect to major public parking areas, transit stops, and intersections within the bikeway system.
- Policy C-P-36: Provide adequate bicycle parking facilities at commercial, business/professional, and light industrial uses.
- Policy CD-P-31: The pedestrian and bikeway system shall be linked to other pedestrian and bikeways in adjacent neighborhoods and ultimately, to the City-wide Pedestrian and Bikeway Trail System to provide a continuous interconnected system.

Transportation Demand Management

- Policy C-I-15: The City shall establish a requirement for a transportation demand management program in any business park, industrial or commercial land use that employs more than 50 full time equivalent employees.

City of Manteca Bicycle Master Plan

The City of Manteca Bicycle Master Plan (2003) includes the following policies related to bicycle circulation in new development areas that are relevant to this analysis:

- Require new development to construct bikeways included in the proposed system along all roadways included within or adjacent to that development.
- Require new development to provide support facilities such as bicycle racks, personal lockers, and showers at appropriate locations such as parks, major recreational destinations, park-and-ride facilities, employment centers, schools, and commercial centers.
- Provide bicycle crossings at appropriate intervals along new roadways that will adequately serve new large-scale commercial, office, industrial, and residential development.
- Require new development to incorporate parks and schools as important destinations for bicyclists when designing circulation plans for subdivisions and other developments.

City of Manteca Zoning Ordinance

Chapter 17.15, Parking and Loading, of the City of Manteca Zoning Ordinance (2005) sets forth City requirements for both on- and off-street parking associated with residential, commercial, and industrial housing.

City of Manteca Transportation Impact Analysis Guidelines

The City of Manteca has established a set of Transportation Impact Analysis Guidelines to determine the significance of impacts related to land use development and infrastructure improvements. The guidelines determine the level of project generated traffic that triggers the need to study a facility (which was used in defining the study area), and the level of service thresholds that constitute a project related significant impact.

Based on the City of Manteca Transportation Impact Analysis Guidelines, an impact is determined to occur when one of the following happens:

Freeway Mainline Facilities

- A project is said to impact a freeway mainline segment if ***the addition of project traffic causes a freeway segment operating at an acceptable LOS under Existing or Cumulative No Project Conditions to degrade to an unacceptable LOS*** (as defined by SJCOG or Caltrans LOS guidelines). For freeway mainline segments operating at an unacceptable LOS under Existing or Cumulative No Project Conditions, an impact is said to occur if ***the addition of project traffic increases the density by 0.1 passenger car equivalents per mile per lane (pc/mi/ln)***. The calculation shall be conducted for each direction of travel.

Freeway Ramp Facilities

- A project is said to impact a ramp merge or diverge segment if ***the addition of project traffic causes a ramp segment operating at an acceptable LOS under Existing or Cumulative No Project Conditions to degrade to an unacceptable LOS*** (as defined by SJCOG or Caltrans LOS guidelines). For ramp merge or diverge segments operating at an unacceptable LOS under Existing or Cumulative No Project Conditions, a project impact is said to occur if ***the addition of project traffic increases the density by 0.1 pc/mi/ln***.

Intersections

- A project is said to impact an intersection if ***the addition of project traffic causes an intersection operating at an acceptable LOS under Existing or Cumulative No Project Conditions to degrade to an unacceptable LOS*** (as defined by City of Manteca, SJCOG, or Caltrans LOS guidelines).
- A project is said to impact an intersection operating at an unacceptable LOS under Existing or Cumulative No Project Conditions, if:
 - i. ***The addition of project traffic increases the average vehicle delay for a signalized intersection by three (3) seconds or more, or***
 - ii. ***The addition of project traffic increases the average delay for an all-way stop-controlled intersection by three (3) seconds or more and the intersection meets the one hour peak hour signal warrant, or***
 - iii. ***The addition of project traffic increases the highest delayed side-street movement for a side-street stop-controlled intersection by three (3) seconds or more and the intersection meets the one hour peak hour signal warrant.***

City of Manteca Public Facilities Implementation Plan

The City of Manteca's Public Facilities Implementation Plan (PFIP) (1993) is the implementing document for the City's General Plan policies on public facilities. The purpose of the PFIP is to ensure that public facilities are adequate as the City grows, and that they are developed in accordance with the City's General Plan. The PFIP is based on the City's individual water, sewer collection, drainage, and transportation facilities master plans. Under the PFIP, development impact fees are collected at or near the time of development and are used to finance the expansion and capacity of public facilities (i.e., water, sewer collection, drainage, and transportation) necessary to accommodate the new demands. Public improvements are timed to ensure the LOS targets for each service are reasonably maintained.

The PFIP is currently undergoing an update to cover the costs of infrastructure to a 2023 time horizon. It is envisioned that the updated PFIP fee will cover the costs of city roadway and interchange improvements needed to accommodate growth through 2023. This report assumes that the project applicant will provide the appropriate development impact fees in compliance with the current PFIP adopted at the time building permits are sought.

4. ANALYSIS METHODOLOGY

The operations of roadway facilities are described in terms of level of service (LOS). LOS is a qualitative description of traffic flow based on factors such as speed, travel time, delay, and freedom to maneuver. Six levels are defined, from LOS A, which represents uncongested conditions, to LOS F, which represents extremely congested conditions when volumes exceed capacity, resulting in stop-and-go conditions. LOS E represents at-capacity operations.

LEVEL OF SERVICE

Signalized Intersections

The LOS methodology approved by the City analyzes a signalized intersection's operation based on average control vehicular delay, as calculated using the methods described in Chapter 16 of the *Highway Capacity Manual* (HCM) (Transportation Research Board 2000). Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The average control delay for signalized intersections was calculated using the Synchro analysis software and is correlated to a LOS designation, as shown in Table 1.

TABLE 1: SIGNALIZED INTERSECTION LEVEL OF SERVICE CRITERIA		
LOS	Description	Average Control Delay per Vehicle (seconds)
A	Operations with very low delay occurring with favorable progression or short cycle lengths.	≤10
B	Operations with low delay occurring with good progression or short cycle lengths.	>10–20
C	Operations with average delays resulting from fair progression or longer cycle lengths. Individual cycle failures begin to appear.	>20–35
D	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, and high volume-to-capacity (V/C) ratios. Many vehicles stop, and individual cycle failures are noticeable.	>35–55
E	Operations with long delays indicating poor progression, long cycle lengths, or high V/C ratios. Individual cycle failures are frequent. This is considered the limit of acceptable delay.	>55–80
F	Operations with delays unacceptable to most drivers occurring due to over-saturation, poor progression, or very long cycle lengths.	>80

Source: Transportation Research Board 2000.

Unsignalized Intersections

Operations of the unsignalized study intersections were evaluated using the methodology contained in Chapter 17 of the HCM. At two-way or side-street stop-controlled intersections, the control delay is calculated for each movement, not for the intersection as a whole, and the LOS is based on movement with the highest delay. For approaches composed of a single lane, the control delay is computed as the average of all movements in that

lane. For all-way stop-controlled locations, a weighted average delay for the entire intersection is calculated. Table 2 summarizes the relationship between delay and LOS for unsignalized intersections.

TABLE 2: UNSIGNALIZED INTERSECTION LEVEL OF SERVICE CRITERIA		
LOS	Description	Average Control Delay per Vehicle (seconds)
A	Little or no delay	≤10
B	Short traffic delays	>10–15
C	Average traffic delays	>15–25
D	Long traffic delays	>25–35
E	Very long traffic delays	>35–50
F	Extreme traffic delays with intersection capacity exceeded	>50
Source: Transportation Research Board 2000.		

PEAK HOUR SIGNAL WARRANTS

A peak hour signal warrant analysis was conducted for all unsignalized study intersections. The analysis applied the peak hour traffic signal warrant recommended in the Federal Highway Administration's (FHWA's) *Manual on Uniform Traffic Control Devices* (MUTCD) (2003) and associated Caltrans guidelines.

Please note that the use of the peak hour signal warrant is intended to examine the general correlation between the planned level of future development and the need to install new traffic signals. The traffic analysis presented in this document estimates future development-generated traffic compared against a sub-set (peak hour warrant) of the standard traffic signal warrants recommended in the Federal Highway Administration Manual on Uniform Traffic Control Devices and associated State guidelines. This analysis should not serve as the only basis for deciding whether and when to install a signal. To reach such a decision, the full set of warrants should be investigated based on field-measured, rather than forecast, traffic data and a thorough study of traffic and roadway conditions by an experienced engineer. Furthermore, the decision to install a signal should not be based solely upon the warrants, because the installation of signals can lead to certain types of collisions. The City of Manteca should undertake regular monitoring of actual traffic conditions and accident data, and timely re-evaluation of the full set of warrants in order to prioritize and program intersections for signalization.

Roadway Segments

Roadway segment operations were evaluated using the ADT volume thresholds defined by Fehr & Peers for use in other studies conducted in the City. Table 3 presents the relationships between daily traffic volumes and LOS ratings.

**TABLE 3:
ROADWAY SEGMENT LEVEL OF SERVICE CRITERIA**

Lanes	Level of Service C Threshold	Level of Service D Threshold	Level of Service E Threshold
2	12,000	14,600	15,600
4	24,000	31,100	32,900
6	36,000	46,800	49,300

Source: Fehr & Peers 2008, City of Manteca 2003.

Freeway Mainline, Off-Ramp Diverge, On-Ramp Merge, and Weaving Segments

Freeway-segment operations were evaluated using the methodology contained in Chapter 21 of the HCM. The average density, in passenger cars per mile per lane, was calculated using the HCS+ analysis software and is correlated to an LOS designation for both mainline segments and ramp junctions, as shown in Table 4.

**TABLE 4:
DENSITY-BASED FREEWAY MAINLINE, OFF-RAMP DIVERGE, AND ON-RAMP MERGE SEGMENTS
LEVEL OF SERVICE CRITERIA**

LOS	Mainline Density ^a	Ramp Junction Density ^a
A	≤11	≤10
B	11–18	10–20
C	18–26	20–28
D	26–35	28–35
E	35–45	>35
F	>45	Demand exceeds capacity

Source: Transportation Research Board 2000.

^a Measured in vehicles per mile per lane.

5. EXISTING CONDITIONS ANALYSIS

This chapter describes the existing traffic operations at the study intersections, roadway segments, and freeway facilities described in Chapter 1.

TRAFFIC COUNT COLLECTION

Traffic counts at the study intersections and freeway facilities were collected during weekday AM and PM peak periods in the spring of 2006 and 2007. Based on the traffic count data, the AM and PM peak hours occur from 7:30 AM to 8:30 AM and 5:00 PM to 6:00 PM, respectively. Figure 5 presents the existing AM and PM peak hour turning movement volumes at the study intersections, as well as existing intersection lane configurations and traffic control devices. Figure 6 presents existing AM and PM peak hour freeway-mainline, on-ramp, and off-ramp traffic volumes.

INTERSECTION LOS ANALYSIS

Existing intersection lane configurations, traffic control devices, and peak hour turning movement volumes were used to calculate the LOS for the seven existing study intersections during the AM and PM peak hours. The results of the LOS calculations indicate that all study intersections operate at an acceptable LOS. Table 5 presents the results of the LOS analysis. Appendix A contains the corresponding calculation sheets.

PEAK HOUR SIGNAL WARRANTS

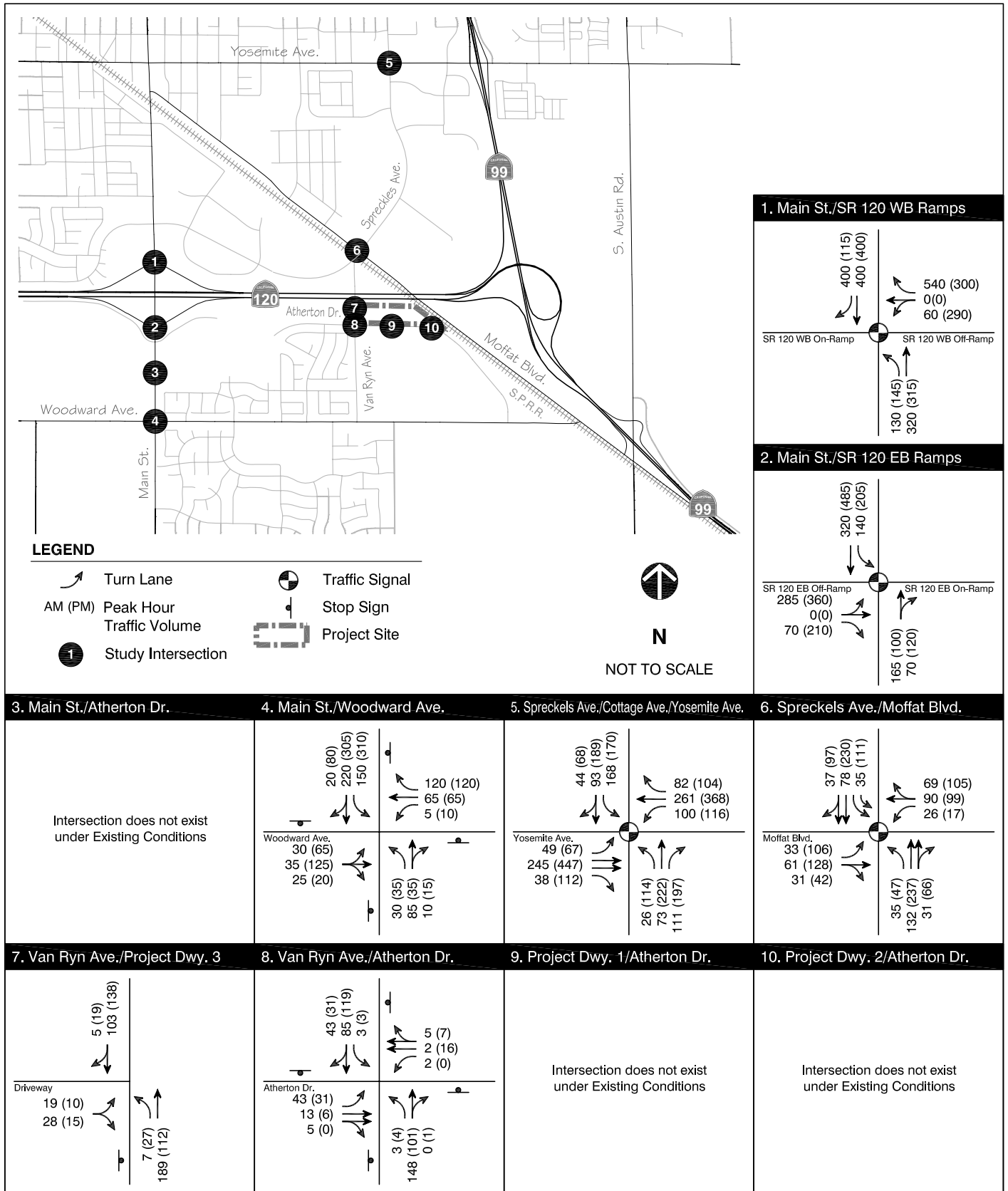
Peak hour signal warrant analyses were conducted for the three unsignalized study intersections. The analysis applied the peak hour traffic signal warrant recommended in the MUTCD and associated State of California (Caltrans) guidelines. The results of the peak hour signal warrant analysis, shown in Table 5, indicates that none of the unsignalized intersections meet the peak hour warrant under existing conditions. Appendix B includes the corresponding calculation sheets.

ROADWAY SEGMENT LOS ANALYSIS

Table 6 presents the results of the roadway segment LOS analysis under existing conditions. The LOS calculations indicate that all roadway segments currently operate at an acceptable LOS.

FREEWAY MAINLINE SEGMENT LOS ANALYSIS

Table 7 presents the results of the freeway mainline LOS analysis under existing conditions. Appendix C contains the corresponding calculation sheets. The LOS calculations indicate that all mainline segments of SR 120 operate at acceptable levels during the AM and PM peak hours.



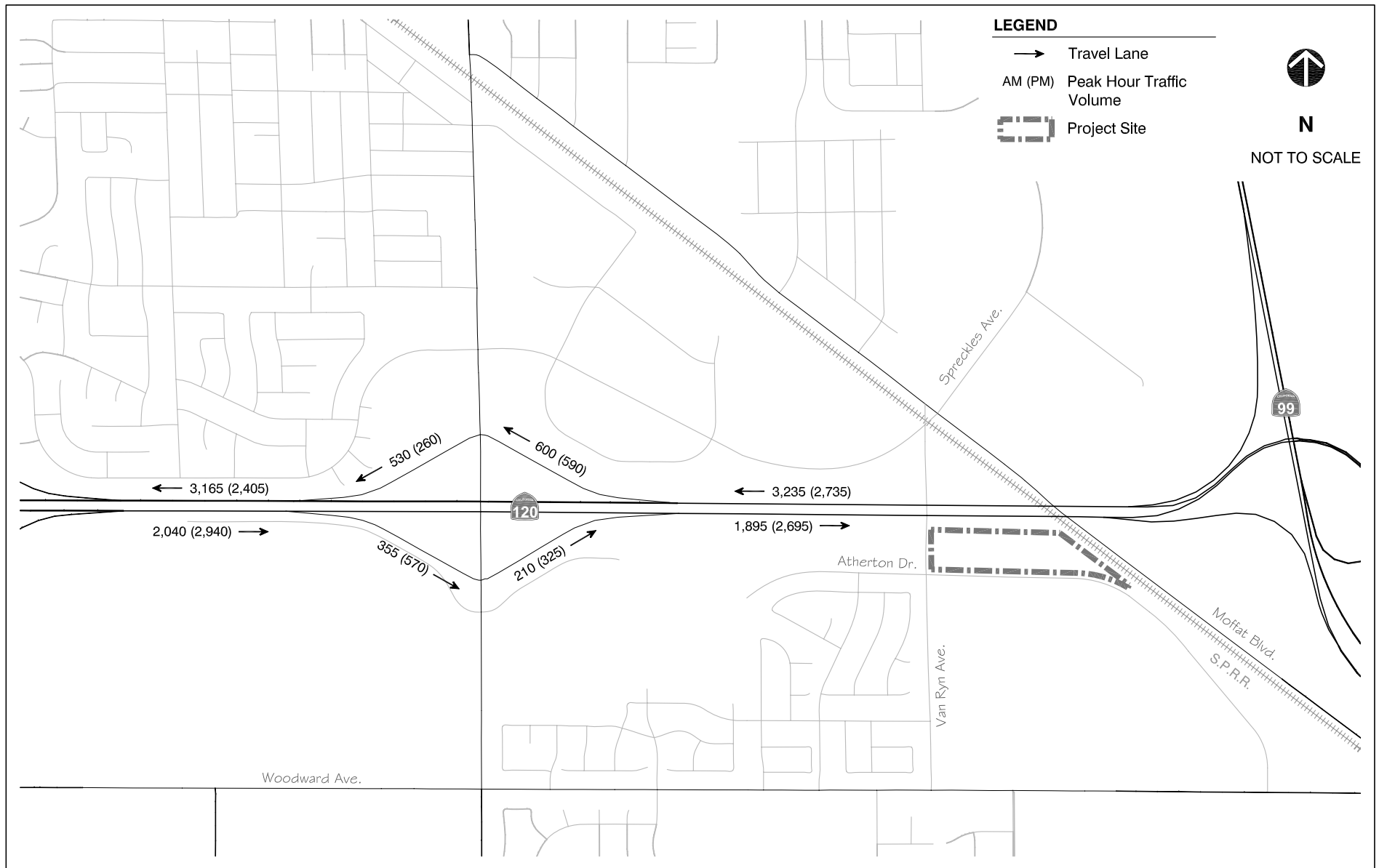


**TABLE 5:
EXISTING CONDITIONS INTERSECTION LOS AND SIGNAL WARRANTS**

Intersection	Peak Hour	Intersection Control	Delay ¹	LOS ²	Meets Warrant
1. Main St. / SR 120 Westbound Ramps	AM PM	Signal	8 20	A C	N/A N/A
2. Main St. / SR 120 Eastbound Ramps	AM PM	Signal	25 26	C C	N/A N/A
4. Main St. / Woodward Ave.	AM PM	All-way Stop-Controlled	10 15	B B	No No
5. Spreckels Ave. / Yosemite Ave.	AM PM	Signal	22 24	C C	N/A N/A
6. Spreckels Ave. / Moffat Blvd.	AM PM	Signal	21 19	C B	N/A N/A
7. Van Ryn Ave. / Driveway	AM PM	Side Street Stop Controlled	11 11	B B	No No
8. Van Ryn Ave. / Atherton Dr.	AM PM	All-way Stop-Controlled	8 8	A A	No No

Notes:

¹ Whole intersection weighted average control delay expressed in seconds per vehicle using methodology described in the 2000 *Highway Capacity Manual*. For side-street stop-controlled intersections, delay for the highest delayed approach is shown.

² LOS = Level of service. For side-street stop-controlled intersections, LOS for the highest delayed approach movement is shown.

Bold highlighting denotes intersections with unacceptable operations (LOS E or F) and that also meet peak-hour volume warrants.

Source: Fehr & Peers, 2008.

**TABLE 6:
EXISTING CONDITIONS ROADWAY LOS**

Roadway Segment	Lanes	Volume ¹	LOS
1. Main Street north of SR 120	4	9,750	C
2. Main Street between SR 120 and Woodward Avenue	2	7,700	C
3. Woodward Ave. west of Main St.	2	2,975	C
4. Main St. south of Woodward Ave.	2	3,975	C
5. Woodward Ave. between Main St. and Van Ryn Ave.	2 ²	5,150	C
6. Woodward Ave. between Van Ryn Ave. and Atherton Dr.	2 ²	4,150	C
7. Yosemite Ave. west of Spreckels Ave.	2	9,195	C

**TABLE 6:
EXISTING CONDITIONS ROADWAY LOS**

Roadway Segment	Lanes	Volume ¹	LOS
8. Yosemite Ave. between Spreckels Ave. and SR 99	4	13,423	C
9. Spreckels Ave. between Yosemite Ave. and Moffat Blvd.	4	6,653	C
10. Van Ryn Ave. between Industrial Park Dr. and Atherton Dr.	2	3,978	C
11. Van Ryn Ave. between Atherton Dr. and Woodward Ave.	2	2,340	C

Notes:

¹ Average daily traffic.

² Portions of this roadway segment are widened to 3 or 4 lanes.

Source: Fehr & Peers, 2008.

**TABLE 7:
EXISTING CONDITIONS FREEWAY MAINLINE LOS**

Travel Direction	Segment	Peak Hour	Density (Vehicles per Miles per Lane)	Level of Service
SR 120 Eastbound	Union Rd. to Main St.	AM	21	C
		PM	30	D
	Main St. to SR 99	AM	19	C
		PM	27	D
SR 120 Westbound	SR 99 to Main St.	AM	33	D
		PM	28	D
	Main St. to Union Rd.	AM	32	D
		PM	24	C

Source: Fehr & Peers, 2008.

RAMP JUNCTION LOS ANALYSIS

Table 8 presents the results of the LOS analysis for ramp junctions under existing conditions. Appendix C contains the corresponding calculation sheets. The LOS calculations indicate that all ramp junctions currently operate at an acceptable LOS D or better during both AM and PM peak hours.

TABLE 8: EXISTING CONDITIONS RAMP JUNCTION LOS					
Travel Direction	Ramp	Merge/Diverge	Peak Hour	Density (Vehicles per Mile per Lane)	Level of Service
SR 120 Eastbound	Main St.	Diverge (Off-ramp)	AM	21	C
			PM	29	D
		Merge (On-ramp)	AM	19	B
			PM	27	C
SR 120 Westbound	Main St.	Diverge (Off-ramp)	AM	35	D
			PM	30	D
		Merge (On-ramp)	AM	31	D
			PM	24	C
Source: Fehr & Peers, 2008.					

6. EXISTING PLUS PROJECT CONDITIONS ANALYSIS

This chapter describes the transportation impacts caused by the project under Existing Plus Project conditions. The Existing Plus Project traffic volumes are estimated by adding the project-generated traffic to the existing traffic counts described in the previous chapter. Project impacts are identified using standards developed by the City of Manteca, SJCOG, and Caltrans. Mitigation measures are recommended to reduce the significance of project impacts.

Pedestrian and Bicycle Impacts

In addition to the traffic impacts defined in Chapter 3, this report also defines the thresholds for impacts to the pedestrian and bicycle systems.

- An impact to the pedestrian or bicycle system is said to occur if the project leads to any of the following:
 - o Disrupt or interfere with existing or planned bicycle or pedestrian facilities.
 - o Create an unmet need for bicycle or pedestrian facilities.
 - o Create an inconsistency with policies related to bicycle or pedestrian systems set forth in the General Plan for the City of Manteca.

APPROACH AND METHODOLOGY

A three-step process is used to estimate the volume of traffic associated with the project: (1) trip generation, (2) trip distribution, and (3) trip assignment. This section describes how existing plus project traffic volume forecasts are developed.

Trip Generation

In the first step, the traffic volumes entering and exiting the project site are estimated. Trip generation rates are taken from *Trip Generation* (Institute of Transportation Engineers, 2003). Table 9 presents the trip generation estimates for the Tesoro Apartments project.

As proposed, the Tesoro Apartments project is projected to generate 2,016 daily vehicle trips on the surrounding roadway system. During the AM peak hour, the project would generate approximately 153 vehicle trips, and during the evening peak hour, the project would generate approximately 186 new vehicle trips.

TABLE 9: PROJECT TRIP GENERATION RATES AND ESTIMATES							
Use	Daily	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
<i>Trip Rates¹</i>							
Apartment	6.72	0.10	0.41	0.51	0.40	0.22	0.62

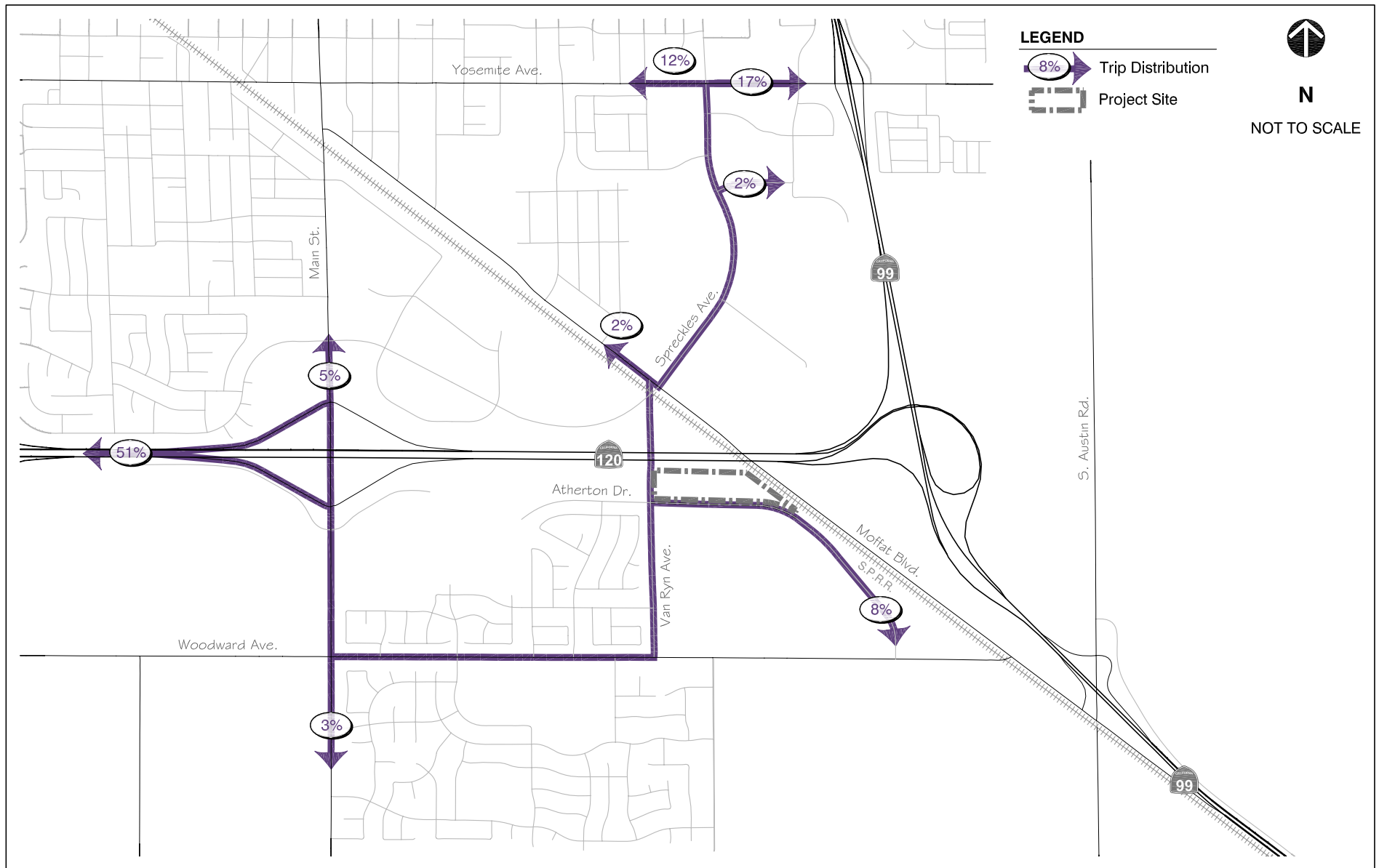
<i>Trip Estimates</i>							
Apartment (300 units)	2,016	30	123	153	120	66	186
Note: ¹ Trip rate per apartment unit Source: <i>Trip Generation</i> (Institute of Transportation Engineers, 2003)							

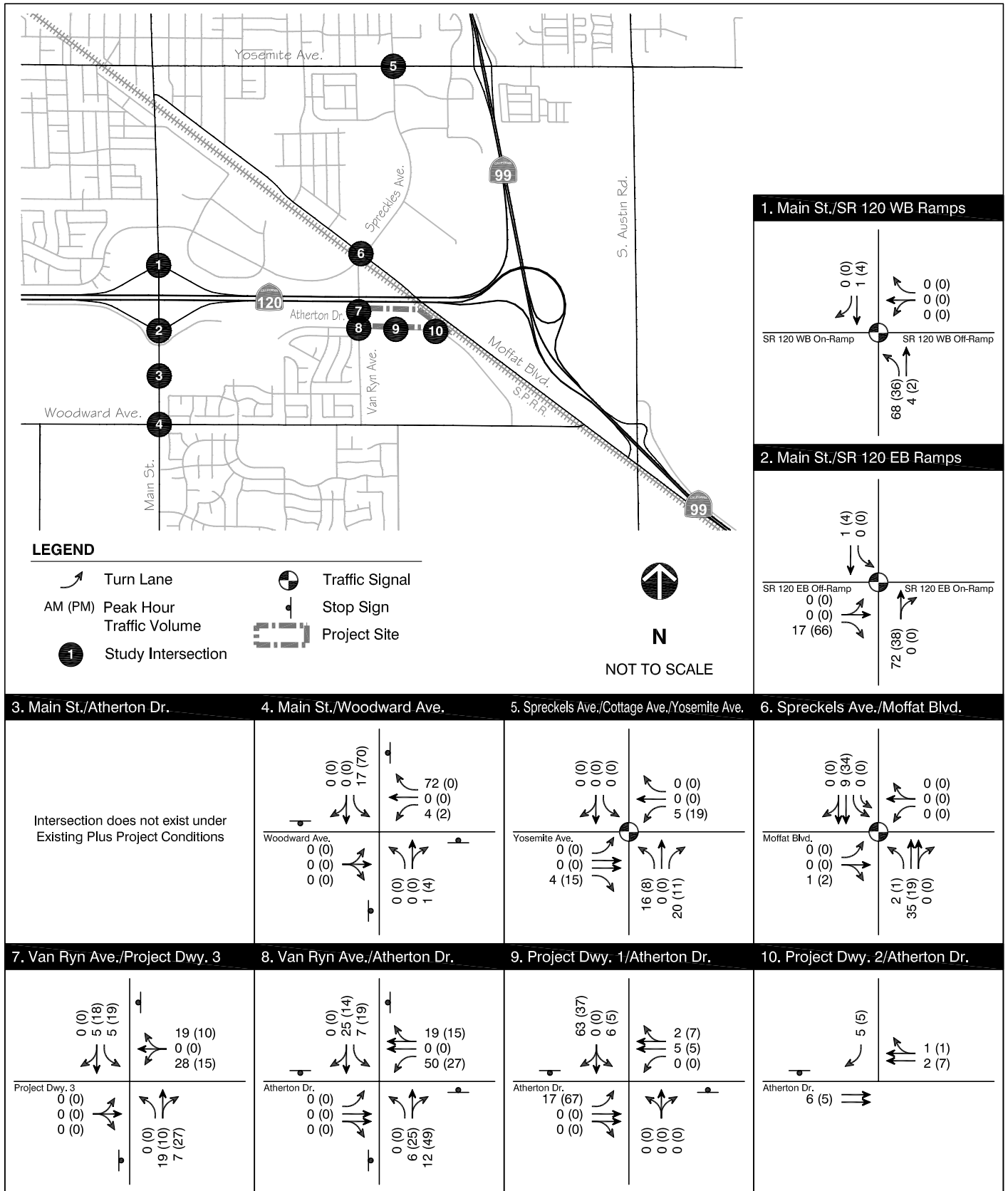
Trip Distribution

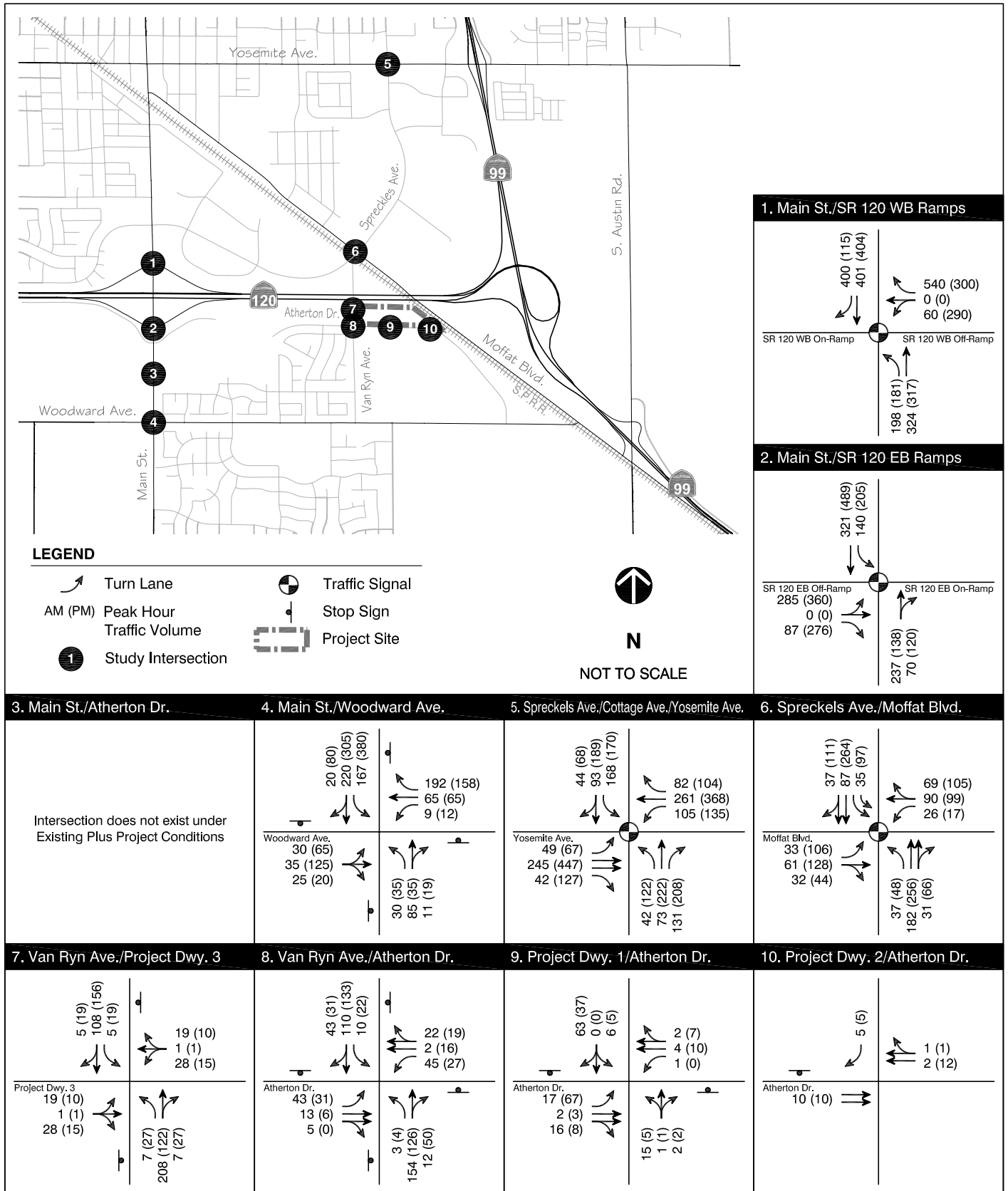
In the second step, the approach and departure patterns for project generated traffic are estimated using the City of Manteca/SJCOG Travel Demand Forecasting Model. Figure 7 shows the trip distribution pattern for the Tesoro Apartments project. As shown in Figure 7, the majority of project traffic is expected to access SR 120 via the Main Street intersection. Figure 8 presents project-generated turning movement estimates at the study intersections.

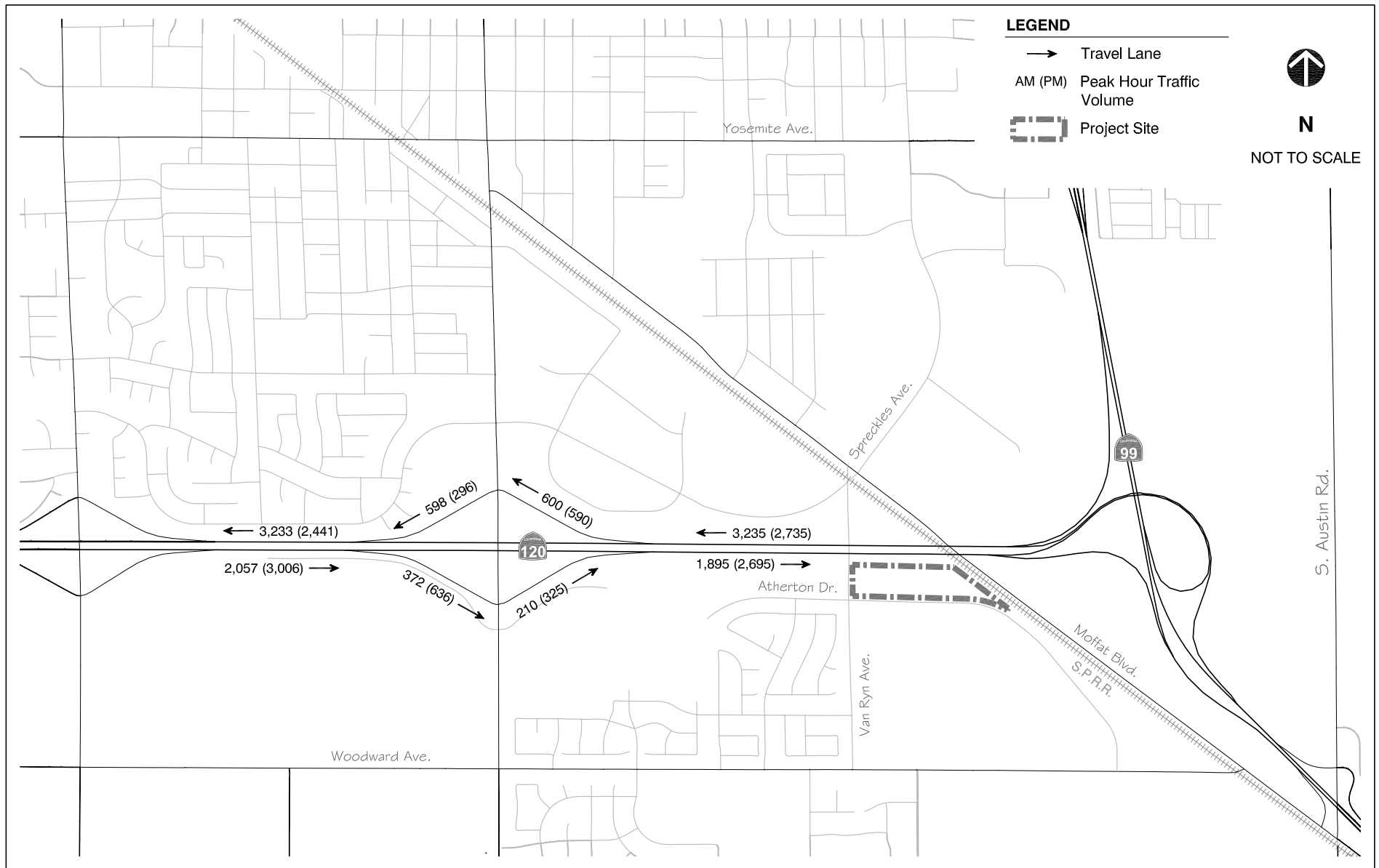
Trip Assignment

In the final step, the project trips shown in Figure 8 are added to the traffic counts collected as part of the existing conditions analysis to develop a set of Existing Plus Project traffic volume forecasts. Figure 9 presents the peak hour turning movement volumes at the study intersections. Figure 10 presents the peak hour traffic volumes on the freeway ramps and mainline segments.









IMPACT ANALYSIS

The Existing Plus Project Conditions traffic volume forecasts were evaluated using the LOS analysis methodologies described in Chapter 4. The results are presented below.

Intersection LOS Analysis

The Existing Plus Project traffic volume forecasts were analyzed assuming the same intersection lane configurations and traffic control devices in the field under Existing Conditions. Table 10 presents the results of the AM peak hour and PM peak hour intersection LOS analysis. Appendix A contains the corresponding calculation sheets.

As shown in Table 10, all intersections are expected to operate at an acceptable LOS under Existing Plus Project conditions. Therefore intersection impacts are *less than significant* under Existing Plus Project conditions.

Peak Hour Signal Warrants

Peak hour signal warrant analyses were conducted for the seven unsignalized study intersections. The analysis applied the peak hour traffic signal warrant recommended in the MUTCD and associated State of California (Caltrans) guidelines. The results of the peak hour signal warrant analysis, shown in Table 10 indicate that none of the unsignalized intersections meets the peak hour warrant under existing conditions. Appendix B includes the corresponding calculation sheets.

Roadway Segment LOS Analysis

Table 11 presents the results of the roadway segment LOS analysis under Existing Plus Project conditions. The LOS calculations indicate that all roadway segments currently operate at an acceptable LOS.

**TABLE 10:
EXISTING PLUS PROJECT CONDITIONS INTERSECTION LOS AND SIGNAL WARRANTS**

Intersection	Peak Hour	Existing		With Project		Meets Warrant
		Delay ²	LOS ³	Delay ²	LOS ³	
1. Main St. / SR 120 Westbound Ramps	AM PM	8 20	A C	11 20	B C	N/A N/A
2. Main St. / SR 120 Eastbound Ramps	AM PM	25 26	C C	26 26	C C	N/A N/A
4. Main St. / Woodward Ave.	AM PM	10 15	B B	11 18	B C	No No
5. Spreckels Ave. / Yosemite Ave.	AM PM	22 24	C C	22 25	C C	N/A N/A
6. Spreckels Ave. / Moffat Blvd.	AM PM	21 19	C B	30 20	C B	N/A N/A
7. Van Ryn Ave. / Driveway	AM PM	11 11	B B	12 12	B B	No No
8. Van Ryn Ave. / Atherton Dr.	AM PM	8 8	A A	9 12	A B	No No
9. Project Driveway #1 / Atherton Dr.	AM PM	N/A N/A	N/A N/A	9 10	A B	No No
10. Project Driveway #2 / Atherton Dr.	AM PM	N/A N/A	N/A N/A	8 8	A A	No No

Notes:

¹ Whole intersection weighted average control delay expressed in seconds per vehicle using methodology described in the 2000 *Highway Capacity Manual*. For side-street stop-controlled intersections, delay for the highest delayed approach is shown.

³ LOS = Level of service. For side-street stop-controlled intersections, LOS for the highest delayed approach movement is shown.

Source: Fehr & Peers, 2008.

**TABLE 11:
EXISTING PLUS PROJECT CONDITIONS ROADWAY LOS**

Roadway Segment	Lanes	No Project		With Project	
		Volume ¹	LOS	Volume ¹	LOS
1. Main Street north of SR 120	4	9,750	C	9,805	C
2. Main Street between SR 120 and Woodward Avenue	2	7,700	C	8,688	C
3. Woodward Ave. west of Main St.	2	2,975	C	2,975	C
4. Main St. south of Woodward Ave.	2	3,975	C	4,030	C

**TABLE 11:
EXISTING PLUS PROJECT CONDITIONS ROADWAY LOS**

Roadway Segment	Lanes	No Project		With Project	
		Volume ¹	LOS	Volume ¹	LOS
5. Woodward Ave. between Main St. and Van Ryn Ave.	2 ²	5,150	C	6,190	C
6. Woodward Ave. between Van Ryn Ave. and Atherton Dr.	2 ²	4,150	C	4,150	C
7. Yosemite Ave. west of Spreckels Ave.	2	9,195	C	9,410	C
8. Yosemite Ave. between Spreckels Ave. and SR 99	4	13,423	C	13,663	C
9. Spreckels Ave. between Yosemite Ave. and Moffat Blvd.	4	6,653	C	7,178	C
10. Van Ryn Ave. between Industrial Park Dr. and Atherton Dr.	2	3,978	C	5,533	C
11. Van Ryn Ave. between Atherton Dr. and Woodward Ave.	2	2,340	C	5,240	C

Notes:

¹ Average daily traffic.

² Portions of this roadway segment are widened to 3 or 4 lanes.

Source: Fehr & Peers, 2008.

Freeway Mainline Segment LOS Analysis

Table 12 presents the results of the freeway mainline LOS analysis under Existing Plus Project conditions. Appendix C contains the corresponding calculation sheets. The LOS calculations indicate that all mainline segments of SR 120 operate at acceptable levels during the AM and PM peak hours.

**TABLE 12:
EXISTING PLUS PROJECT CONDITIONS FREEWAY MAINLINE LOS**

Travel Direction	Segment	Peak Hour	No Project		With Project	
			Density ¹	LOS	Density ¹	LOS
SR 120 Eastbound	Union Rd. to Main St.	AM	21	C	21	C
		PM	30	D	30	D
	Main St. to SR 99	AM	19	C	19	C
		PM	27	D	27	D
SR 120 Westbound	SR 99 to Main St.	AM	33	D	33	D
		PM	28	D	28	D
	Main St. to Union Rd.	AM	32	D	33	D
		PM	24	C	25	C

Notes:

¹ Density reported in vehicles per mile per lane.

Source: Fehr & Peers, 2008.

Ramp Junction LOS Analysis

Table 13 presents the results of the LOS analysis for ramp junctions under Existing Plus Project conditions. Appendix C contains the corresponding calculation sheets. The LOS calculations indicate that all ramp junctions currently operate at an acceptable LOS D or better during both AM and PM peak hours.

TABLE 13: EXISTING CONDITIONS RAMP JUNCTION LOS							
Travel Direction	Ramp	Merge/Diverge	Peak Hour	No Project		With Project	
				Density ¹	LOS	Density ¹	LOS
SR 120 Eastbound	Main St.	Diverge (Off-ramp)	AM	21	C	21	C
			PM	29	D	31	D
		Merge (On-ramp)	AM	19	B	20	B
			PM	27	C	27	C
SR 120 Westbound	Main St.	Diverge (Off-ramp)	AM	35	D	35	D
			PM	30	D	30	D
		Merge (On-ramp)	AM	31	D	31	D
			PM	24	C	24	C
Source: Fehr & Peers, 2008.							

7. CUMULATIVE CONDITIONS ANALYSIS

This chapter presents an analysis of Cumulative conditions with and without the proposed project. The Cumulative No Project condition is based on traffic volumes obtained from the 2020 version of the City of Manteca/San Joaquin Council of Government (SJCOG) travel demand forecasting model. The analysis methodologies described in Chapter 4 were used to evaluate the LOS at the study intersections, roadway segments, and freeway facilities.

Cumulative Plus Project traffic volume forecasts are developed in a similar manner to what was done under existing conditions. Trips from the proposed Tesoro Apartments project were added to the Cumulative No Project traffic volume forecasts to obtain Cumulative Plus Project traffic volumes. This chapter describes the procedure used to determine the cumulative traffic volumes and presents the results of the level of service analysis for Cumulative conditions.

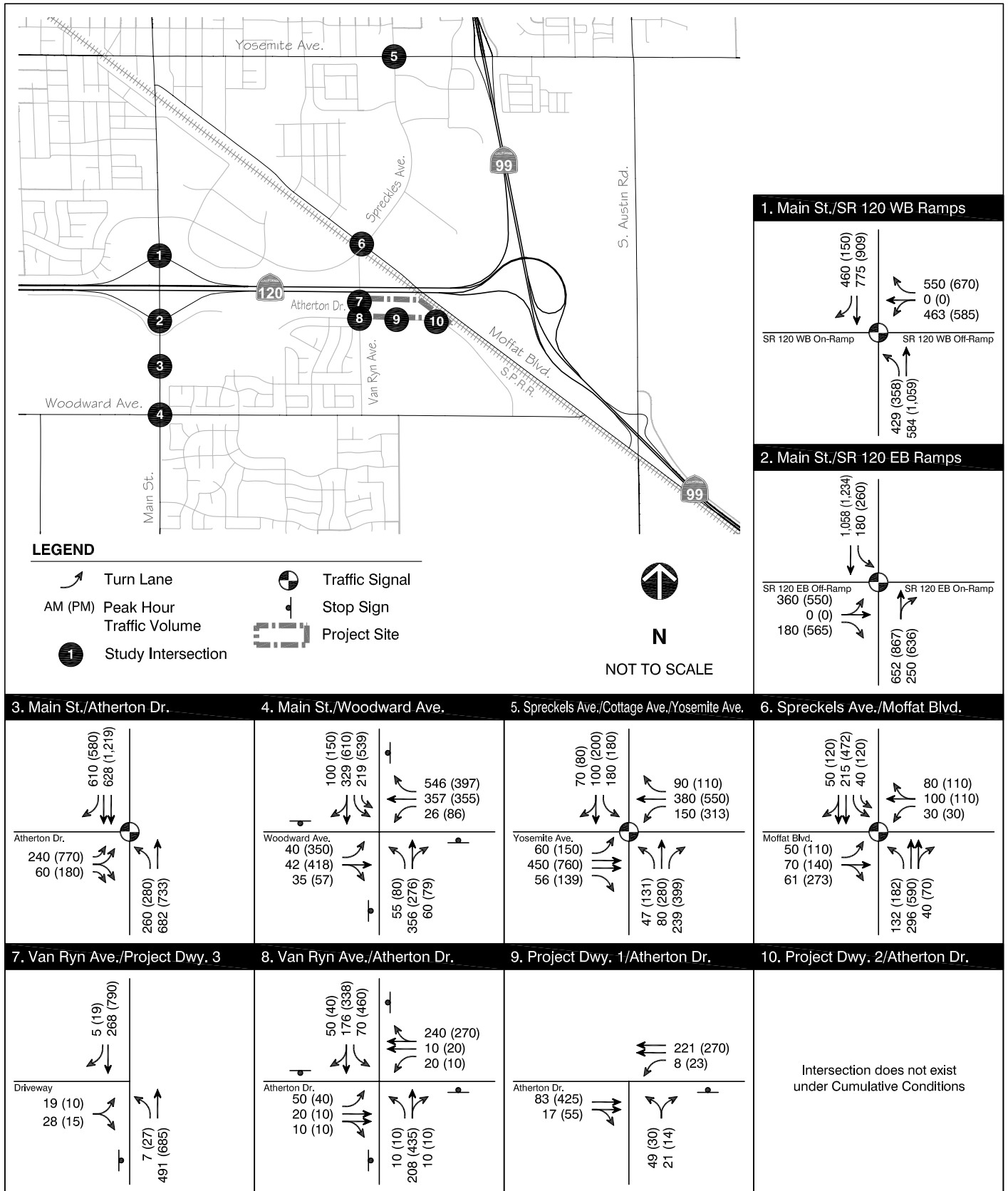
TRAFFIC ESTIMATES

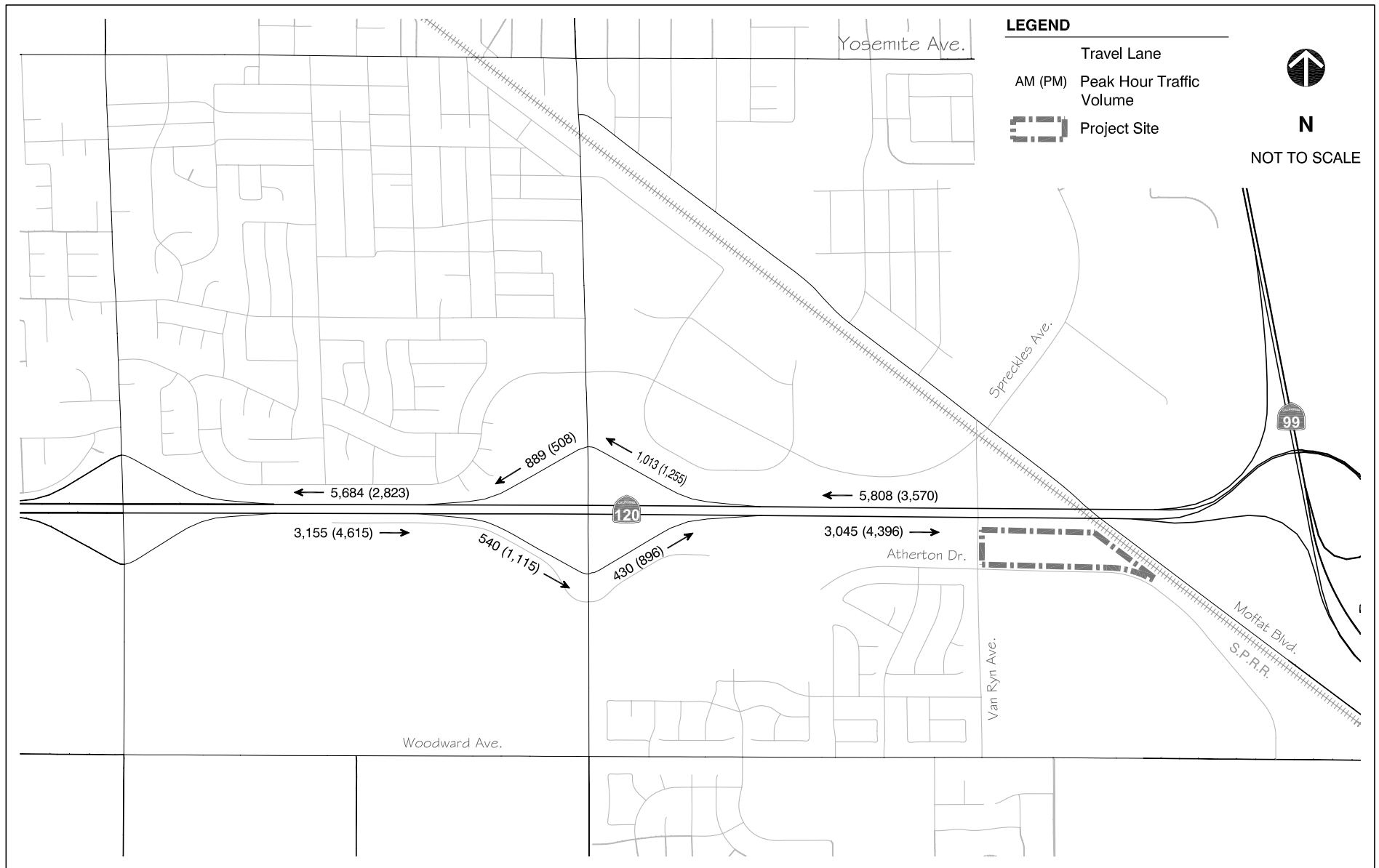
The City of Manteca/SJCOG travel demand forecasting model was used to develop traffic volumes under Cumulative No Project conditions. The model is based on the 2005 SJCOG Regional Transportation Plan travel demand forecasting model but has been enhanced to contain a high level of detail within the cities of Manteca, Lathrop, and Ripon. This additional detail helps the model more accurately represent travel patterns in these cities. In addition to the background growth in outlying areas assumed to occur by 2020, a list of approved and pending projects provided by City of Manteca staff was incorporated into the model to provide additional confidence in future traffic volume forecasts.

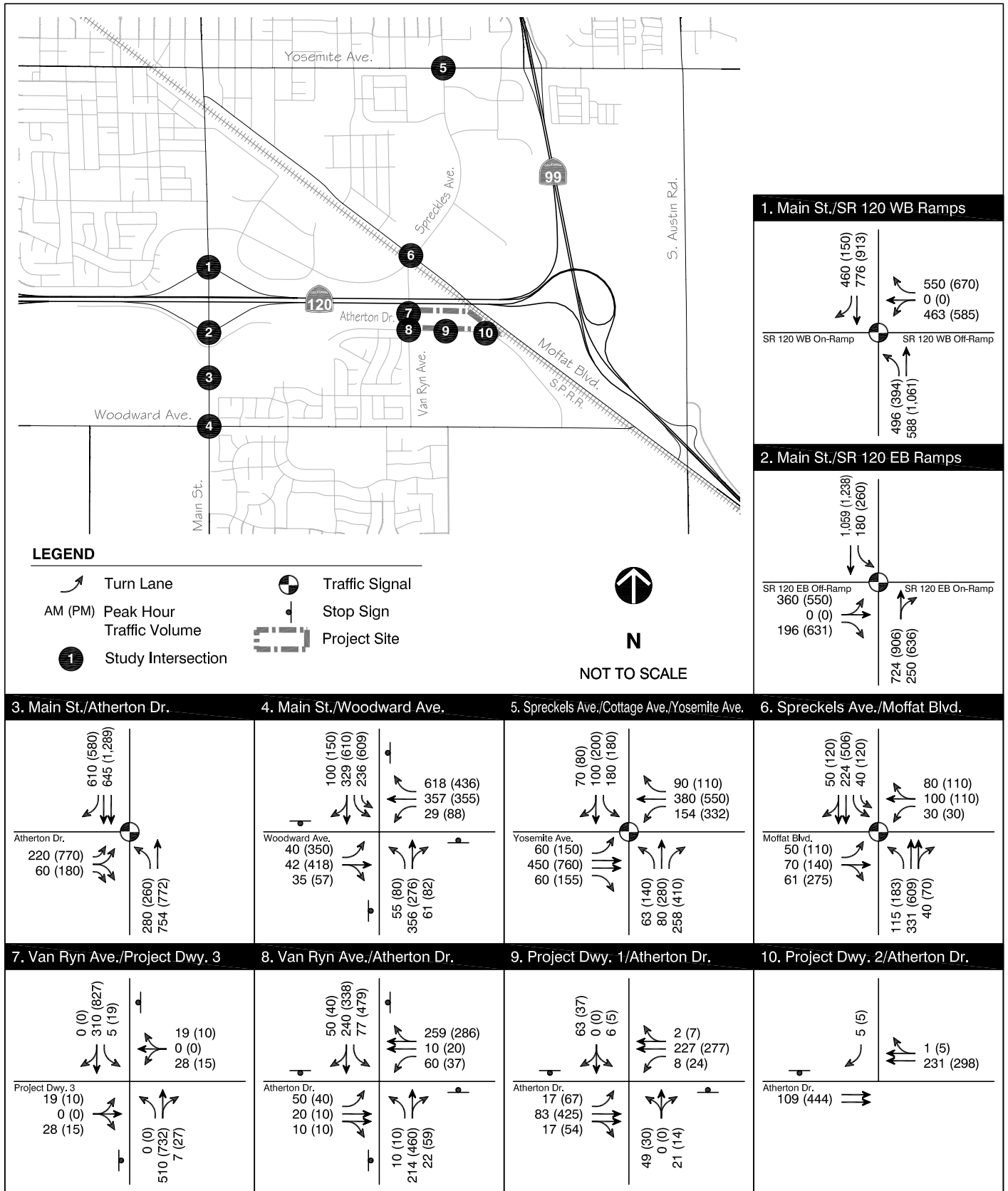
To reduce for model error, a technique known as the difference method was used to develop Cumulative No Project traffic volume forecasts. The difference method adds model turning movement forecasts to existing traffic count data based on the following formula:

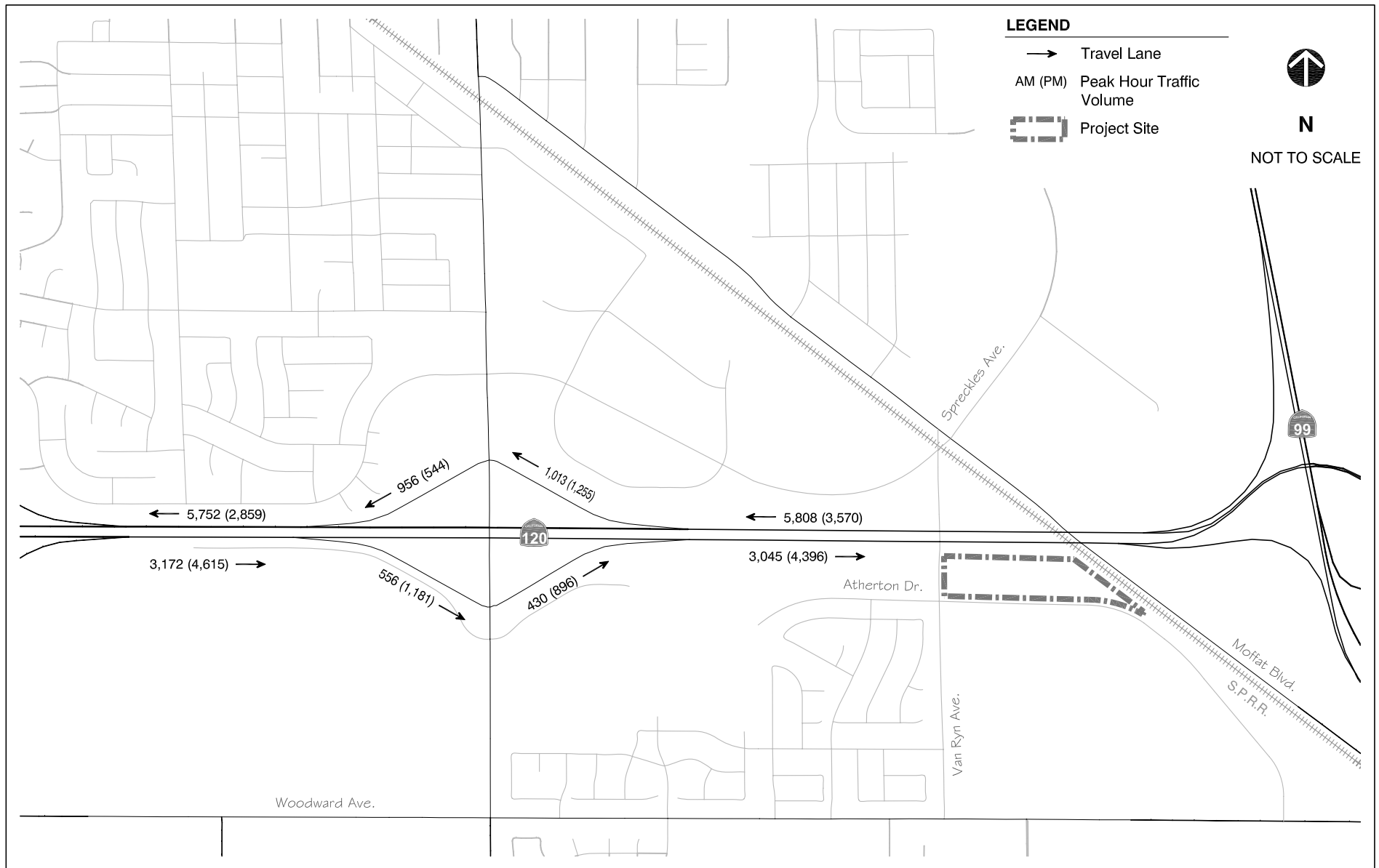
Existing Turning Movement Volumes + (2020 SJCOG Turning Movement Forecasts – 2007 SJCOG Turning Movement Forecasts)

Figure 11 presents the AM and PM peak hour turning movement volumes for Cumulative No Project conditions at the study intersections. Figure 12 presents the peak hour volume forecasts for freeway ramps and mainline segments. The trip distribution pattern under Cumulative conditions was assumed to be unchanged from existing conditions (shown in Figures 7 and 8). By adding the project trips shown in Figure 8 to the Cumulative No Project traffic volumes, Cumulative Plus Project traffic volumes were developed, as shown on Figures 13 and 14.









ROADWAY IMPROVEMENTS

The City of Manteca General Plan identifies a set of roadway improvements will provide acceptable traffic operations commensurate with buildout of the Land Use Element. The Public Facilities Implementation Plan (PFIP) is the document that defines how the General Plan Circulation Element is funded and implemented. As mentioned in Chapter 3, the PFIP is currently being updated to develop a fee and capitol improvement plan that will provide adequate infrastructure to 2023 conditions. However, since the final PFIP has not been adopted by the City Council, the majority of the improvements contained in the PFIP update are not assumed to be constructed under cumulative conditions.

The only local roadway projects assumed to be complete under Cumulative conditions is the extension of Atherton Drive between Union Road and Main Street with a new intersection at Atherton Drive/Main Street and minor intersection improvements at Main Street/Woodward Avenue. Additionally, it is assumed that the west side of Main Street will be widened to accommodate two southbound through lanes between SR 120 and Woodward Avenue. These improvements are assumed to be in place as a result of the development of the Promenade Lifestyle Center (along Atherton Drive between Union Road and Main Street) and other reasonably foreseeable development along the west side of Main Street. Also, it is assumed that the widening of Yosemite Avenue between Powers Avenue and Spreckels Avenue will be complete under 2020 conditions.

In addition to the local roadway improvements, SJCOG plans to widen SR 120 from four to six lanes between I-5 and SR 99. This improvement is identified as a Tier 1 project on the SJCOG Regional Transportation plan and will be funded through a combination of regional transportation impact fees and the recently passed Measure K local option transportation sales tax. This project is also assumed to be complete under Cumulative conditions.

The 2007 SJCOG RTP also lists improvements to the SR 120/Main Street interchange as a Tier 1 project. However, a portion of the funding for this project is incorporated in the pending PFIP update. As with other PFIP funded projects, this interchange is not assumed to be improved under Cumulative Conditions as the updated PFIP has not yet been adopted by the Manteca City Council.

IMPACT ANALYSIS

The Cumulative No Project and Plus Project Conditions traffic volume forecasts were evaluated using the LOS analysis methodologies described in Chapter 4. The results are presented below. If a project impact is identified, a mitigation measure is recommended to reduce the significance of the impact.

Intersection LOS Analysis

Table 14 presents the results of the AM peak hour and PM peak hour intersection LOS analysis under Cumulative conditions. Appendix A contains the corresponding calculation sheets.

As shown in Table 14, the following intersections are expected to operate at an unacceptable LOS during the AM or PM peak hour and meet the peak hour signal warrant (if applicable) under Cumulative Plus Project conditions:

- Main Street / Westbound SR 120 Ramps
- Main Street / Eastbound SR 120 Ramps
- Main Street / Woodward Avenue
- Van Ryn Avenue / Atherton Drive

**TABLE 14:
CUMULATIVE CONDITIONS INTERSECTION LOS AND SIGNAL WARRANTS**

Intersection	Peak Hour	No Project		With Project		Meets Warrant
		Delay ²	LOS ³	Delay ²	LOS ³	
1. Main St. / SR 120 Westbound Ramps	AM	84	F	99	F	N/A
	PM	118	F	124	F	N/A
2. Main St. / SR 120 Eastbound Ramps	AM	44	D	60	E	N/A
	PM	>200	F	>200	F	N/A
3. Main St. / Atherton Dr.	AM	13	B	20	C	N/A
	PM	34	C	34	C	N/A
4. Main St. / Woodward Ave.	AM	36	E	36	E	Yes
	PM	>200	F	>200	F	Yes
5. Spreckels Ave. / Yosemite Ave.	AM	22	C	22	C	N/A
	PM	40	D	41	D	N/A
6. Spreckels Ave. / Moffat Blvd.	AM	25	C	34	C	N/A
	PM	30	C	31	C	N/A
7. Van Ryn Ave. / Driveway	AM	13	B	18	C	No
	PM	14	B	31	D	No
8. Van Ryn Ave. / Atherton Dr.	AM	11	B	13	C	No
	PM	34	D	53	F	Yes
9. Project Driveway #1 / Atherton Dr.	AM	10	B	12	B	No
	PM	17	C	21	C	No
10. Project Driveway #2 / Atherton Dr.	AM	N/A	N/A	9	A	No
	PM	N/A	N/A	9	A	No

Notes:

¹ Whole intersection weighted average control delay expressed in seconds per vehicle using methodology described in the 2000 *Highway Capacity Manual*. For side-street stop-controlled intersections, delay for the highest delayed approach is shown.

³ LOS = Level of service. For side-street stop-controlled intersections, LOS for the highest delayed approach movement is shown.

Bold highlighting denotes intersections with unacceptable operations (LOS E or F) and that also meet peak-hour volume warrants. Shading indicates a significant project impact.

Source: Fehr & Peers, 2008.

Peak Hour Signal Warrants

Peak hour signal warrant analyses were conducted for the five unsignalized study intersections. The analysis applied the peak hour traffic signal warrant recommended in the MUTCD and associated State of California (Caltrans) guidelines. The results of the peak hour signal warrant analysis, shown in Table 14, indicate that all of the non-project driveway unsignalized intersections meet the peak hour warrant under cumulative conditions. Appendix B includes the corresponding calculation sheets.

Because project traffic is expected to either degrade intersection operations, or exacerbate unacceptable intersection operations, while meeting peak hour signal warrants under Cumulative conditions, these are considered significant impacts.

IMPACT 1 *Project trips exacerbate a transportation system deficiency under Cumulative conditions at the Main Street/Westbound SR 120 Off-Ramp intersection. This impact is considered **significant**.*

Mitigation Measure 1: The City of Manteca and Caltrans are currently preparing a Project Study Report (PSR) for future interchange improvements at Main Street/SR 120. As part of the improvements, the ramp terminal intersections would be designed to provide acceptable LOS D or better operations under 2020 conditions. The future design of the ramp terminal intersections is not yet finalized, but based on the PSR for the Union Road/SR 120 interchange (which is very similar), the design would either be a spread diamond design with dual left-turn lanes, and dedicated right-turn lanes, or a partial cloverleaf design with a northbound to westbound loop on-ramp.

As mentioned above, this improvement is considered a Tier 1 funded improvement in the SJCOG RTP; however, it is dependent on the adoption of the PFIP by the City Council. Since the PFIP has not yet been adopted, the project can mitigate its impact as follows:

- Pay the current PFIP fee in place at time of building permit approval;
- If the PFIP fee in place at time of building permit approval is known by the City to not fully fund the cost of the interchange improvements, then the project applicant shall also pay his fair-share of the unfunded portion of the interchange improvements.

By completing the mitigations described above, the project will be contributing its fair share toward mitigating the project's cumulative impact at this location. Therefore this impact is considered **less than significant with mitigation**.

IMPACT 2 *Project trips exacerbate a transportation system deficiency under Cumulative conditions at the Main Street / Eastbound SR 120 Off-Ramp intersection. This impact is considered **significant**.*

Mitigation Measure 2: The City of Manteca and Caltrans are currently preparing a Project Study Report (PSR) for future interchange improvements at Main Street/SR 120. As part of the improvements, the ramp terminal intersections would be designed to provide acceptable LOS D or better operations under 2020 conditions. The future design of the ramp terminal intersections is not yet finalized, but based on the PSR for the Union Road/SR 120 interchange (which is very similar), the design would likely include dual left-turn lanes and dedicated right-turn lanes.

As mentioned above, this improvement is considered a Tier 1 funded improvement in the SJCOG RTP; however, it is dependent on the adoption of the PFIP by the City Council. Since the PFIP has not yet been adopted, the project can mitigate its impact as follows:

- Pay the current PFIP fee in place at time of building permit approval;
- If the PFIP fee in place at time of building permit approval is known by the City to not fully fund the cost of the interchange improvements, then the project applicant shall also pay his fair-share of the unfunded portion of the interchange improvements.

By completing the mitigations described above, the project will be contributing its fair share toward mitigating the project's cumulative impact at this location. Therefore this impact is considered **less than significant with mitigation**.

IMPACT 3 *Project trips exacerbate a transportation system deficiency under Cumulative conditions at the Main Street/Woodward Avenue intersection. This impact is considered **significant**.*

Mitigation Measure 3: The updated PFIP includes improvements at this intersection that would provide acceptable operations under 2020 conditions. The proposed improvements are as follows:

- Traffic signal.
- Two through lanes and dual left-turn lanes on northbound and westbound approaches.
- Two through lanes with a single left- and right-turn lane on the eastbound approach.
- Two through lanes, dual left-turn lanes, and a right-turn lane the southbound approach.

Since the PFIP has not yet been adopted, the project can mitigate its impact as follows:

- Pay the current PFIP fee in place at time of building permit approval;
- If the PFIP fee in place at time of building permit approval is known by the City to not fully fund the cost of the intersection improvements listed above, then the project applicant shall also pay his fair-share of the unfunded portion of the improvements.

By completing the mitigations described above, the project will be contributing its fair share toward mitigating the project's cumulative impact at this location. Therefore this impact is considered **less than significant with mitigation**.

IMPACT 4 *Project trips degrade intersection operations to an unacceptable level under Cumulative conditions at the Van Ryn Avenue/Atherton Drive intersection. This impact is considered **significant**.*

Mitigation Measure 4: The updated PFIP includes signalization at this intersection, which would provide acceptable operations. Since the PFIP has not yet been adopted, the project can mitigate its impact as follows:

- Pay the current PFIP fee in place at time of building permit approval;
- If the PFIP fee in place at time of building permit approval is known by the City to not fully fund the cost of the intersection improvements listed above, then the project applicant shall also pay his fair-share of the unfunded portion of the improvements.

By completing the mitigations described above, the project will be contributing its fair share toward mitigating the project's cumulative impact at this location. Therefore this impact is considered **less than significant with mitigation**.

Roadway Segment LOS Analysis

Table 15 presents the results of the roadway segment LOS analysis under Cumulative conditions with and without the project. The LOS calculations indicate that all roadway segments are expected to operate at an acceptable LOS, except for the following segments, which operate at an unacceptable LOS F with and without the project:

- Main Street between SR 120 and Woodward Avenue

TABLE 15: CUMULATIVE CONDITIONS ROADWAY LOS				
Roadway Segment	No Project		With Project	
	Volume ¹	LOS	Volume ¹	LOS
1. Main Street north of SR 120	19,685	C	19,740	C
2. Main Street between SR 120 and Woodward Avenue	21,785	F	22,298	F
3. Woodward Ave. west of Main St.	10,195	C	10,195	C
4. Main St. south of Woodward Ave.	10,245	C	10,300	C
5. Woodward Ave. between Main St. and Van Ryn Ave.	12,420	D	12,440	D
6. Woodward Ave. between Van Ryn Ave. and Atherton Dr.	9,900	C	9,900	C
7. Yosemite Ave. west of Spreckels Ave.	14,365	C	14,590	C
8. Yosemite Ave. between Spreckels Ave. and SR 99	19,775	C	20,008	C
9. Spreckels Ave. between Yosemite Ave. and Moffat Blvd.	10,968	C	11,455	C
10. Van Ryn Ave. between Industrial Park Dr. and Atherton Dr.	11,780	C	12,353	D
11. Van Ryn Ave. between Atherton Dr. and Woodward Ave.	4,205	C	4,215	C
Notes: ¹ Average daily traffic. ² Portions of this roadway segment are widened to 3 or 4 lanes. Bold highlighting denotes roadway segments with unacceptable operations (LOS E or F). Shading indicates a significant project impact. Source: Fehr & Peers, 2008.				

IMPACT 5 *Project trips exacerbate a transportation system deficiency under Cumulative conditions on Main Street between SR 120 and Woodward Avenue. This impact is considered **significant**.*

Mitigation Measure 5: The PFIP includes a project to widen the segment of Main Street between SR 120 and Woodward Avenue to six lanes. Since the PFIP has not yet been adopted, the project can mitigate its impact as follows:

- Pay the current PFIP fee in place at time of building permit approval;

- If the PFIP fee in place at time of building permit approval is known by the City to not fully fund the cost of the improvement listed above, then the project applicant shall also pay his fair-share of the unfunded portion of the improvements.

By completing the mitigations described above, the project will be contributing its fair share toward mitigating the project's cumulative impact at this location. Therefore this impact is considered **less than significant with mitigation**.

Freeway Mainline Segment LOS Analysis

Table 16 presents the results of the freeway mainline LOS analysis under Cumulative conditions with and without the proposed project. Appendix C contains the corresponding LOS calculation sheets. The LOS calculations indicate that all mainline segments of SR 120 and SR 99 operate at acceptable levels during the AM and PM peak hours.

TABLE 16: CUMULATIVE CONDITIONS FREEWAY MAINLINE LOS						
Travel Direction	Segment	Peak Hour	No Project		With Project	
			Density ¹	LOS	Density ¹	LOS
SR 120 Eastbound	Union Rd. to Main St.	AM	20	C	20	C
		PM	30	D	30	D
	Main St. to SR 99	AM	20	C	20	C
		PM	28	D	28	D
SR 120 Westbound	SR 99 to Main St.	AM	41	E ²	41	E ²
		PM	23	C	23	C
	Main St. to Union Rd.	AM	40	E ²	41	E ²
		PM	18	C	18	C
Notes: ¹ Density reported in vehicles per mile per lane. ² Based on the SJCOG CMP, LOS F is the acceptable standard on this section of SR 120. ³ Weaving section. Density in weaving sections is provided for informational purposes only and is not used as LOS threshold. Bold highlighting denotes mainline segments with unacceptable operations (LOS E or F). Shading indicates a significant project impact. Source: Fehr & Peers, 2008.						

Even though no impacts were identified on the freeway mainline, the updated PFIP will include funding to construct new interchanges at Union Road/SR 120 and Main Street/SR 120. As part of these interchange improvements, auxiliary lanes will be constructed in the westbound direction of SR 120 between Main Street and Union Road. This auxiliary lane will improve the peak hour LOS to D or better conditions at all study mainline locations, which is a positive secondary impact of mitigation measures one and two.

Ramp Junction LOS Analysis

Table 17 presents the results of the LOS analysis for ramp junctions under Cumulative conditions, with and without the proposed project. Appendix C contains the corresponding calculation sheets. The LOS calculations

indicate that all ramp junctions currently operate at an acceptable LOS D or better during both AM and PM peak hours.

**TABLE 17:
CUMULATIVE CONDITIONS RAMP JUNCTION LOS**

Travel Direction	Ramp	Merge/Diverge	Peak Hour	No Project		With Project	
				Density ¹	LOS	Density ¹	LOS
SR 120 Eastbound	Main St.	Diverge (Off-ramp)	AM	22	C	23	C
			PM	31	D	31	D
		Merge (On-ramp)	AM	20	B	20	B
			PM	28	D	28	D
SR 120 Westbound	Main St.	Diverge (Off-ramp)	AM	38	E ²	38	E ²
			PM	28	D	28	D
		Merge (On-ramp)	AM	35	E ²	35	E ²
			PM	19	B	19	B

Notes:

¹ Density reported in vehicles per mile per lane.

² Based on the SJCOG CMP, LOS F is the acceptable standard on this section of SR 120.

³ Weaving section. Density in weaving sections is provided for informational purposes only and is not used as LOS threshold.

Bold highlighting denotes mainline segments with unacceptable operations (LOS E or F). Shading indicates a significant project impact.

Source: Fehr & Peers, 2008.

Even though no impacts were identified on the freeway mainline, the updated PFIP will include funding to construct new interchanges at Union Road/SR 120 and Main Street/SR 120. As part of these interchange improvements, auxiliary lanes will be constructed in the westbound direction of SR 120 between Main Street and Union Road. This auxiliary lane will improve the peak hour LOS to D or better conditions at all study mainline locations, which is a positive secondary impact of mitigation measures one and two.

BICYCLE AND PEDESTRIAN IMPACT ANALYSIS

Currently, there are no bicycle or pedestrian facilities along Atherton Drive in front of the project. Typical activities (biking to work, exercising, walking dogs, etc.) may create an unmet demand for bicycle and pedestrian facilities along Atherton Drive.

IMPACT 6 *The project would generate bicycle and pedestrian trips that are not served by any infrastructure along Atherton Drive. This impact is considered **significant**.*

Mitigation Measure 6: The project applicant shall pay the fair share cost of extending the Class 1 bicycle path along the north side of Atherton Drive along the project frontage. In addition the project shall pay a fair share toward the installation of a sidewalk along the south side of Atherton Drive and the east side of Van Ryn Avenue along the project frontage. By paying a fair share toward the construction of bicycle and pedestrian facilities near the project site, this impact would be **less than significant with mitigation**.

APPENDIX A:
INTERSECTION LOS CALCULATION WORKSHEETS

Tesoro Apartments
1: SR 120 WB Ramp & Main Street

Existing Conditions
AM

												
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	1583	1770	1863			1863	1583
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1770	1583	1770	1863			1863	1583
Volume (vph)	0	0	0	60	0	540	130	320	0	0	400	400
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	0	0	65	0	587	141	348	0	0	435	435
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	87
Lane Group Flow (vph)	0	0	0	0	65	587	141	348	0	0	435	348
Turn Type				Perm		Free	Prot					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		Free						6
Actuated Green, G (s)					5.9	100.0	13.6	86.1			68.5	68.5
Effective Green, g (s)					5.9	100.0	13.6	86.1			68.5	68.5
Actuated g/C Ratio					0.06	1.00	0.14	0.86			0.68	0.68
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)					104	1583	241	1604			1276	1084
v/s Ratio Prot							c0.08	0.19			0.23	
v/s Ratio Perm					0.04	c0.37						0.22
v/c Ratio					0.62	0.37	0.59	0.22			0.34	0.32
Uniform Delay, d1					46.0	0.0	40.6	1.2			6.5	6.4
Progression Factor					1.00	1.00	0.71	0.02			1.00	1.00
Incremental Delay, d2					11.1	0.7	3.5	0.2			0.7	0.8
Delay (s)					57.1	0.7	32.3	0.2			7.2	7.1
Level of Service					E	A	C	A			A	A
Approach Delay (s)		0.0			6.3			9.5			7.2	
Approach LOS		A			A			A			A	
Intersection Summary												
HCM Average Control Delay			7.4									
HCM Volume to Capacity ratio			0.42									
Actuated Cycle Length (s)			100.0									
Intersection Capacity Utilization			46.5%									
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
2: SR 120 EB Ramps & Main Street

Existing Conditions

AM

												
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	
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)		1770	1583					1788		1770	1863	
Flt Permitted		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (perm)		1770	1583					1788		1770	1863	
Volume (vph)	285	0	70	0	0	0	0	165	70	140	320	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)	310	0	76	0	0	0	0	179	76	152	348	0
RTOR Reduction (vph)	0	0	60	0	0	0	0	10	0	0	0	0
Lane Group Flow (vph)	0	310	16	0	0	0	0	245	0	152	348	0
Turn Type	Perm		Perm						Prot			
Protected Phases	4						2		1		6	
Permitted Phases	4		4									
Actuated Green, G (s)	21.2		21.2				53.5		13.3		70.8	
Effective Green, g (s)	21.2		21.2				53.5		13.3		70.8	
Actuated g/C Ratio	0.21		0.21				0.54		0.13		0.71	
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)	375		336				957		235		1319	
v/s Ratio Prot							0.14		c0.09		c0.19	
v/s Ratio Perm	0.18		0.01									
v/c Ratio	0.83		0.05				0.26		0.65		0.26	
Uniform Delay, d1	37.6		31.4				12.5		41.1		5.2	
Progression Factor	1.00		1.00				1.00		0.77		0.39	
Incremental Delay, d2	13.8		0.1				0.6		5.8		0.5	
Delay (s)	51.5		31.4				13.2		37.5		2.5	
Level of Service	D		C				B		D		A	
Approach Delay (s)	47.5				0.0		13.2				13.1	
Approach LOS	D				A		B				B	
Intersection Summary												
HCM Average Control Delay			24.8		HCM Level of Service				C			
HCM Volume to Capacity ratio			0.44									
Actuated Cycle Length (s)			100.0		Sum of lost time (s)				8.0			
Intersection Capacity Utilization			46.5%		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.

Tesoro Apartments
5: Yosemite Avenue & Cottage Ave.

Existing Conditions
AM

												
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	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	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	1863	1583	1770	1863	1583	1770	1773	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	1863	1583	1770	1863	1583	1770	1773	
Volume (vph)	49	245	38	100	261	82	26	73	111	168	93	44
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)	53	266	41	109	284	89	28	79	121	183	101	48
RTOR Reduction (vph)	0	0	34	0	0	69	0	0	73	0	15	0
Lane Group Flow (vph)	53	266	7	109	284	20	28	79	48	183	134	0
Turn Type	Prot		Perm	Prot		Perm	Prot		pm+ov		Prot	
Protected Phases	7	4		3	8		5	2	3		1	6
Permitted Phases			4			8			2			
Actuated Green, G (s)	4.1	10.0	10.0	6.9	12.8	12.8	2.3	16.1	23.0	8.7	22.5	
Effective Green, g (s)	4.1	10.0	10.0	6.9	12.8	12.8	2.3	16.1	23.0	8.7	22.5	
Actuated g/C Ratio	0.07	0.17	0.17	0.12	0.22	0.22	0.04	0.28	0.40	0.15	0.39	
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	
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	
Lane Grp Cap (vph)	126	613	274	212	413	351	71	520	741	267	691	
v/s Ratio Prot	0.03	0.08		c0.06	c0.15		0.02	0.04	0.01	c0.10	c0.08	
v/s Ratio Perm			0.00			0.01			0.02			
v/c Ratio	0.42	0.43	0.03	0.51	0.69	0.06	0.39	0.15	0.07	0.69	0.19	
Uniform Delay, d1	25.7	21.3	19.8	23.8	20.6	17.7	27.0	15.7	10.7	23.2	11.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.3	0.5	0.0	2.1	4.7	0.1	3.6	0.1	0.0	7.1	0.1	
Delay (s)	27.9	21.8	19.8	25.9	25.3	17.8	30.6	15.8	10.7	30.3	11.8	
Level of Service	C	C	B	C	C	B	C	B	B	C	B	
Approach Delay (s)		22.5			24.1			14.9			22.0	
Approach LOS		C			C			B			C	
Intersection Summary												
HCM Average Control Delay			21.7			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.46									
Actuated Cycle Length (s)			57.7			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			43.6%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
6: Moffat Blvd. & Spreckels Rd.

Existing Conditions
AM

												
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	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		0.97	0.95	
Frt	1.00	0.95		1.00	0.93		1.00	0.97		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1768		1770	1742		1770	3437		3433	3369	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1768		1770	1742		1770	3437		3433	3369	
Volume (vph)	33	61	31	26	90	69	35	132	31	35	78	37
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)	36	66	34	28	98	75	38	143	34	38	85	40
RTOR Reduction (vph)	0	12	0	0	18	0	0	24	0	0	36	0
Lane Group Flow (vph)	36	88	0	28	155	0	38	153	0	38	89	0
Turn Type	Prot			Prot			Split			Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases												
Actuated Green, G (s)	3.1	33.0		2.9	32.8		7.2	7.2		6.3	6.3	
Effective Green, g (s)	3.1	33.0		2.9	32.8		7.2	7.2		6.3	6.3	
Actuated g/C Ratio	0.05	0.50		0.04	0.50		0.11	0.11		0.10	0.10	
Clearance Time (s)	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	
Lane Grp Cap (vph)	84	892		78	874		195	378		331	325	
v/s Ratio Prot	c0.02	0.05		0.02	c0.09		0.02	c0.04		0.01	c0.03	
v/s Ratio Perm												
v/c Ratio	0.43	0.10		0.36	0.18		0.19	0.40		0.11	0.27	
Uniform Delay, d1	30.3	8.4		30.3	8.9		26.5	27.1		27.0	27.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.5	0.2		2.8	0.4		0.5	0.7		0.2	0.5	
Delay (s)	33.8	8.7		33.2	9.4		27.0	27.8		27.2	27.9	
Level of Service	C	A		C	A		C	C		C	C	
Approach Delay (s)		15.3			12.7			27.7			27.7	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM Average Control Delay			21.1			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.24									
Actuated Cycle Length (s)			65.4			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			33.6%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	19	28	7	189	103	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	30	8	205	112	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh)	0					
Upstream signal (ft)	1137					
pX, platoon unblocked						
vC, conflicting volume	335	115	117			
vC1, stage 1 conf vol	115					
vC2, stage 2 conf vol	221					
vCu, unblocked vol	335	115	117			
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 %	96	97	99			
cM capacity (veh/h)	512	938	1471			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	51	8	205	117		
Volume Left	21	8	0	0		
Volume Right	30	0	0	5		
cSH	702	1471	1700	1700		
Volume to Capacity	0.07	0.01	0.12	0.07		
Queue Length 95th (ft)	6	0	0	0		
Control Delay (s)	10.5	7.5	0.0	0.0		
Lane LOS	B	A				
Approach Delay (s)	10.5	0.3		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization	19.9%		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.

Tesoro Apartments
1: SR 120 WB Ramp & Main Street

Existing Conditions

PM

												
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	1583	1770	1863			1863	1583
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1770	1583	1770	1863			1863	1583
Volume (vph)	0	0	0	290	0	300	145	315	0	0	400	115
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	0	0	315	0	326	158	342	0	0	435	125
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	33
Lane Group Flow (vph)	0	0	0	0	315	326	158	342	0	0	435	92
Turn Type				Split		Free	Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases						Free						6
Actuated Green, G (s)					21.1	100.0	11.4	70.9			55.5	55.5
Effective Green, g (s)					21.1	100.0	11.4	70.9			55.5	55.5
Actuated g/C Ratio					0.21	1.00	0.11	0.71			0.56	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)					373	1583	202	1321			1034	879
v/s Ratio Prot					c0.18		c0.09	0.18			c0.23	
v/s Ratio Perm						0.21						0.06
v/c Ratio					0.84	0.21	0.78	0.26			0.42	0.10
Uniform Delay, d1					37.9	0.0	43.1	5.2			12.9	10.5
Progression Factor					1.00	1.00	0.96	0.37			1.00	1.00
Incremental Delay, d2					15.9	0.3	17.5	0.1			1.3	0.2
Delay (s)					53.8	0.3	58.7	2.0			14.2	10.7
Level of Service					D	A	E	A			B	B
Approach Delay (s)		0.0			26.6			19.9			13.4	
Approach LOS		A			C			B			B	
Intersection Summary												
HCM Average Control Delay			20.3									
HCM Volume to Capacity ratio			0.57									
Actuated Cycle Length (s)			100.0									
Intersection Capacity Utilization			55.2%									
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
2: SR 120 EB Ramps & Main Street

Existing Conditions

PM

												
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	
Frt		1.00	0.85					0.93		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1770	1583					1726		1770	1863	
Flt Permitted		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (perm)		1770	1583					1726		1770	1863	
Volume (vph)	360	0	210	0	0	0	0	100	120	205	485	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)	391	0	228	0	0	0	0	109	130	223	527	0
RTOR Reduction (vph)	0	0	170	0	0	0	0	30	0	0	0	0
Lane Group Flow (vph)	0	391	58	0	0	0	0	209	0	223	527	0
Turn Type	Split		Perm							Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases			4									
Actuated Green, G (s)		25.5	25.5					44.1		18.4	66.5	
Effective Green, g (s)		25.5	25.5					44.1		18.4	66.5	
Actuated g/C Ratio		0.26	0.26					0.44		0.18	0.66	
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)		451	404					761		326	1239	
v/s Ratio Prot		c0.22						0.12		c0.13	c0.28	
v/s Ratio Perm			0.04									
v/c Ratio		0.87	0.14					0.27		0.68	0.43	
Uniform Delay, d1		35.6	28.8					17.8		38.1	7.8	
Progression Factor		1.00	1.00					1.00		0.58	1.07	
Incremental Delay, d2		15.9	0.2					0.9		5.4	0.8	
Delay (s)		51.6	29.0					18.7		27.5	9.1	
Level of Service		D	C					B		C	A	
Approach Delay (s)		43.2			0.0			18.7			14.6	
Approach LOS		D			A			B			B	
Intersection Summary												
HCM Average Control Delay			26.2					HCM Level of Service			C	
HCM Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			100.0					Sum of lost time (s)		8.0		
Intersection Capacity Utilization			55.2%					ICU Level of Service		B		
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.

Tesoro Apartments
5: Yosemite Avenue & Cottage Ave.

Existing Conditions

PM

												
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	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	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	1863	1583	1770	1863	1583	1770	1789	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	1863	1583	1770	1863	1583	1770	1789	
Volume (vph)	67	447	112	116	368	104	114	222	197	170	189	68
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)	73	486	122	126	400	113	124	241	214	185	205	74
RTOR Reduction (vph)	0	0	88	0	0	76	0	0	108	0	14	0
Lane Group Flow (vph)	73	486	34	126	400	37	124	241	106	185	265	0
Turn Type	Prot		Perm	Prot		Perm	Prot		pm+ov		Prot	
Protected Phases	7	4		3	8		5	2	3		1	6
Permitted Phases			4			8			2			
Actuated Green, G (s)	4.1	18.6	18.6	7.7	22.2	22.2	7.5	15.1	22.8	9.5	17.1	
Effective Green, g (s)	4.1	18.6	18.6	7.7	22.2	22.2	7.5	15.1	22.8	9.5	17.1	
Actuated g/C Ratio	0.06	0.28	0.28	0.12	0.33	0.33	0.11	0.23	0.34	0.14	0.26	
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	
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	
Lane Grp Cap (vph)	108	984	440	204	618	525	198	420	634	251	457	
v/s Ratio Prot	0.04	0.14		c0.07	c0.21		0.07	0.13	0.02	c0.10	c0.15	
v/s Ratio Perm			0.02			0.02			0.05			
v/c Ratio	0.68	0.49	0.08	0.62	0.65	0.07	0.63	0.57	0.17	0.74	0.58	
Uniform Delay, d1	30.7	20.2	17.8	28.2	19.0	15.3	28.4	23.0	15.4	27.5	21.8	
Progression Factor	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	15.5	0.4	0.1	5.5	2.3	0.1	6.1	1.9	0.1	10.7	1.8	
Delay (s)	46.2	20.6	17.9	33.7	21.4	15.4	34.4	24.9	15.5	38.2	23.5	
Level of Service	D	C	B	C	C	B	C	C	B	D	C	
Approach Delay (s)		22.9			22.7			23.5			29.4	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			24.3				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			66.9				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			57.5%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
6: Moffat Blvd. & Spreckels Rd.

Existing Conditions

PM

												
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		1.00	0.95		0.97	0.95	
Frt	1.00	1.00	0.85	1.00	0.92		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	1719		1770	3423		3433	3382	
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	1719		1770	3423		3433	3382	
Volume (vph)	106	128	42	17	99	105	47	237	66	111	230	97
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)	115	139	46	18	108	114	51	258	72	121	250	105
RTOR Reduction (vph)	0	0	30	0	39	0	0	27	0	0	49	0
Lane Group Flow (vph)	115	139	16	18	183	0	51	303	0	121	306	0
Turn Type	Prot		Perm	Prot			Split			Split		
Protected Phases	1	6		5	2		4	4		8	8	
Permitted Phases			6									
Actuated Green, G (s)	7.0	17.0	17.0	1.0	11.0		7.8	7.8		8.0	8.0	
Effective Green, g (s)	7.0	17.0	17.0	1.0	11.0		7.8	7.8		8.0	8.0	
Actuated g/C Ratio	0.14	0.34	0.34	0.02	0.22		0.16	0.16		0.16	0.16	
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)	249	636	540	36	380		277	536		551	543	
v/s Ratio Prot	c0.06	0.07		0.01	c0.11		0.03	c0.09		0.04	c0.09	
v/s Ratio Perm			0.01									
v/c Ratio	0.46	0.22	0.03	0.50	0.48		0.18	0.57		0.22	0.56	
Uniform Delay, d1	19.7	11.7	10.9	24.2	16.9		18.2	19.4		18.2	19.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.4	0.2	0.0	10.5	1.0		0.3	1.4		0.2	1.3	
Delay (s)	21.0	11.8	10.9	34.7	17.9		18.6	20.8		18.4	20.6	
Level of Service	C	B	B	C	B		B	C		B	C	
Approach Delay (s)		15.2			19.1			20.5			20.1	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM Average Control Delay			19.0			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.52									
Actuated Cycle Length (s)			49.8			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			43.6%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	10	15	27	112	138	19
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	16	29	122	150	21
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh)	0					
Upstream signal (ft)	1203					
pX, platoon unblocked						
vC, conflicting volume	341	160	171			
vC1, stage 1 conf vol	160					
vC2, stage 2 conf vol	180					
vCu, unblocked vol	341	160	171			
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 %	98	98	98			
cM capacity (veh/h)	507	885	1407			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	27	29	122	171		
Volume Left	11	29	0	0		
Volume Right	16	0	0	21		
cSH	681	1407	1700	1700		
Volume to Capacity	0.04	0.02	0.07	0.10		
Queue Length 95th (ft)	3	2	0	0		
Control Delay (s)	10.5	7.6	0.0	0.0		
Lane LOS	B	A				
Approach Delay (s)	10.5	1.5		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay		1.5				
Intersection Capacity Utilization		25.1%		ICU Level of Service		A
Analysis Period (min)		15				

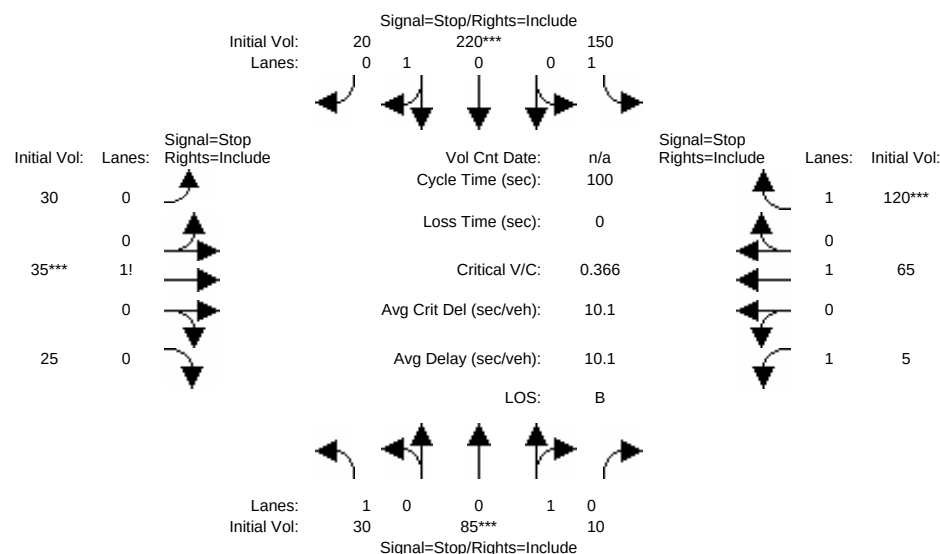
Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

Level Of Service Computation Report
2000 HCM 4-Way Stop (Future Volume Alternative)
AM

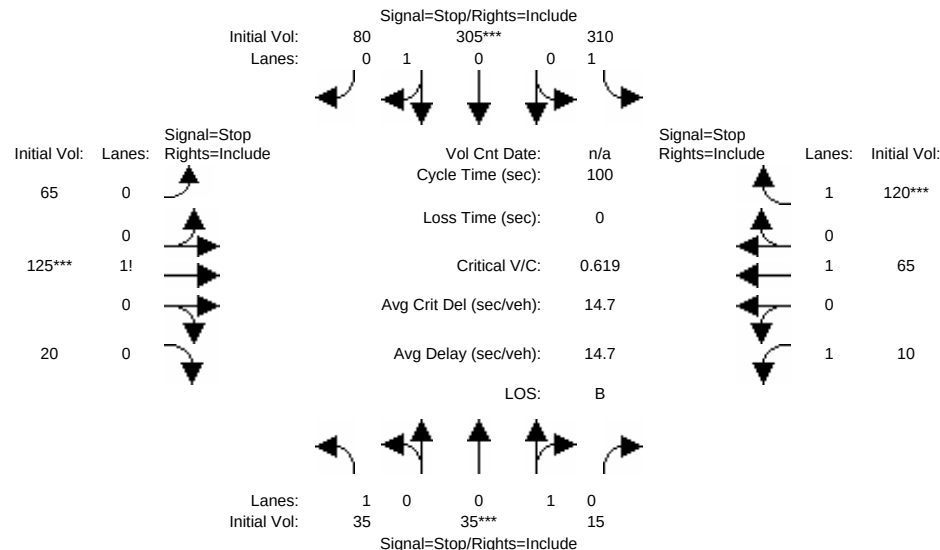
Intersection #41: Woodward/Main Ex



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:												
Base Vol:	30	85	10	150	220	20	30	35	25	5	65	120
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:	30	85	10	150	220	20	30	35	25	5	65	120
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:	30	85	10	150	220	20	30	35	25	5	65	120
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:	30	85	10	150	220	20	30	35	25	5	65	120
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	30	85	10	150	220	20	30	35	25	5	65	120
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
Final Volume:	30	85	10	150	220	20	30	35	25	5	65	120
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	0.89	0.11	1.00	0.92	0.08	0.33	0.39	0.28	1.00	1.00	1.00
Final Sat.:	555	546	64	594	601	55	190	222	159	531	575	648
Capacity Analysis Module:												
Vol/Sat:	0.05	0.16	0.16	0.25	0.37	0.37	0.16	0.16	0.16	0.01	0.11	0.19
Crit Moves:	****			****			****			****		
Delay/Veh:	9.2	9.3	9.3	10.5	11.0	11.0	10.0	10.0	10.0	9.2	9.3	9.0
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:	9.2	9.3	9.3	10.5	11.0	11.0	10.0	10.0	10.0	9.2	9.3	9.0
LOS by Move:	A	A	A	B	B	B	A	A	A	A	A	A
ApproachDel:	9.3			10.8			10.0			9.1		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	9.3			10.8			10.0			9.1		
LOS by Appr:	A			B			A			A		
AllWayAvgQ:	0.1	0.2	0.2	0.3	0.5	0.5	0.2	0.2	0.2	0.0	0.1	0.2

Level Of Service Computation Report
2000 HCM 4-Way Stop (Future Volume Alternative)
PM

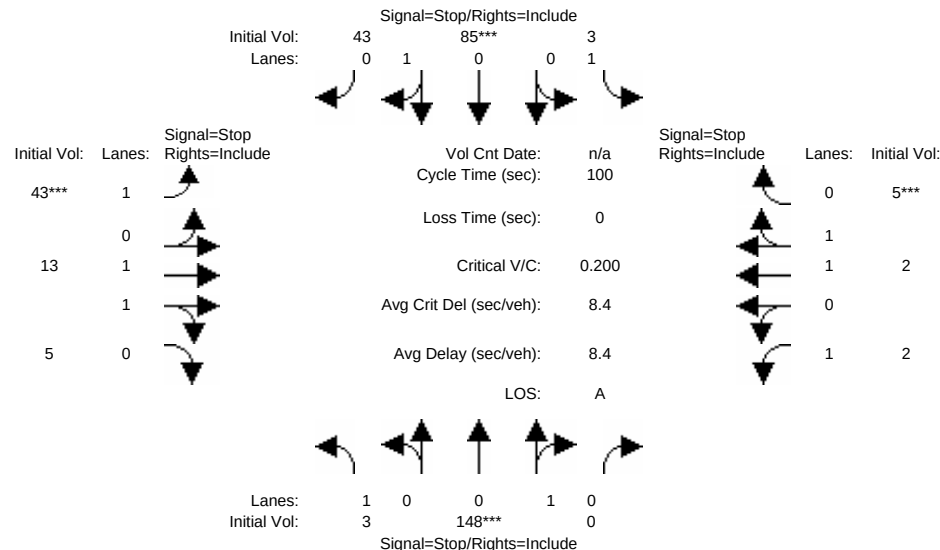
Intersection #41: Woodward/Main Ex



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:8												
Base Vol:	35	35	15	310	305	80	65	125	20	10	65	120
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:	35	35	15	310	305	80	65	125	20	10	65	120
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:	35	35	15	310	305	80	65	125	20	10	65	120
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:	35	35	15	310	305	80	65	125	20	10	65	120
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	35	35	15	310	305	80	65	125	20	10	65	120
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
Final Volume:	35	35	15	310	305	80	65	125	20	10	65	120
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	0.70	0.30	1.00	0.79	0.21	0.31	0.59	0.10	1.00	1.00	1.00
Final Sat.:	472	364	156	558	492	129	163	314	50	469	502	557
Capacity Analysis Module:												
Vol/Sat:	0.07	0.10	0.10	0.56	0.62	0.62	0.40	0.40	0.40	0.02	0.13	0.22
Crit Moves:	****			****			****			****		
Delay/Veh:	10.4	9.8	9.8	16.5	17.0	17.0	13.7	13.7	13.7	10.1	10.4	10.3
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:	10.4	9.8	9.8	16.5	17.0	17.0	13.7	13.7	13.7	10.1	10.4	10.3
LOS by Move:	B	A	A	C	C	C	B	B	B	B	B	B
ApproachDel:	10.1			16.8			13.7			10.4		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	10.1			16.8			13.7			10.4		
LOS by Appr:	B			C			B			B		
AllWayAvgQ:	0.1	0.1	0.1	1.2	1.5	1.5	0.6	0.6	0.6	0.0	0.1	0.2

Level Of Service Computation Report
2000 HCM 4-Way Stop (Future Volume Alternative)
AM

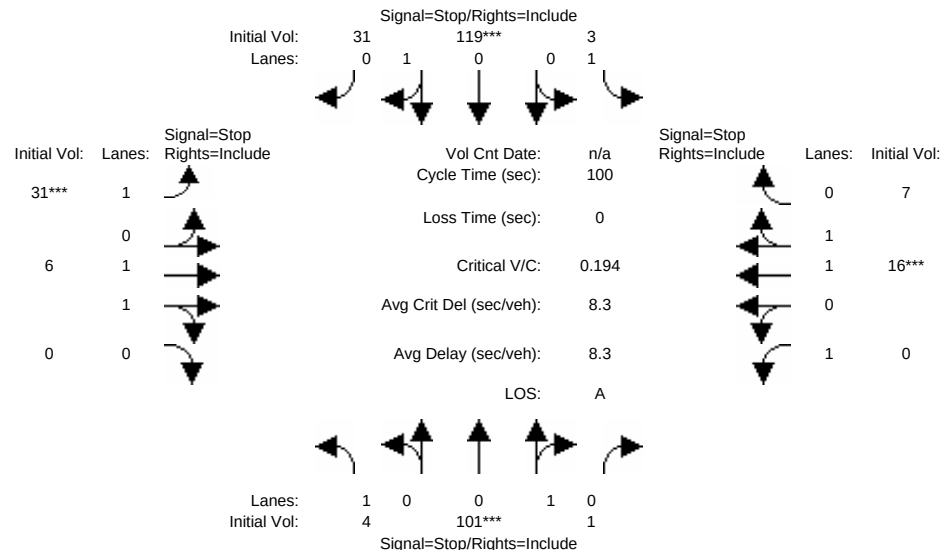
Intersection #81: Atherton/VanRyn Ex



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:												
Base Vol:	3	148	0	3	85	43	43	13	5	2	2	5
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:	3	148	0	3	85	43	43	13	5	2	2	5
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:	3	148	0	3	85	43	43	13	5	2	2	5
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:	3	148	0	3	85	43	43	13	5	2	2	5
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	3	148	0	3	85	43	43	13	5	2	2	5
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
Final Volume:	3	148	0	3	85	43	43	13	5	2	2	5
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	0.00	1.00	0.66	0.34	1.00	1.44	0.56	1.00	1.00	1.00
Final Sat.:	672	742	0	668	515	260	597	961	389	581	632	721
Capacity Analysis Module:												
Vol/Sat:	0.00	0.20	xxxx	0.00	0.17	0.17	0.07	0.01	0.01	0.00	0.00	0.01
Crit Moves:		****			****		****					****
Delay/Veh:	8.0	8.7	0.0	8.0	8.2	8.2	8.9	7.9	7.6	8.6	8.1	7.4
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:	8.0	8.7	0.0	8.0	8.2	8.2	8.9	7.9	7.6	8.6	8.1	7.4
LOS by Move:	A	A	*	A	A	A	A	A	A	A	A	A
ApproachDel:		8.6			8.2			8.6			7.8	
Delay Adj:		1.00			1.00			1.00			1.00	
ApprAdjDel:		8.6			8.2			8.6			7.8	
LOS by Appr:		A			A			A			A	
AllWayAvgQ:	0.0	0.2	0.2	0.0	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0

Level Of Service Computation Report
2000 HCM 4-Way Stop (Future Volume Alternative)
PM

Intersection #81: Atherton/VanRyn Ex



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:												
Base Vol:	4	101	1	3	119	31	31	6	0	0	16	7
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:	4	101	1	3	119	31	31	6	0	0	16	7
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:	4	101	1	3	119	31	31	6	0	0	16	7
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:	4	101	1	3	119	31	31	6	0	0	16	7
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	4	101	1	3	119	31	31	6	0	0	16	7
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
Final Volume:	4	101	1	3	119	31	31	6	0	0	16	7
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	0.99	0.01	1.00	0.79	0.21	1.00	2.00	0.00	1.00	1.39	0.61
Final Sat.:	674	738	7	679	614	160	601	1311	0	595	925	429
Capacity Analysis Module:												
Vol/Sat:	0.01	0.14	0.14	0.00	0.19	0.19	0.05	0.00	xxxx	0.00	0.02	0.02
Crit Moves:	****			****			****			****		
Delay/Veh:	8.0	8.2	8.2	8.0	8.4	8.4	8.7	7.9	0.0	0.0	7.9	7.6
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:	8.0	8.2	8.2	8.0	8.4	8.4	8.7	7.9	0.0	0.0	7.9	7.6
LOS by Move:	A	A	A	A	A	A	A	A	*	*	A	A
ApproachDel:	8.2			8.4			8.6			7.8		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	8.2			8.4			8.6			7.8		
LOS by Appr:	A			A			A			A		
AllWayAvgQ:	0.0	0.2	0.2	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0

Tesoro Apartments
1: SR 120 WB Ramp & Main Street

Existing + Project Conditions
AM

												
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	1583	1770	1863			1863	1583
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1770	1583	1770	1863			1863	1583
Volume (vph)	0	0	0	60	0	540	198	324	0	0	401	400
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	0	0	65	0	587	215	352	0	0	436	435
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	100
Lane Group Flow (vph)	0	0	0	0	65	587	215	352	0	0	436	335
Turn Type				Perm		Free	Prot					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		Free						6
Actuated Green, G (s)					5.9	100.0	18.3	86.1			63.8	63.8
Effective Green, g (s)					5.9	100.0	18.3	86.1			63.8	63.8
Actuated g/C Ratio					0.06	1.00	0.18	0.86			0.64	0.64
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)					104	1583	324	1604			1189	1010
v/s Ratio Prot							c0.12	0.19			0.23	
v/s Ratio Perm					0.04	c0.37						0.21
v/c Ratio					0.62	0.37	0.66	0.22			0.37	0.33
Uniform Delay, d1					46.0	0.0	38.0	1.2			8.6	8.3
Progression Factor					1.00	1.00	0.93	0.12			1.00	1.00
Incremental Delay, d2					11.1	0.7	4.9	0.2			0.9	0.9
Delay (s)					57.1	0.7	40.1	0.3			9.4	9.2
Level of Service					E	A	D	A			A	A
Approach Delay (s)		0.0			6.3			15.4			9.3	
Approach LOS		A			A			B			A	
Intersection Summary												
HCM Average Control Delay			10.0				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.45									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			50.3%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
2: SR 120 EB Ramps & Main Street

Existing + Project Conditions
AM

																		
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							
Frt		1.00	0.85					0.97		1.00	1.00							
Flt Protected		0.95	1.00					1.00		0.95	1.00							
Satd. Flow (prot)		1770	1583					1806		1770	1863							
Flt Permitted		0.95	1.00					1.00		0.95	1.00							
Satd. Flow (perm)		1770	1583					1806		1770	1863							
Volume (vph)	285	0	87	0	0	0	0	237	70	140	321	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)	310	0	95	0	0	0	0	258	76	152	349	0						
RTOR Reduction (vph)	0	0	75	0	0	0	0	7	0	0	0	0						
Lane Group Flow (vph)	0	310	20	0	0	0	0	327	0	152	349	0						
Turn Type	Perm		Perm						Prot									
Protected Phases			4								2		1		6			
Permitted Phases	4				4													
Actuated Green, G (s)			21.2		21.2								52.8		14.0		70.8	
Effective Green, g (s)			21.2		21.2								52.8		14.0		70.8	
Actuated g/C Ratio			0.21		0.21								0.53		0.14		0.71	
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)			375		336								954		248		1319	
v/s Ratio Prot													c0.18		c0.09		0.19	
v/s Ratio Perm			0.18		0.01													
v/c Ratio			0.83		0.06								0.34		0.61		0.26	
Uniform Delay, d1			37.6		31.4								13.6		40.5		5.2	
Progression Factor			1.00		1.00								1.00		1.04		0.95	
Incremental Delay, d2			13.8		0.1								1.0		4.2		0.5	
Delay (s)			51.5		31.5								14.6		46.3		5.5	
Level of Service			D		C								B		D		A	
Approach Delay (s)			46.8				0.0				14.6				17.8			
Approach LOS			D				A				B				B			
Intersection Summary																		
HCM Average Control Delay			26.4		HCM Level of Service				C									
HCM Volume to Capacity ratio			0.50															
Actuated Cycle Length (s)			100.0		Sum of lost time (s)				12.0									
Intersection Capacity Utilization			50.3%		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.

Tesoro Apartments
6: Moffat Blvd. & Spreckels Rd.

Existing + Project Conditions

AM

												
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	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		0.97	0.95	
Frt	1.00	0.95		1.00	0.93		1.00	0.98		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1766		1770	1742		1770	3461		3433	3382	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1766		1770	1742		1770	3461		3433	3382	
Volume (vph)	33	61	32	26	90	69	37	182	31	35	87	37
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)	36	66	35	28	98	75	40	198	34	38	95	40
RTOR Reduction (vph)	0	12	0	0	18	0	0	14	0	0	37	0
Lane Group Flow (vph)	36	89	0	28	155	0	40	218	0	38	98	0
Turn Type	Prot			Prot			Split			Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases												
Actuated Green, G (s)	5.1	51.0		3.4	49.3		21.6	21.6		8.0	8.0	
Effective Green, g (s)	5.1	51.0		3.4	49.3		21.6	21.6		8.0	8.0	
Actuated g/C Ratio	0.05	0.51		0.03	0.49		0.22	0.22		0.08	0.08	
Clearance Time (s)	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	
Lane Grp Cap (vph)	90	901		60	859		382	748		275	271	
v/s Ratio Prot	c0.02	0.05		0.02	c0.09		0.02	c0.06		0.01	c0.03	
v/s Ratio Perm												
v/c Ratio	0.40	0.10		0.47	0.18		0.10	0.29		0.14	0.36	
Uniform Delay, d1	46.0	12.6		47.4	14.1		31.4	32.8		42.8	43.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.9	0.2		5.6	0.5		0.6	1.0		0.2	0.8	
Delay (s)	48.9	12.9		53.1	14.6		32.0	33.8		43.0	44.4	
Level of Service	D	B		D	B		C	C		D	D	
Approach Delay (s)		22.3			19.9			33.5			44.1	
Approach LOS		C			B			C			D	
Intersection Summary												
HCM Average Control Delay			30.4			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.24									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)				16.0		
Intersection Capacity Utilization			35.0%			ICU Level of Service				A		
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
7: Yosemite Avenue & Cottage Ave.

Existing + Project Conditions
AM

												
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	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	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	1863	1583	1770	1863	1583	1770	1773	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	1863	1583	1770	1863	1583	1770	1773	
Volume (vph)	49	245	42	105	261	82	42	73	131	168	93	44
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)	53	266	46	114	284	89	46	79	142	183	101	48
RTOR Reduction (vph)	0	0	38	0	0	69	0	0	85	0	15	0
Lane Group Flow (vph)	53	266	8	114	284	20	46	79	57	183	134	0
Turn Type	Prot		Perm	Prot		Perm	Prot		pm+ov		Prot	
Protected Phases	7	4		3	8		5	2	3		1	6
Permitted Phases			4			8			2			
Actuated Green, G (s)	4.1	9.9	9.9	7.0	12.8	12.8	2.6	16.1	23.1	8.8	22.3	
Effective Green, g (s)	4.1	9.9	9.9	7.0	12.8	12.8	2.6	16.1	23.1	8.8	22.3	
Actuated g/C Ratio	0.07	0.17	0.17	0.12	0.22	0.22	0.04	0.28	0.40	0.15	0.39	
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	
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	
Lane Grp Cap (vph)	126	606	271	214	413	351	80	519	742	269	684	
v/s Ratio Prot	0.03	0.08		c0.06	c0.15		0.03	0.04	0.01	c0.10	c0.08	
v/s Ratio Perm			0.00			0.01			0.03			
v/c Ratio	0.42	0.44	0.03	0.53	0.69	0.06	0.57	0.15	0.08	0.68	0.20	
Uniform Delay, d1	25.7	21.5	19.9	23.9	20.7	17.7	27.1	15.7	10.7	23.2	11.8	
Progression Factor	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	2.3	0.5	0.0	2.5	4.7	0.1	9.6	0.1	0.0	6.9	0.1	
Delay (s)	28.0	22.0	20.0	26.4	25.4	17.8	36.7	15.8	10.8	30.1	11.9	
Level of Service	C	C	B	C	C	B	D	B	B	C	B	
Approach Delay (s)		22.6			24.2			16.7			21.9	
Approach LOS		C			C			B			C	
Intersection Summary												
HCM Average Control Delay			21.9			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			57.8			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			43.6%			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.

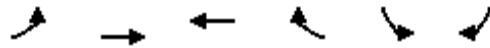
Channelized right turn lanes are not counted.

Tesoro Apartments
9: Atherton Dr. & Project Access

Existing + Project Conditions

AM

												
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)	17	2	16	1	4	2	2	1	2	6	0	63
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)	18	2	17	1	4	2	2	1	2	7	0	68
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	7			20			121	57	10	48	64	3
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	7			20			121	57	10	48	64	3
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 %	99			100			100	100	100	99	100	94
cM capacity (veh/h)	1613			1595			781	824	1069	935	816	1079
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1				
Volume Total	18	1	18	1	3	4	5	75				
Volume Left	18	0	0	1	0	0	2	7				
Volume Right	0	0	17	0	0	2	2	68				
cSH	1613	1700	1700	1595	1700	1700	886	1065				
Volume to Capacity	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.07				
Queue Length 95th (ft)	1	0	0	0	0	0	0	6				
Control Delay (s)	7.3	0.0	0.0	7.3	0.0	0.0	9.1	8.6				
Lane LOS	A			A			A	A				
Approach Delay (s)	3.5			1.0			9.1	8.6				
Approach LOS							A	A				
Intersection Summary												
Average Delay	6.7											
Intersection Capacity Utilization	18.6%			ICU Level of Service					A			
Analysis Period (min)	15											



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	10	2	1	0	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	11	2	1	0	5
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	3				8	2
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3				8	2
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	99
cM capacity (veh/h)	1617				1011	1082
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	5	5	1	2	5	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	1	5	
cSH	1700	1700	1700	1700	1082	
Volume to Capacity	0.00	0.00	0.00	0.00	0.01	
Queue Length 95th (ft)	0	0	0	0	0	
Control Delay (s)	0.0	0.0	0.0	0.0	8.3	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		8.3	
Approach LOS					A	
Intersection Summary						
Average Delay			2.3			
Intersection Capacity Utilization			13.3%		ICU Level of Service	A
Analysis Period (min)			15			

Tesoro Apartments
16: Project Access & Spreckels Rd.

Existing + Project Conditions

AM

												
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)	19	0	28	28	0	19	7	208	7	5	108	5
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)	21	0	30	30	0	21	8	226	8	5	117	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	TWLTL			TWLTL								
Median storage veh	0			0								
Upstream signal (ft)												1163
pX, platoon unblocked												
vC, conflicting volume	393	380	120	404	379	230	123					234
vC1, stage 1 conf vol	131	131		245	245							
vC2, stage 2 conf vol	262	249		159	134							
vCu, unblocked vol	393	380	120	404	379	230	123					234
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1					4.1
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2					2.2
p0 queue free %	95	100	97	93	100	97	99					100
cM capacity (veh/h)	447	433	931	446	434	809	1464					1334
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	51	51	8	234	5	123						
Volume Left	21	30	8	0	5	0						
Volume Right	30	21	0	8	0	5						
cSH	648	545	1464	1700	1334	1700						
Volume to Capacity	0.08	0.09	0.01	0.14	0.00	0.07						
Queue Length 95th (ft)	6	8	0	0	0	0						
Control Delay (s)	11.0	12.3	7.5	0.0	7.7	0.0						
Lane LOS	B	B	A		A							
Approach Delay (s)	11.0	12.3	0.2		0.3							
Approach LOS	B	B										
Intersection Summary												
Average Delay			2.7									
Intersection Capacity Utilization			22.2%		ICU Level of Service				A			
Analysis Period (min)			15									

Tesoro Apartments
1: SR 120 WB Ramp & Main Street

Existing + Project Conditions

PM

												
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	1583	1770	1863			1863	1583
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1770	1583	1770	1863			1863	1583
Volume (vph)	0	0	0	290	0	300	181	317	0	0	404	115
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	0	0	315	0	326	197	345	0	0	439	125
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	36
Lane Group Flow (vph)	0	0	0	0	315	326	197	345	0	0	439	89
Turn Type				Split		Free	Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases						Free						6
Actuated Green, G (s)					21.1	100.0	16.1	70.9			50.8	50.8
Effective Green, g (s)					21.1	100.0	16.1	70.9			50.8	50.8
Actuated g/C Ratio					0.21	1.00	0.16	0.71			0.51	0.51
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)					373	1583	285	1321			946	804
v/s Ratio Prot					c0.18		c0.11	0.19			c0.24	
v/s Ratio Perm						0.21						0.06
v/c Ratio					0.84	0.21	0.69	0.26			0.46	0.11
Uniform Delay, d1					37.9	0.0	39.6	5.2			15.8	12.8
Progression Factor					1.00	1.00	0.74	0.41			1.00	1.00
Incremental Delay, d2					15.9	0.3	6.9	0.1			1.6	0.3
Delay (s)					53.8	0.3	36.2	2.3			17.5	13.1
Level of Service					D	A	D	A			B	B
Approach Delay (s)		0.0			26.6			14.6			16.5	
Approach LOS		A			C			B			B	
Intersection Summary												
HCM Average Control Delay			19.6		HCM Level of Service					B		
HCM Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			100.0		Sum of lost time (s)					12.0		
Intersection Capacity Utilization			57.4%		ICU Level of Service					B		
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
2: SR 120 EB Ramps & Main Street

Existing + Project Conditions

PM

												
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	
Frt		1.00	0.85					0.94		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1770	1583					1746		1770	1863	
Flt Permitted		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (perm)		1770	1583					1746		1770	1863	
Volume (vph)	360	0	276	0	0	0	0	138	120	205	489	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)	391	0	300	0	0	0	0	150	130	223	532	0
RTOR Reduction (vph)	0	0	173	0	0	0	0	22	0	0	0	0
Lane Group Flow (vph)	0	391	127	0	0	0	0	258	0	223	532	0
Turn Type	Split		Perm							Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases			4									
Actuated Green, G (s)		25.7	25.7					44.0		18.3	66.3	
Effective Green, g (s)		25.7	25.7					44.0		18.3	66.3	
Actuated g/C Ratio		0.26	0.26					0.44		0.18	0.66	
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	407					768		324	1235	
v/s Ratio Prot		c0.22						0.15		c0.13	c0.29	
v/s Ratio Perm			0.08									
v/c Ratio		0.86	0.31					0.34		0.69	0.43	
Uniform Delay, d1		35.4	30.0					18.4		38.2	7.9	
Progression Factor		1.00	1.00					1.00		0.60	0.76	
Incremental Delay, d2		14.9	0.4					1.2		5.4	0.8	
Delay (s)		50.3	30.4					19.6		28.3	6.8	
Level of Service		D	C					B		C	A	
Approach Delay (s)		41.7			0.0			19.6			13.2	
Approach LOS		D			A			B			B	
Intersection Summary												
HCM Average Control Delay			25.6					HCM Level of Service			C	
HCM Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			100.0					Sum of lost time (s)		8.0		
Intersection Capacity Utilization			57.4%					ICU Level of Service		B		
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.

Tesoro Apartments
5: Yosemite Avenue & Cottage Ave.

Existing + Project Conditions

PM

												
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	
Lane Util. Factor	1.00	0.95	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	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	1863	1583	1770	1863	1583	1770	1789	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	1863	1583	1770	1863	1583	1770	1789	
Volume (vph)	67	447	127	135	368	104	122	222	208	170	189	68
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)	73	486	138	147	400	113	133	241	226	185	205	74
RTOR Reduction (vph)	0	0	100	0	0	75	0	0	107	0	14	0
Lane Group Flow (vph)	73	486	38	147	400	38	133	241	119	185	265	0
Turn Type	Prot		Perm	Prot		Perm	Prot		pm+ov		Prot	
Protected Phases	7	4		3	8		5	2	3		1	6
Permitted Phases			4			8			2			
Actuated Green, G (s)	4.1	18.3	18.3	8.1	22.3	22.3	7.7	15.1	23.2	9.6	17.0	
Effective Green, g (s)	4.1	18.3	18.3	8.1	22.3	22.3	7.7	15.1	23.2	9.6	17.0	
Actuated g/C Ratio	0.06	0.27	0.27	0.12	0.33	0.33	0.11	0.23	0.35	0.14	0.25	
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	
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	
Lane Grp Cap (vph)	108	965	432	214	619	526	203	419	642	253	453	
v/s Ratio Prot	0.04	0.14		c0.08	c0.21		0.08	0.13	0.02	c0.10	c0.15	
v/s Ratio Perm			0.02			0.02			0.05			
v/c Ratio	0.68	0.50	0.09	0.69	0.65	0.07	0.66	0.58	0.18	0.73	0.58	
Uniform Delay, d1	30.8	20.6	18.2	28.3	19.0	15.3	28.4	23.1	15.3	27.5	22.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	15.5	0.4	0.1	8.8	2.3	0.1	7.4	1.9	0.1	10.4	1.9	
Delay (s)	46.3	21.0	18.3	37.1	21.4	15.4	35.8	25.1	15.5	37.9	23.9	
Level of Service	D	C	B	D	C	B	D	C	B	D	C	
Approach Delay (s)		23.1			23.8			23.8			29.5	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			24.7				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			67.1				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			57.5%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
6: Moffatt Blvd. & Spreckels Rd.

Existing + Project Conditions

PM

												
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		1.00	0.95		0.97	0.95	
Frt	1.00	1.00	0.85	1.00	0.92		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	1719		1770	3430		3433	3382	
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	1719		1770	3430		3433	3382	
Volume (vph)	106	128	44	17	99	105	48	256	66	97	264	111
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)	115	139	48	18	108	114	52	278	72	105	287	121
RTOR Reduction (vph)	0	0	32	0	39	0	0	24	0	0	49	0
Lane Group Flow (vph)	115	139	16	18	183	0	52	326	0	105	359	0
Turn Type	Prot		Perm	Prot			Split			Split		
Protected Phases	1	6		5	2		4	4		8	8	
Permitted Phases			6									
Actuated Green, G (s)	7.1	17.3	17.3	1.0	11.2		8.4	8.4		9.0	9.0	
Effective Green, g (s)	7.1	17.3	17.3	1.0	11.2		8.4	8.4		9.0	9.0	
Actuated g/C Ratio	0.14	0.33	0.33	0.02	0.22		0.16	0.16		0.17	0.17	
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)	243	623	530	34	372		288	557		598	589	
v/s Ratio Prot	c0.06	0.07		0.01	c0.11		0.03	c0.09		0.03	c0.11	
v/s Ratio Perm			0.01									
v/c Ratio	0.47	0.22	0.03	0.53	0.49		0.18	0.58		0.18	0.61	
Uniform Delay, d1	20.6	12.4	11.6	25.1	17.8		18.7	20.0		18.2	19.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.5	0.2	0.0	14.1	1.0		0.3	1.6		0.1	1.8	
Delay (s)	22.0	12.6	11.6	39.2	18.8		19.0	21.6		18.3	21.5	
Level of Service	C	B	B	D	B		B	C		B	C	
Approach Delay (s)		16.0			20.3			21.3			20.9	
Approach LOS		B			C			C			C	
Intersection Summary												
HCM Average Control Delay			19.9			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.54									
Actuated Cycle Length (s)			51.7			Sum of lost time (s)				16.0		
Intersection Capacity Utilization			45.0%			ICU Level of Service				A		
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
7: Project Access & Spreckels Rd.

Existing + Project Conditions

PM

												
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)	10	1	15	15	1	10	27	122	27	19	156	19
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)	11	1	16	16	1	11	29	133	29	21	170	21
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	TWLTL			TWLTL								
Median storage veh	0			0								
Upstream signal (ft)											1147	
pX, platoon unblocked												
vC, conflicting volume	424	442	180	434	438	147	190				162	
vC1, stage 1 conf vol	221	221		206	206							
vC2, stage 2 conf vol	203	221		228	232							
vCu, unblocked vol	424	442	180	434	438	147	190				162	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	97	100	98	96	100	99	98				99	
cM capacity (veh/h)	435	404	863	426	403	900	1384				1417	
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	28	28	29	162	21	190						
Volume Left	11	16	29	0	21	0						
Volume Right	16	11	0	29	0	21						
cSH	607	533	1384	1700	1417	1700						
Volume to Capacity	0.05	0.05	0.02	0.10	0.01	0.11						
Queue Length 95th (ft)	4	4	2	0	1	0						
Control Delay (s)	11.2	12.1	7.7	0.0	7.6	0.0						
Lane LOS	B	B	A		A							
Approach Delay (s)	11.2	12.1	1.2		0.7							
Approach LOS	B	B										
Intersection Summary												
Average Delay			2.3									
Intersection Capacity Utilization			26.0%		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.

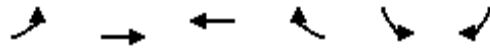
Channelized right turn lanes are not counted.

Tesoro Apartments
9: Atherton Dr. & Project Access

Existing + Project Conditions

PM

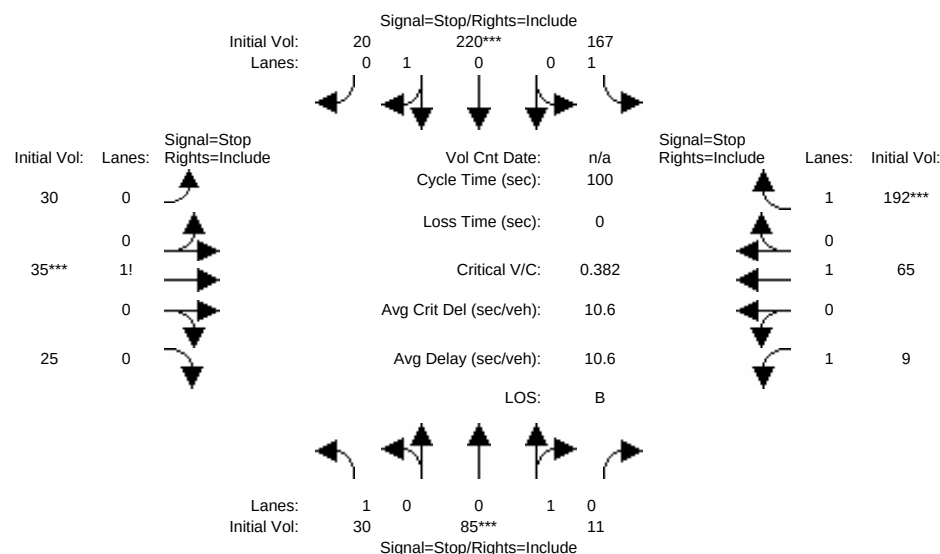
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Volume (veh/h)	67	3	8	0	10	7	15	1	2	5	0	37
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	73	3	9	0	11	8	16	1	2	5	0	40
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	18			12			199	172	6	165	172	9
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	18			12			199	172	6	165	172	9
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 %	95			100			98	100	100	99	100	96
cM capacity (veh/h)	1597			1605			689	688	1075	755	687	1070
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1				
Volume Total	73	2	10	0	7	11	20	46				
Volume Left	73	0	0	0	0	0	16	5				
Volume Right	0	0	9	0	0	8	2	40				
cSH	1597	1700	1700	1700	1700	1700	718	1019				
Volume to Capacity	0.05	0.00	0.01	0.00	0.00	0.01	0.03	0.04				
Queue Length 95th (ft)	4	0	0	0	0	0	2	4				
Control Delay (s)	7.4	0.0	0.0	0.0	0.0	0.0	10.2	8.7				
Lane LOS	A						B	A				
Approach Delay (s)	6.3			0.0			10.2	8.7				
Approach LOS							B	A				
Intersection Summary												
Average Delay	6.7											
Intersection Capacity Utilization	21.7%			ICU Level of Service					A			
Analysis Period (min)	15											



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	10	12	1	0	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	11	13	1	0	5
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	14				19	7
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	14				19	7
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	99
cM capacity (veh/h)	1602				996	1073
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	5	5	9	5	5	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	1	5	
cSH	1700	1700	1700	1700	1073	
Volume to Capacity	0.00	0.00	0.01	0.00	0.01	
Queue Length 95th (ft)	0	0	0	0	0	
Control Delay (s)	0.0	0.0	0.0	0.0	8.4	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		8.4	
Approach LOS					A	
Intersection Summary						
Average Delay			1.5			
Intersection Capacity Utilization			13.3%		ICU Level of Service	A
Analysis Period (min)			15			

Level Of Service Computation Report
2000 HCM 4-Way Stop (Future Volume Alternative)
AM

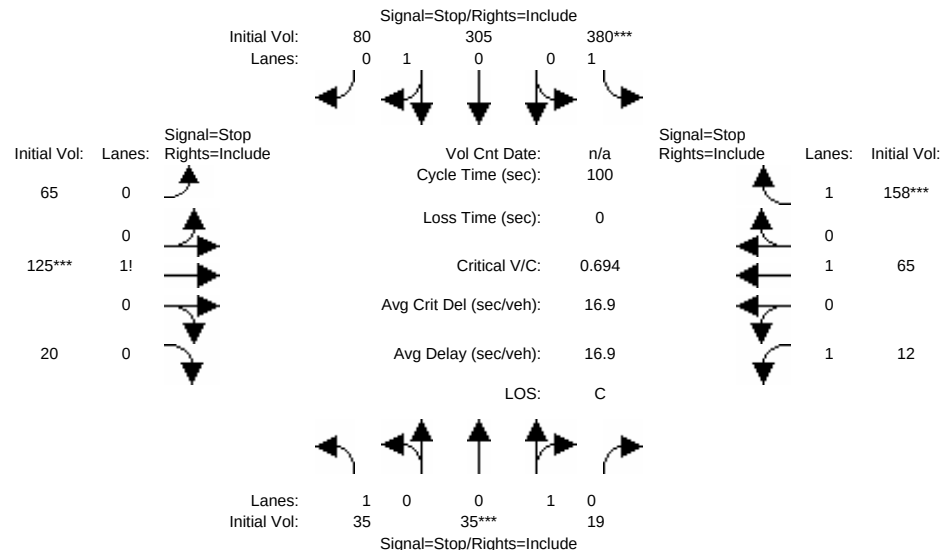
Intersection #42: Woodward/Main ExPP



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:												
Base Vol:	30	85	11	167	220	20	30	35	25	9	65	192
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:	30	85	11	167	220	20	30	35	25	9	65	192
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:	30	85	11	167	220	20	30	35	25	9	65	192
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:	30	85	11	167	220	20	30	35	25	9	65	192
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	30	85	11	167	220	20	30	35	25	9	65	192
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
Final Volume:	30	85	11	167	220	20	30	35	25	9	65	192
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	0.89	0.11	1.00	0.92	0.08	0.33	0.39	0.28	1.00	1.00	1.00
Final Sat.:	529	513	66	571	576	52	184	215	153	526	570	643
Capacity Analysis Module:												
Vol/Sat:	0.06	0.17	0.17	0.29	0.38	0.38	0.16	0.16	0.16	0.02	0.11	0.30
Crit Moves:	****			****			****			****		
Delay/Veh:	9.5	9.7	9.7	11.2	11.5	11.5	10.2	10.2	10.2	9.3	9.4	10.1
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:	9.5	9.7	9.7	11.2	11.5	11.5	10.2	10.2	10.2	9.3	9.4	10.1
LOS by Move:	A	A	A	B	B	B	B	B	B	A	A	B
ApproachDel:	9.6			11.4			10.2			9.9		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	9.6			11.4			10.2			9.9		
LOS by Appr:	A			B			B			A		
AllWayAvgQ:	0.1	0.2	0.2	0.4	0.6	0.6	0.2	0.2	0.2	0.0	0.1	0.4

Level Of Service Computation Report
2000 HCM 4-Way Stop (Future Volume Alternative)
PM

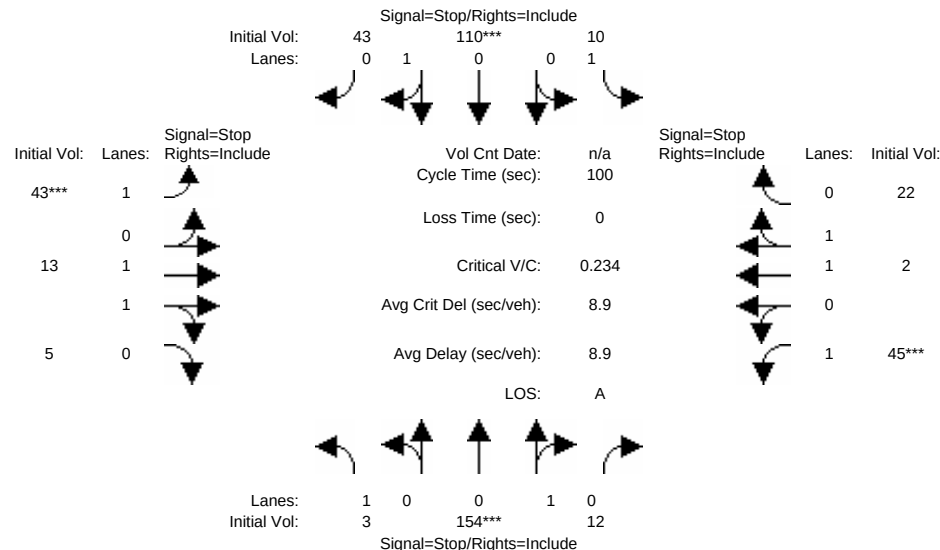
Intersection #42: Woodward/Main ExPP



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:												
Base Vol:	35	35	19	380	305	80	65	125	20	12	65	158
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:	35	35	19	380	305	80	65	125	20	12	65	158
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:	35	35	19	380	305	80	65	125	20	12	65	158
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:	35	35	19	380	305	80	65	125	20	12	65	158
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	35	35	19	380	305	80	65	125	20	12	65	158
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
Final Volume:	35	35	19	380	305	80	65	125	20	12	65	158
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	0.65	0.35	1.00	0.79	0.21	0.31	0.59	0.10	1.00	1.00	1.00
Final Sat.:	455	326	177	548	481	126	159	305	49	460	491	545
Capacity Analysis Module:												
Vol/Sat:	0.08	0.11	0.11	0.69	0.63	0.63	0.41	0.41	0.41	0.03	0.13	0.29
Crit Moves:	****			****			****			****		
Delay/Veh:	10.7	10.1	10.1	22.3	17.9	17.9	14.2	14.2	14.2	10.4	10.7	11.4
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:	10.7	10.1	10.1	22.3	17.9	17.9	14.2	14.2	14.2	10.4	10.7	11.4
LOS by Move:	B	B	B	C	C	C	B	B	B	B	B	B
ApproachDel:	10.4			20.1			14.2			11.1		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	10.4			20.1			14.2			11.1		
LOS by Appr:	B			C			B			B		
AllWayAvgQ:	0.1	0.1	0.1	2.0	1.6	1.6	0.6	0.6	0.6	0.0	0.1	0.4

Level Of Service Computation Report
2000 HCM 4-Way Stop (Future Volume Alternative)
AM

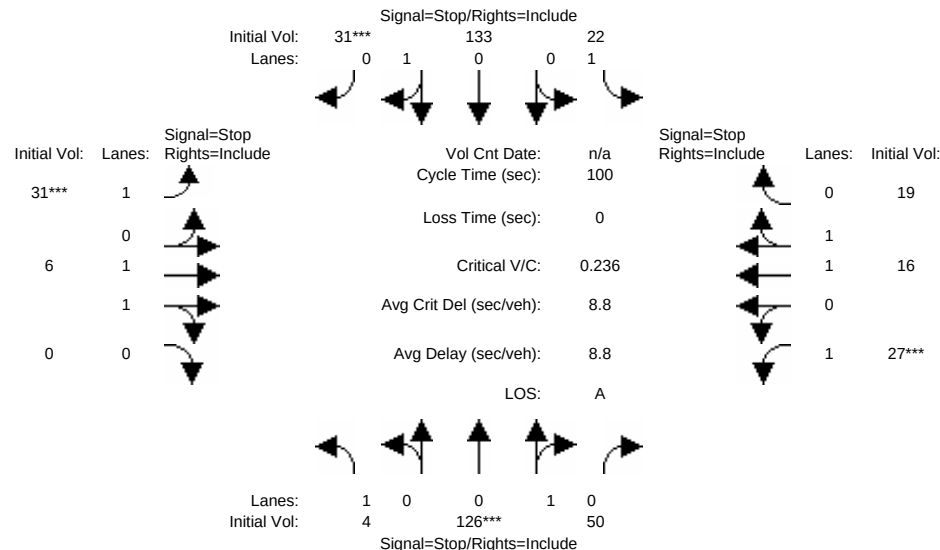
Intersection #82: Atherton/Van Ryn ExPP



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:												
Base Vol:	3	154	12	10	110	43	43	13	5	45	2	22
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:	3	154	12	10	110	43	43	13	5	45	2	22
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:	3	154	12	10	110	43	43	13	5	45	2	22
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:	3	154	12	10	110	43	43	13	5	45	2	22
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	3	154	12	10	110	43	43	13	5	45	2	22
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
Final Volume:	3	154	12	10	110	43	43	13	5	45	2	22
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	0.93	0.07	1.00	0.72	0.28	1.00	1.44	0.56	1.00	1.00	1.00
Final Sat.:	639	658	51	637	524	205	562	900	363	565	612	695
Capacity Analysis Module:												
Vol/Sat:	0.00	0.23	0.23	0.02	0.21	0.21	0.08	0.01	0.01	0.08	0.00	0.03
Crit Moves:	****			****			****			****		
Delay/Veh:	8.2	9.1	9.1	8.3	8.7	8.7	9.2	8.2	7.9	9.2	8.2	7.7
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:	8.2	9.1	9.1	8.3	8.7	8.7	9.2	8.2	7.9	9.2	8.2	7.7
LOS by Move:	A	A	A	A	A	A	A	A	A	A	A	A
ApproachDel:	9.1			8.7			8.9			8.7		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	9.1			8.7			8.9			8.7		
LOS by Appr:	A			A			A			A		
AllWayAvgQ:	0.0	0.3	0.3	0.0	0.2	0.2	0.1	0.0	0.0	0.1	0.0	0.0

Level Of Service Computation Report
2000 HCM 4-Way Stop (Future Volume Alternative)
PM

Intersection #82: Atherton/Van Ryn ExPP



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:												
Base Vol:	4	126	50	22	133	31	31	6	0	27	16	19
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:	4	126	50	22	133	31	31	6	0	27	16	19
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:	4	126	50	22	133	31	31	6	0	27	16	19
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:	4	126	50	22	133	31	31	6	0	27	16	19
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	4	126	50	22	133	31	31	6	0	27	16	19
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
Final Volume:	4	126	50	22	133	31	31	6	0	27	16	19
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	0.72	0.28	1.00	0.81	0.19	1.00	2.00	0.00	1.00	1.00	1.00
Final Sat.:	650	534	212	652	599	140	556	1203	0	562	609	690
Capacity Analysis Module:												
Vol/Sat:	0.01	0.24	0.24	0.03	0.22	0.22	0.06	0.00	xxxx	0.05	0.03	0.03
Crit Moves:	****			****			****			****		
Delay/Veh:	8.2	8.8	8.8	8.3	8.8	8.8	9.1	8.3	0.0	9.0	8.4	7.7
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:	8.2	8.8	8.8	8.3	8.8	8.8	9.1	8.3	0.0	9.0	8.4	7.7
LOS by Move:	A	A	A	A	A	A	A	A	*	A	A	A
ApproachDel:	8.8			8.8			9.0			8.4		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	8.8			8.8			9.0			8.4		
LOS by Appr:	A			A			A			A		
AllWayAvgQ:	0.0	0.3	0.3	0.0	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0

Tesoro Apartments
1: SR 120 WB Ramp & Main Street

Cumulative Conditions
AM

												
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	1583	1770	1863			1863	1583
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1770	1583	1770	1863			1863	1583
Volume (vph)	0	0	0	463	0	550	429	584	0	0	775	460
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	0	0	503	0	598	466	635	0	0	842	500
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	98
Lane Group Flow (vph)	0	0	0	0	503	598	466	635	0	0	842	403
Turn Type				Perm		Free	Prot					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		Free						6
Actuated Green, G (s)					34.6	110.0	28.4	67.4			35.0	35.0
Effective Green, g (s)					34.6	110.0	28.4	67.4			35.0	35.0
Actuated g/C Ratio					0.31	1.00	0.26	0.61			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)					557	1583	457	1142			593	504
v/s Ratio Prot							c0.26	0.34			c0.45	
v/s Ratio Perm					0.28	0.38						0.25
v/c Ratio					0.90	0.38	1.02	0.56			1.42	0.80
Uniform Delay, d1					36.1	0.0	40.8	12.5			37.5	34.3
Progression Factor					1.00	1.00	1.23	1.92			1.00	1.00
Incremental Delay, d2					17.9	0.7	17.9	0.6			198.7	12.5
Delay (s)					54.0	0.7	68.0	24.6			236.2	46.7
Level of Service					D	A	E	C			F	D
Approach Delay (s)		0.0			25.1			43.0			165.6	
Approach LOS		A			C			D			F	
Intersection Summary												
HCM Average Control Delay			83.8									
HCM Volume to Capacity ratio			1.12									
Actuated Cycle Length (s)			110.0									
Intersection Capacity Utilization			100.2%									
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
2: SR 120 EB Ramps & Main Street

Cumulative Conditions
AM

												
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	
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)		1770	1583					1793		1770	1863	
Flt Permitted		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (perm)		1770	1583					1793		1770	1863	
Volume (vph)	360	0	180	0	0	0	0	652	250	180	1058	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)	391	0	196	0	0	0	0	709	272	196	1150	0
RTOR Reduction (vph)	0	0	75	0	0	0	0	13	0	0	0	0
Lane Group Flow (vph)	0	391	121	0	0	0	0	969	0	196	1150	0
Turn Type	Perm		Perm								Prot	
Protected Phases			4				2				1 6	
Permitted Phases	4		4									
Actuated Green, G (s)			27.6 27.6				55.0				15.4 74.4	
Effective Green, g (s)			27.6 27.6				55.0				15.4 74.4	
Actuated g/C Ratio			0.25 0.25				0.50				0.14 0.68	
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)			444 397				897				248 1260	
v/s Ratio Prot							c0.54				0.11 c0.62	
v/s Ratio Perm			0.22 0.08									
v/c Ratio			0.88 0.31				1.08				0.79 0.91	
Uniform Delay, d1			39.6 33.4				27.5				45.7 15.1	
Progression Factor			1.00 1.00				1.00				0.50 0.82	
Incremental Delay, d2			18.1 0.4				53.9				1.6 1.3	
Delay (s)			57.7 33.9				81.4				24.5 13.6	
Level of Service			E C				F				C B	
Approach Delay (s)			49.7		0.0		81.4				15.2	
Approach LOS			D		A		F				B	
Intersection Summary												
HCM Average Control Delay			44.4		HCM Level of Service			D				
HCM Volume to Capacity ratio			1.01									
Actuated Cycle Length (s)			110.0		Sum of lost time (s)			12.0				
Intersection Capacity Utilization			100.2%		ICU Level of Service			G				
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
3: Atherton Rd. & Main Street

Cumulative Conditions
AM

												
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	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.94		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	3431		1770	3318		1770	1863	1583	1770	1863	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	3431		1770	3318		1770	1863	1583	1770	1863	1583
Volume (vph)	220	40	10	10	140	100	50	582	10	20	608	610
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)	239	43	11	11	152	109	54	633	11	22	661	663
RTOR Reduction (vph)	0	8	0	0	96	0	0	0	6	0	0	324
Lane Group Flow (vph)	239	46	0	11	165	0	54	633	5	22	661	339
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)	10.9	19.2		0.9	9.2		2.7	36.8	36.8	1.7	35.8	35.8
Effective Green, g (s)	10.9	19.2		0.9	9.2		2.7	36.8	36.8	1.7	35.8	35.8
Actuated g/C Ratio	0.15	0.26		0.01	0.12		0.04	0.49	0.49	0.02	0.48	0.48
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)	259	883		21	409		64	919	781	40	894	760
v/s Ratio Prot	c0.14	0.01		0.01	c0.05		c0.03	0.34		0.01	c0.35	
v/s Ratio Perm									0.00			0.21
v/c Ratio	0.92	0.05		0.52	0.40		0.84	0.69	0.01	0.55	0.74	0.45
Uniform Delay, d1	31.4	20.8		36.6	30.2		35.7	14.5	9.6	36.1	15.6	12.8
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	35.7	0.0		21.6	0.7		60.7	2.2	0.0	15.3	3.2	0.4
Delay (s)	67.1	20.9		58.2	30.8		96.4	16.7	9.6	51.4	18.9	13.3
Level of Service	E	C		E	C		F	B	A	D	B	B
Approach Delay (s)		58.6			31.9			22.7			16.6	
Approach LOS		E			C			C			B	
Intersection Summary												
HCM Average Control Delay			24.6			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			74.6			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			67.9%			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.

Tesoro Apartments
5: Yosemite Avenue & Cottage Ave.

Cumulative Conditions
AM

												
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	0.95	1.00	1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85	1.00	0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3437		1770	1863	1583	1770	1748	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	3437		1770	1863	1583	1770	1748	
Volume (vph)	60	450	56	150	380	90	47	80	239	180	100	70
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)	65	489	61	163	413	98	51	87	260	196	109	76
RTOR Reduction (vph)	0	0	45	0	21	0	0	0	126	0	26	0
Lane Group Flow (vph)	65	489	16	163	490	0	51	87	134	196	159	0
Turn Type	Prot		Perm	Prot			Prot		pm+ov		Prot	
Protected Phases	7	4		3	8		5	2	3		1	6
Permitted Phases			4						2			
Actuated Green, G (s)	4.4	15.7	15.7	8.8	20.1		3.9	10.7	19.5	9.6	16.4	
Effective Green, g (s)	4.4	15.7	15.7	8.8	20.1		3.9	10.7	19.5	9.6	16.4	
Actuated g/C Ratio	0.07	0.26	0.26	0.14	0.33		0.06	0.18	0.32	0.16	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	
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)	128	914	409	256	1136		114	328	612	279	472	
v/s Ratio Prot	0.04	c0.14		c0.09	0.14		0.03	0.05	0.03	c0.11	c0.09	
v/s Ratio Perm			0.01						0.05			
v/c Ratio	0.51	0.54	0.04	0.64	0.43		0.45	0.27	0.22	0.70	0.34	
Uniform Delay, d1	27.2	19.4	16.9	24.5	15.9		27.4	21.7	15.1	24.2	17.8	
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	3.1	0.6	0.0	5.1	0.3		2.8	0.4	0.2	7.8	0.4	
Delay (s)	30.3	20.0	16.9	29.6	16.1		30.2	22.1	15.3	32.0	18.3	
Level of Service	C	C	B	C	B		C	C	B	C	B	
Approach Delay (s)		20.8			19.4			18.7			25.3	
Approach LOS		C			B			B			C	
Intersection Summary												
HCM Average Control Delay			20.8			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.52									
Actuated Cycle Length (s)			60.8			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			48.3%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
6: Moffat Blvd. & Spreckels Rd.

Cumulative Conditions
AM

												
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	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		0.97	0.95	
Frt	1.00	0.93		1.00	0.93		1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1733		1770	1739		1770	3473		3433	3440	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1733		1770	1739		1770	3473		3433	3440	
Volume (vph)	50	70	61	30	100	80	96	296	42	40	215	50
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)	54	76	66	33	109	87	104	322	46	43	234	54
RTOR Reduction (vph)	0	25	0	0	23	0	0	12	0	0	22	0
Lane Group Flow (vph)	54	117	0	33	173	0	104	356	0	43	266	0
Turn Type	Prot			Prot			Split			Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases												
Actuated Green, G (s)	4.8	29.8		2.9	27.9		12.4	12.4		10.6	10.6	
Effective Green, g (s)	4.8	29.8		2.9	27.9		12.4	12.4		10.6	10.6	
Actuated g/C Ratio	0.07	0.42		0.04	0.39		0.17	0.17		0.15	0.15	
Clearance Time (s)	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	
Lane Grp Cap (vph)	118	720		72	677		306	601		508	509	
v/s Ratio Prot	c0.03	0.07		0.02	c0.10		0.06	c0.10		0.01	c0.08	
v/s Ratio Perm												
v/c Ratio	0.46	0.16		0.46	0.26		0.34	0.59		0.08	0.52	
Uniform Delay, d1	32.2	13.1		33.6	14.9		26.1	27.3		26.4	28.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.8	0.5		4.6	0.9		0.7	1.6		0.1	1.0	
Delay (s)	35.0	13.6		38.2	15.8		26.7	28.9		26.4	29.2	
Level of Service	C	B		D	B		C	C		C	C	
Approach Delay (s)		19.5			19.0			28.4			28.8	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM Average Control Delay			25.3			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.40									
Actuated Cycle Length (s)			71.7			Sum of lost time (s)				16.0		
Intersection Capacity Utilization			39.7%			ICU Level of Service				A		
Analysis Period (min)			15									
c Critical Lane Group												

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	U	U	W
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	19	28	7	521	268	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	30	8	566	291	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh	0					
Upstream signal (ft)	1170					
pX, platoon unblocked	0.95	0.95	0.95			
vC, conflicting volume	873	291	297			
vC1, stage 1 conf vol	291					
vC2, stage 2 conf vol	582					
vCu, unblocked vol	867	257	263			
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 %	93	96	99			
cM capacity (veh/h)	317	746	1242			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	51	8	566	291	5	
Volume Left	21	8	0	0	0	
Volume Right	30	0	0	0	5	
cSH	482	1242	1700	1700	1700	
Volume to Capacity	0.11	0.01	0.33	0.17	0.00	
Queue Length 95th (ft)	9	0	0	0	0	
Control Delay (s)	13.4	7.9	0.0	0.0	0.0	
Lane LOS	B	A				
Approach Delay (s)	13.4	0.1		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization		37.4%		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.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↵	↑↑	↵	
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	113	17	8	361	49	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	123	18	9	392	53	23
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			141		346	71
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			141		346	71
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		91	98
cM capacity (veh/h)			1439		621	977
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1
Volume Total	82	59	9	196	196	76
Volume Left	0	0	9	0	0	53
Volume Right	0	18	0	0	0	23
cSH	1700	1700	1439	1700	1700	697
Volume to Capacity	0.05	0.03	0.01	0.12	0.12	0.11
Queue Length 95th (ft)	0	0	0	0	0	9
Control Delay (s)	0.0	0.0	7.5	0.0	0.0	10.8
Lane LOS			A			B
Approach Delay (s)	0.0		0.2			10.8
Approach LOS						B
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			20.6%		ICU Level of Service	A
Analysis Period (min)			15			

Tesoro Apartments
1: SR 120 WB Ramp & Main Street

Cumulative Conditions

PM

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	1583	1770	1863			1863	1583
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1770	1583	1770	1863			1863	1583
Volume (vph)	0	0	0	585	0	670	358	1059	0	0	909	150
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	0	0	636	0	728	389	1151	0	0	988	163
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	25
Lane Group Flow (vph)	0	0	0	0	636	728	389	1151	0	0	988	138
Turn Type				Split		Free	Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases						Free						6
Actuated Green, G (s)					46.1	120.0	21.9	65.9			40.0	40.0
Effective Green, g (s)					46.1	120.0	21.9	65.9			40.0	40.0
Actuated g/C Ratio					0.38	1.00	0.18	0.55			0.33	0.33
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)					680	1583	323	1023			621	528
v/s Ratio Prot					c0.36		c0.22	0.62			c0.53	
v/s Ratio Perm						0.46						0.09
v/c Ratio					0.94	0.46	1.20	1.13			1.59	0.26
Uniform Delay, d1					35.5	0.0	49.0	27.0			40.0	29.2
Progression Factor					1.00	1.00	0.36	0.50			1.00	1.00
Incremental Delay, d2					20.1	1.0	94.8	57.7			273.5	1.2
Delay (s)					55.6	1.0	112.6	71.2			313.5	30.4
Level of Service					E	A	F	E			F	C
Approach Delay (s)		0.0			26.4			81.7			273.4	
Approach LOS		A			C			F			F	
Intersection Summary												
HCM Average Control Delay			117.5									
HCM Volume to Capacity ratio			1.23									
Actuated Cycle Length (s)			120.0									
Intersection Capacity Utilization			139.3%									
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
2: SR 120 EB Ramps & Main Street

Cumulative Conditions

PM

												
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	
Frt		1.00	0.85					0.94		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1770	1583					1756		1770	1863	
Flt Permitted		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (perm)		1770	1583					1756		1770	1863	
Volume (vph)	550	0	565	0	0	0	0	867	636	260	1234	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)	598	0	614	0	0	0	0	942	691	283	1341	0
RTOR Reduction (vph)	0	0	33	0	0	0	0	22	0	0	0	0
Lane Group Flow (vph)	0	598	582	0	0	0	0	1611	0	283	1341	0
Turn Type	Split		Perm							Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases			4									
Actuated Green, G (s)		42.0	42.0					55.0		11.0	70.0	
Effective Green, g (s)		42.0	42.0					55.0		11.0	70.0	
Actuated g/C Ratio		0.35	0.35					0.46		0.09	0.58	
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)		620	554					805		162	1087	
v/s Ratio Prot		0.34						c0.92		c0.16	0.72	
v/s Ratio Perm			c0.37									
v/c Ratio		0.96	1.05					2.00		1.75	1.23	
Uniform Delay, d1		38.3	39.0					32.5		54.5	25.0	
Progression Factor		1.00	1.00					0.43		1.64	0.72	
Incremental Delay, d2		27.3	51.9					450.8		338.4	105.9	
Delay (s)		65.5	90.9					464.8		428.0	124.0	
Level of Service		E	F					F		F	F	
Approach Delay (s)		78.4			0.0			464.8			177.0	
Approach LOS		E			A			F			F	
Intersection Summary												
HCM Average Control Delay		255.4						HCM Level of Service		F		
HCM Volume to Capacity ratio		1.61										
Actuated Cycle Length (s)		120.0						Sum of lost time (s)		12.0		
Intersection Capacity Utilization		139.3%						ICU Level of Service		H		
Analysis Period (min)		15										
c Critical Lane Group												

Tesoro Apartments
3: Atherton Rd. & Main Street

Cumulative Conditions
PM

												
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	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.99		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	3455		1770	3509		1770	1863	1583	1770	1863	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	3455		1770	3509		1770	1863	1583	1770	1863	1583
Volume (vph)	770	370	70	10	170	10	20	723	70	110	1109	580
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)	837	402	76	11	185	11	22	786	76	120	1205	630
RTOR Reduction (vph)	0	12	0	0	4	0	0	0	33	0	0	166
Lane Group Flow (vph)	837	466	0	11	192	0	22	786	43	120	1205	464
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)	33.0	46.7		1.2	14.9		4.3	44.1	44.1	12.0	51.8	51.8
Effective Green, g (s)	33.0	46.7		1.2	14.9		4.3	44.1	44.1	12.0	51.8	51.8
Actuated g/C Ratio	0.28	0.39		0.01	0.12		0.04	0.37	0.37	0.10	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
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)	487	1345		18	436		63	685	582	177	804	683
v/s Ratio Prot	c0.47	0.13		0.01	c0.05		0.01	0.42		c0.07	c0.65	
v/s Ratio Perm									0.03			0.29
v/c Ratio	1.72	0.35		0.61	0.44		0.35	1.15	0.07	0.68	1.50	0.68
Uniform Delay, d1	43.5	25.9		59.2	48.7		56.5	38.0	24.7	52.1	34.1	27.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	0.89	1.11	1.25
Incremental Delay, d2	332.0	0.2		48.7	0.7		3.3	82.7	0.2	0.9	225.0	0.5
Delay (s)	375.5	26.0		107.9	49.4		59.8	120.7	24.9	47.3	263.1	34.8
Level of Service	F	C		F	D		E	F	C	D	F	C
Approach Delay (s)	248.5			52.5			110.9			176.3		
Approach LOS	F			D			F			F		
Intersection Summary												
HCM Average Control Delay			178.9		HCM Level of Service				F			
HCM Volume to Capacity ratio			1.39									
Actuated Cycle Length (s)			120.0		Sum of lost time (s)				16.0			
Intersection Capacity Utilization			122.7%		ICU Level of Service				H			
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.

Tesoro Apartments
5: Yosemite Avenue & Cottage Ave.

Cumulative Conditions

PM

												
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	0.95	1.00	1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3450		1770	1863	1583	1770	1783	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	3450		1770	1863	1583	1770	1783	
Volume (vph)	150	760	139	313	550	110	131	280	399	180	200	80
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)	163	826	151	340	598	120	142	304	434	196	217	87
RTOR Reduction (vph)	0	0	111	0	17	0	0	0	36	0	15	0
Lane Group Flow (vph)	163	826	40	340	701	0	142	304	398	196	289	0
Turn Type	Prot		Perm	Prot			Prot		pm+ov	Prot		
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4						2			
Actuated Green, G (s)	11.1	24.6	24.6	20.6	34.1		10.2	17.9	38.5	12.9	20.6	
Effective Green, g (s)	11.1	24.6	24.6	20.6	34.1		10.2	17.9	38.5	12.9	20.6	
Actuated g/C Ratio	0.12	0.27	0.27	0.22	0.37		0.11	0.19	0.42	0.14	0.22	
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)	214	946	423	396	1279		196	362	731	248	399	
v/s Ratio Prot	0.09	c0.23		c0.19	0.20		0.08	c0.16	0.12	c0.11	c0.16	
v/s Ratio Perm			0.03						0.13			
v/c Ratio	0.76	0.87	0.10	0.86	0.55		0.72	0.84	0.54	0.79	0.72	
Uniform Delay, d1	39.2	32.2	25.3	34.3	22.9		39.5	35.7	20.1	38.2	33.1	
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	14.7	9.0	0.1	16.6	0.5		12.5	15.6	0.8	15.6	6.4	
Delay (s)	53.9	41.2	25.4	50.9	23.3		52.0	51.3	21.0	53.9	39.5	
Level of Service	D	D	C	D	C		D	D	C	D	D	
Approach Delay (s)		40.9			32.2			36.4			45.1	
Approach LOS		D			C			D			D	
Intersection Summary												
HCM Average Control Delay			37.8			HCM Level of Service			D			
HCM Volume to Capacity ratio			0.88									
Actuated Cycle Length (s)			92.0			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			76.4%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
6: Moffat Blvd. & Spreckels Rd.

Cumulative Conditions

PM

												
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		1.00	0.95		0.97	0.95	
Frt	1.00	1.00	0.85	1.00	0.92		1.00	0.98		1.00	0.97	
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	1723		1770	3483		3433	3432	
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	1723		1770	3483		3433	3432	
Volume (vph)	110	140	273	30	110	110	182	590	70	120	472	120
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)	120	152	297	33	120	120	198	641	76	130	513	130
RTOR Reduction (vph)	0	0	223	0	37	0	0	9	0	0	23	0
Lane Group Flow (vph)	120	152	74	33	203	0	198	708	0	130	620	0
Turn Type	Prot		Perm		Prot		Split		Split			
Protected Phases	1	6		5	2		4	4		8	8	
Permitted Phases			6									
Actuated Green, G (s)	7.7	19.7	19.7	3.0	15.0		21.0	21.0		18.9	18.9	
Effective Green, g (s)	7.7	19.7	19.7	3.0	15.0		21.0	21.0		18.9	18.9	
Actuated g/C Ratio	0.10	0.25	0.25	0.04	0.19		0.27	0.27		0.24	0.24	
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)	173	467	397	68	329		473	931		825	825	
v/s Ratio Prot	c0.07	0.08		0.02	c0.12		0.11	c0.20		0.04	c0.18	
v/s Ratio Perm			0.05									
v/c Ratio	0.69	0.33	0.19	0.49	0.62		0.42	0.76		0.16	0.75	
Uniform Delay, d1	34.3	24.0	23.2	37.0	29.2		23.8	26.5		23.6	27.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	11.4	0.4	0.2	5.4	3.4		0.6	3.7		0.1	3.9	
Delay (s)	45.7	24.4	23.4	42.4	32.6		24.4	30.2		23.7	31.6	
Level of Service	D	C	C	D	C		C	C		C	C	
Approach Delay (s)		28.4			33.8			28.9			30.2	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			29.7			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			78.6			Sum of lost time (s)				16.0		
Intersection Capacity Utilization			58.9%			ICU Level of Service				B		
Analysis Period (min)			15									
c Critical Lane Group												

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	10	15	27	685	790	19
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	16	29	745	859	21
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh	0					
Upstream signal (ft)	1168					
pX, platoon unblocked	0.77	0.77	0.77			
vC, conflicting volume	1662	859	879			
vC1, stage 1 conf vol	859					
vC2, stage 2 conf vol	803					
vCu, unblocked vol	1856	817	844			
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 %	93	94	95			
cM capacity (veh/h)	147	291	613			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	27	29	745	859	21	
Volume Left	11	29	0	0	0	
Volume Right	16	0	0	0	21	
cSH	209	613	1700	1700	1700	
Volume to Capacity	0.13	0.05	0.44	0.51	0.01	
Queue Length 95th (ft)	11	4	0	0	0	
Control Delay (s)	24.8	11.2	0.0	0.0	0.0	
Lane LOS	C	B				
Approach Delay (s)	24.8	0.4		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization		51.6%		ICU Level of Service		A
Analysis Period (min)		15				

Intersection has too many lanes per leg.

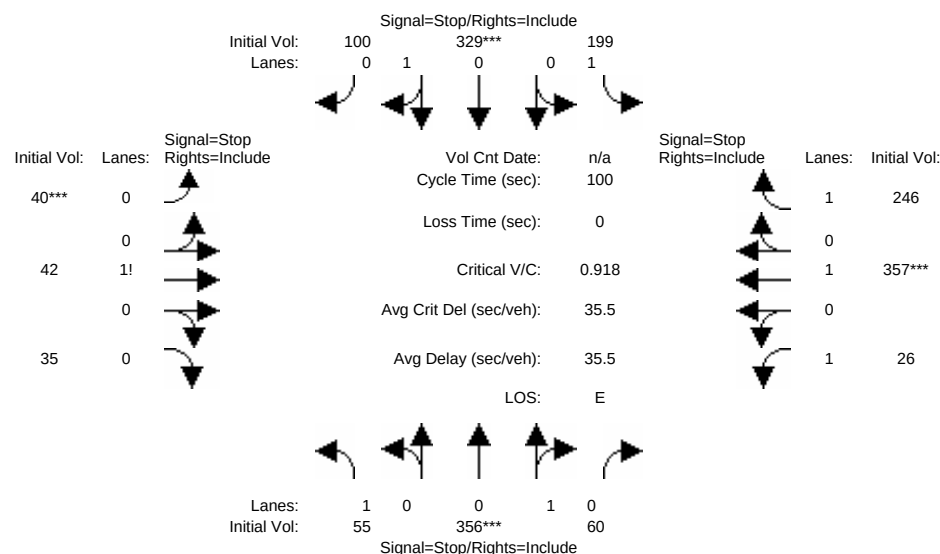
HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↱	↑↑	↲	
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	585	55	23	250	30	14
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	636	60	25	272	33	15
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			696		852	348
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			696		852	348
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		89	98
cM capacity (veh/h)			896		290	648
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1
Volume Total	424	272	25	136	136	48
Volume Left	0	0	25	0	0	33
Volume Right	0	60	0	0	0	15
cSH	1700	1700	896	1700	1700	352
Volume to Capacity	0.25	0.16	0.03	0.08	0.08	0.14
Queue Length 95th (ft)	0	0	2	0	0	12
Control Delay (s)	0.0	0.0	9.1	0.0	0.0	16.8
Lane LOS			A			C
Approach Delay (s)	0.0		0.8			16.8
Approach LOS						C
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization			29.1%		ICU Level of Service	A
Analysis Period (min)			15			

Level Of Service Computation Report
2000 HCM 4-Way Stop (Future Volume Alternative)
AM

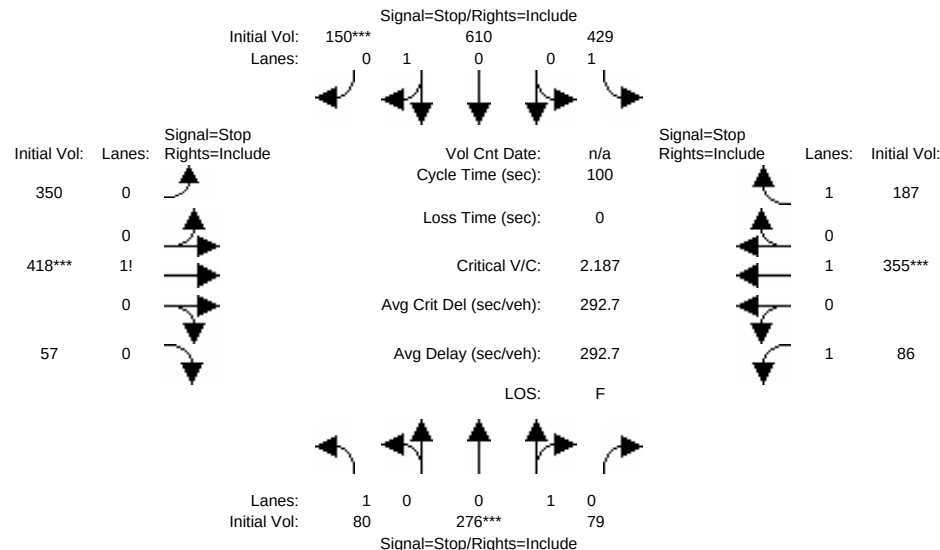
Intersection #43: Woodward/Main Cum



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:												
Base Vol:	55	356	60	199	329	100	40	42	35	26	357	246
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:	55	356	60	199	329	100	40	42	35	26	357	246
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:	55	356	60	199	329	100	40	42	35	26	357	246
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:	55	356	60	199	329	100	40	42	35	26	357	246
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	55	356	60	199	329	100	40	42	35	26	357	246
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
Final Volume:	55	356	60	199	329	100	40	42	35	26	357	246
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	0.86	0.14	1.00	0.77	0.23	0.34	0.36	0.30	1.00	1.00	1.00
Final Sat.:	413	388	65	428	359	109	129	136	113	416	448	488
Capacity Analysis Module:												
Vol/Sat:	0.13	0.92	0.92	0.47	0.92	0.92	0.31	0.31	0.31	0.06	0.80	0.50
Crit Moves:	****			****			****			****		
Delay/Veh:	12.5	51.3	51.3	17.9	49.9	49.9	15.9	15.9	15.9	11.7	34.3	16.8
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:	12.5	51.3	51.3	17.9	49.9	49.9	15.9	15.9	15.9	11.7	34.3	16.8
LOS by Move:	B	F	F	C	E	E	C	C	C	B	D	C
ApproachDel:	46.8			39.8			15.9			26.5		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	46.8			39.8			15.9			26.5		
LOS by Appr:	E			E			C			D		
AllWayAvgQ:	0.1	5.1	5.1	0.8	5.2	5.2	0.4	0.4	0.4	0.1	2.9	0.9

Level Of Service Computation Report
2000 HCM 4-Way Stop (Future Volume Alternative)
PM

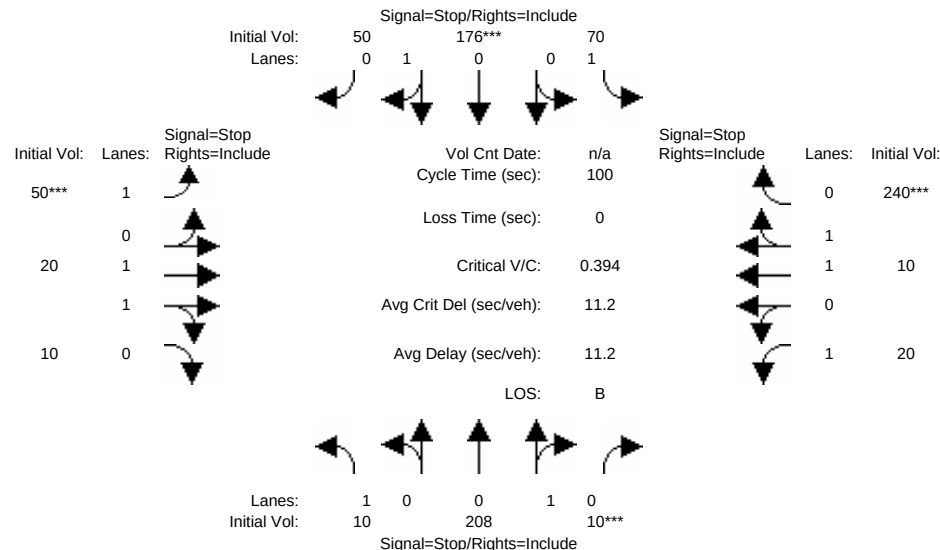
Intersection #43: Woodward/Main Cum



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:												
Base Vol:	80	276	79	429	610	150	350	418	57	86	355	187
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:	80	276	79	429	610	150	350	418	57	86	355	187
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:	80	276	79	429	610	150	350	418	57	86	355	187
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:	80	276	79	429	610	150	350	418	57	86	355	187
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	80	276	79	429	610	150	350	418	57	86	355	187
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
Final Volume:	80	276	79	429	610	150	350	418	57	86	355	187
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	0.78	0.22	1.00	0.80	0.20	0.42	0.51	0.07	1.00	1.00	1.00
Final Sat.:	358	299	85	372	319	79	160	191	26	367	389	419
Capacity Analysis Module:												
Vol/Sat:	0.22	0.92	0.92	1.15	1.91	1.91	2.19	2.19	2.19	0.23	0.91	0.45
Crit Moves:	****					****	****			****		
Delay/Veh:	15.5	59.3	59.3	126.2	440	439.8	563.8	564	563.8	15.4	56.5	17.8
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:	15.5	59.3	59.3	126.2	440	439.8	563.8	564	563.8	15.4	56.5	17.8
LOS by Move:	C	F	F	F	F	F	F	F	F	C	F	C
ApproachDel:	51.2			326.6			563.8			39.3		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	51.2			326.6			563.8			39.3		
LOS by Appr:	F			F			F			E		
AllWayAvgQ:	0.3	5.0	5.0	11.7	47.3	47.3	57.8	57.8	57.8	0.3	4.8	0.8

Level Of Service Computation Report
2000 HCM 4-Way Stop (Future Volume Alternative)
AM

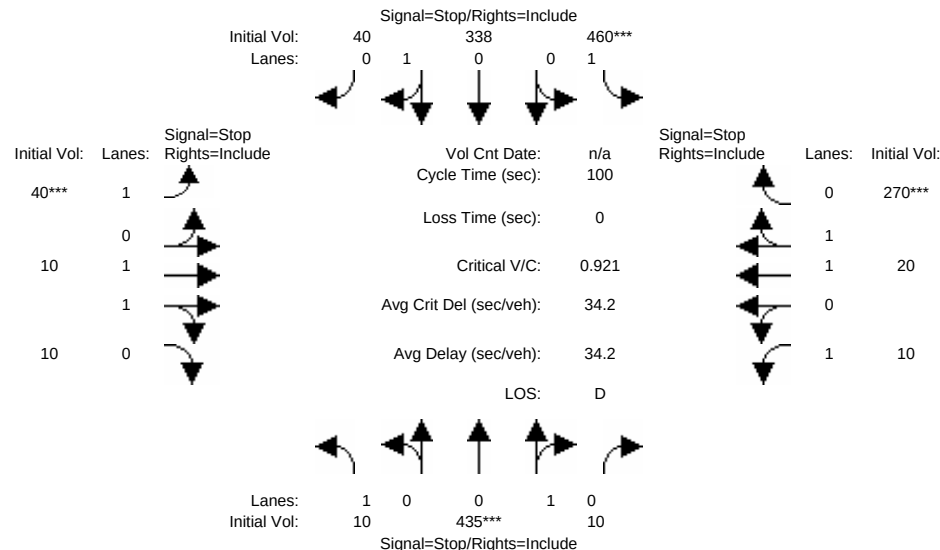
Intersection #83: Atherton/Van Ryn Cum



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:												
Base Vol:	10	208	10	70	176	50	50	20	10	20	10	240
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:	10	208	10	70	176	50	50	20	10	20	10	240
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:	10	208	10	70	176	50	50	20	10	20	10	240
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:	10	208	10	70	176	50	50	20	10	20	10	240
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	10	208	10	70	176	50	50	20	10	20	10	240
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
Final Volume:	10	208	10	70	176	50	50	20	10	20	10	240
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	0.95	0.05	1.00	0.78	0.22	1.00	1.33	0.67	1.00	1.00	1.00
Final Sat.:	537	562	27	547	477	135	463	671	352	501	540	609
Capacity Analysis Module:												
Vol/Sat:	0.02	0.37	0.37	0.13	0.37	0.37	0.11	0.03	0.03	0.04	0.02	0.39
Crit Moves:			****			****			****			****
Delay/Veh:	9.2	11.7	11.7	9.9	11.4	11.4	10.6	9.4	9.1	9.7	9.1	11.5
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:	9.2	11.7	11.7	9.9	11.4	11.4	10.6	9.4	9.1	9.7	9.1	11.5
LOS by Move:	A	B	B	A	B	B	B	A	A	A	A	B
ApproachDel:		11.6			11.0			10.1			11.3	
Delay Adj:		1.00			1.00			1.00			1.00	
ApprAdjDel:		11.6			11.0			10.1			11.3	
LOS by Appr:		B			B			B			B	
AllWayAvgQ:	0.0	0.5	0.5	0.1	0.5	0.5	0.1	0.0	0.0	0.0	0.0	0.6

Level Of Service Computation Report
2000 HCM 4-Way Stop (Future Volume Alternative)
PM

Intersection #83: Atherton/Van Ryn Cum



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:												
Base Vol:	10	435	10	460	338	40	40	10	10	10	20	270
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:	10	435	10	460	338	40	40	10	10	10	20	270
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:	10	435	10	460	338	40	40	10	10	10	20	270
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:	10	435	10	460	338	40	40	10	10	10	20	270
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	10	435	10	460	338	40	40	10	10	10	20	270
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
Final Volume:	10	435	10	460	338	40	40	10	10	10	20	270
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	0.98	0.02	1.00	0.89	0.11	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	458	492	11	499	481	57	342	358	385	388	411	449
Capacity Analysis Module:												
Vol/Sat:	0.02	0.88	0.88	0.92	0.70	0.70	0.12	0.03	0.03	0.03	0.05	0.60
Crit Moves:	****	****	****	****	****	****	****	****	****	****	****	****
Delay/Veh:	10.5	41.8	41.8	48.8	22.9	22.9	13.6	12.2	11.4	11.8	11.5	20.3
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:	10.5	41.8	41.8	48.8	22.9	22.9	13.6	12.2	11.4	11.8	11.5	20.3
LOS by Move:	B	E	E	E	C	C	B	B	B	B	B	C
ApproachDel:	41.1			37.1			13.0			19.4		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	41.1			37.1			13.0			19.4		
LOS by Appr:	E			E			B			C		
AllWayAvgQ:	0.0	4.5	4.5	5.4	2.0	2.0	0.1	0.0	0.0	0.0	0.0	1.2

Tesoro Apartments

Cumulative + Project Conditions

1: SR 120 WB Ramp & Main Street

AM

												
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	1583	1770	1863			1863	1583
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1770	1583	1770	1863			1863	1583
Volume (vph)	0	0	0	463	0	550	496	588	0	0	776	460
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	0	0	503	0	598	539	639	0	0	843	500
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	82
Lane Group Flow (vph)	0	0	0	0	503	598	539	639	0	0	843	418
Turn Type				Perm		Free	Prot					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		Free						6
Actuated Green, G (s)					40.3	130.0	39.7	81.7			38.0	38.0
Effective Green, g (s)					40.3	130.0	39.7	81.7			38.0	38.0
Actuated g/C Ratio					0.31	1.00	0.31	0.63			0.29	0.29
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)					549	1583	541	1171			545	463
v/s Ratio Prot							c0.30	0.34			c0.45	
v/s Ratio Perm					0.28	0.38						0.26
v/c Ratio					0.92	0.38	1.00	0.55			1.55	0.90
Uniform Delay, d1					43.2	0.0	45.1	13.7			46.0	44.2
Progression Factor					1.00	1.00	1.01	0.85			1.00	1.00
Incremental Delay, d2					20.0	0.7	10.7	0.5			255.1	23.5
Delay (s)					63.3	0.7	56.1	12.1			301.1	67.7
Level of Service					E	A	E	B			F	E
Approach Delay (s)		0.0			29.3			32.3			214.2	
Approach LOS		A			C			C			F	
Intersection Summary												
HCM Average Control Delay			98.8				HCM Level of Service			F		
HCM Volume to Capacity ratio			1.15									
Actuated Cycle Length (s)			130.0				Sum of lost time (s)		12.0			
Intersection Capacity Utilization			104.0%				ICU Level of Service		G			
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
2: SR 120 EB Ramps & Main Street

Cumulative + Project Conditions

AM

												
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	
Frt		1.00	0.85					0.97		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1770	1583					1798		1770	1863	
Flt Permitted		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (perm)		1770	1583					1798		1770	1863	
Volume (vph)	360	0	196	0	0	0	0	724	250	180	1059	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)	391	0	213	0	0	0	0	787	272	196	1151	0
RTOR Reduction (vph)	0	0	77	0	0	0	0	10	0	0	0	0
Lane Group Flow (vph)	0	391	136	0	0	0	0	1049	0	196	1151	0
Turn Type	Perm		Perm						Prot			
Protected Phases	4						2		1		6	
Permitted Phases	4		4									
Actuated Green, G (s)	32.2		32.2				67.6		18.2		89.8	
Effective Green, g (s)	32.2		32.2				67.6		18.2		89.8	
Actuated g/C Ratio	0.25		0.25				0.52		0.14		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)	438		392				935		248		1287	
v/s Ratio Prot							c0.58		0.11		c0.62	
v/s Ratio Perm	0.22		0.09									
v/c Ratio	0.89		0.35				1.12		0.79		0.89	
Uniform Delay, d1	47.2		40.2				31.2		54.1		16.3	
Progression Factor	1.00		1.00				1.00		1.26		1.32	
Incremental Delay, d2	19.9		0.5				69.1		1.6		1.0	
Delay (s)	67.2		40.8				100.3		69.6		22.5	
Level of Service	E		D				F		E		C	
Approach Delay (s)	57.9				0.0		100.3				29.3	
Approach LOS	E				A		F				C	
Intersection Summary												
HCM Average Control Delay	60.0		HCM Level of Service				E					
HCM Volume to Capacity ratio	1.04											
Actuated Cycle Length (s)	130.0		Sum of lost time (s)				12.0					
Intersection Capacity Utilization	104.0%		ICU Level of Service				G					
Analysis Period (min)	15											
c Critical Lane Group												

Tesoro Apartments
3: Atherton Rd. & Main Street

Cumulative + Project Conditions

AM

												
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	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.97		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	3431		1770	3246		1770	1863	1583	1770	1863	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	3431		1770	3246		1770	1863	1583	1770	1863	1583
Volume (vph)	220	40	10	12	140	172	50	582	11	37	608	610
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)	239	43	11	13	152	187	54	633	12	40	661	663
RTOR Reduction (vph)	0	7	0	0	154	0	0	0	7	0	0	371
Lane Group Flow (vph)	239	47	0	13	185	0	54	633	5	40	661	292
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)	14.3	27.2		0.9	13.8		2.9	31.8	31.8	2.9	31.8	31.8
Effective Green, g (s)	14.3	27.2		0.9	13.8		2.9	31.8	31.8	2.9	31.8	31.8
Actuated g/C Ratio	0.18	0.35		0.01	0.18		0.04	0.40	0.40	0.04	0.40	0.40
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)	321	1184		20	568		65	752	639	65	752	639
v/s Ratio Prot	c0.14	0.01		0.01	c0.06		c0.03	0.34		0.02	c0.35	
v/s Ratio Perm									0.00			0.18
v/c Ratio	0.74	0.04		0.65	0.33		0.83	0.84	0.01	0.62	0.88	0.46
Uniform Delay, d1	30.5	17.1		38.8	28.4		37.7	21.2	14.1	37.4	21.7	17.2
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	9.0	0.0		56.6	0.3		56.7	8.5	0.0	16.1	11.4	0.5
Delay (s)	39.6	17.1		95.4	28.8		94.4	29.7	14.1	53.5	33.1	17.7
Level of Service	D	B		F	C		F	C	B	D	C	B
Approach Delay (s)		35.4			31.2			34.4			26.2	
Approach LOS		D			C			C			C	
Intersection Summary												
HCM Average Control Delay			30.0			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			78.8			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			70.3%			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.

Tesoro Apartments
5: Yosemite Avenue & Cottage Ave.

Cumulative + Project Conditions

AM

												
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	0.95	1.00	1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85	1.00	0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3437		1770	1863	1583	1770	1748	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	3437		1770	1863	1583	1770	1748	
Volume (vph)	60	450	60	154	380	90	63	80	258	180	100	70
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)	65	489	65	167	413	98	68	87	280	196	109	76
RTOR Reduction (vph)	0	0	48	0	21	0	0	0	127	0	25	0
Lane Group Flow (vph)	65	489	17	167	490	0	68	87	153	196	160	0
Turn Type	Prot		Perm	Prot			Prot		pm+ov	Prot		
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4						2			
Actuated Green, G (s)	4.4	15.8	15.8	8.8	20.2		4.5	10.7	19.5	9.7	15.9	
Effective Green, g (s)	4.4	15.8	15.8	8.8	20.2		4.5	10.7	19.5	9.7	15.9	
Actuated g/C Ratio	0.07	0.26	0.26	0.14	0.33		0.07	0.18	0.32	0.16	0.26	
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)	128	917	410	255	1138		131	327	610	281	456	
v/s Ratio Prot	0.04	c0.14		c0.09	0.14		0.04	0.05	0.04	c0.11	c0.09	
v/s Ratio Perm			0.01						0.06			
v/c Ratio	0.51	0.53	0.04	0.65	0.43		0.52	0.27	0.25	0.70	0.35	
Uniform Delay, d1	27.3	19.4	16.9	24.7	15.9		27.2	21.8	15.4	24.3	18.3	
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	3.1	0.6	0.0	5.9	0.3		3.4	0.4	0.2	7.3	0.5	
Delay (s)	30.4	20.0	17.0	30.6	16.2		30.7	22.2	15.6	31.6	18.8	
Level of Service	C	C	B	C	B		C	C	B	C	B	
Approach Delay (s)		20.8			19.7			19.3			25.4	
Approach LOS		C			B			B			C	
Intersection Summary												
HCM Average Control Delay			21.0			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.52									
Actuated Cycle Length (s)			61.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			48.5%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
6: Moffat Blvd. & Spreckels Rd.

Cumulative + Project Conditions

AM

												
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	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		0.97	0.95	
Frt	1.00	0.93		1.00	0.93		1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1733		1770	1739		1770	3483		3433	3443	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1733		1770	1739		1770	3483		3433	3443	
Volume (vph)	50	70	61	30	100	80	115	331	40	40	224	50
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)	54	76	66	33	109	87	125	360	43	43	243	54
RTOR Reduction (vph)	0	24	0	0	22	0	0	9	0	0	21	0
Lane Group Flow (vph)	54	118	0	33	174	0	125	394	0	43	276	0
Turn Type	Prot			Prot			Split			Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases												
Actuated Green, G (s)	7.3	43.7		5.0	41.4		22.4	22.4		12.9	12.9	
Effective Green, g (s)	7.3	43.7		5.0	41.4		22.4	22.4		12.9	12.9	
Actuated g/C Ratio	0.07	0.44		0.05	0.41		0.22	0.22		0.13	0.13	
Clearance Time (s)	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	
Lane Grp Cap (vph)	129	757		89	720		396	780		443	444	
v/s Ratio Prot	c0.03	0.07		0.02	c0.10		0.07	c0.11		0.01	c0.08	
v/s Ratio Perm												
v/c Ratio	0.42	0.16		0.37	0.24		0.32	0.50		0.10	0.62	
Uniform Delay, d1	44.3	17.0		46.0	19.1		32.4	33.9		38.4	41.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.2	0.4		2.6	0.8		2.1	2.3		0.1	2.7	
Delay (s)	46.5	17.5		48.6	19.9		34.5	36.3		38.5	43.9	
Level of Service	D	B		D	B		C	D		D	D	
Approach Delay (s)		25.5			24.0			35.8			43.3	
Approach LOS		C			C			D			D	
Intersection Summary												
HCM Average Control Delay			34.1			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.38									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)				16.0		
Intersection Capacity Utilization			41.0%			ICU Level of Service				A		
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
7: Project Access & Spreckels Rd.

Cumulative + Project Conditions

AM

												
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)	19	0	28	28	0	19	7	568	7	5	310	5
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)	21	0	30	30	0	21	8	617	8	5	337	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	TWLTL			TWLTL								
Median storage veh	0			0								
Upstream signal (ft)											1163	
pX, platoon unblocked	0.90	0.90	0.90	0.90	0.90		0.90					
vC, conflicting volume	1004	991	340	1015	990	621	342			625		
vC1, stage 1 conf vol	351	351		636	636							
vC2, stage 2 conf vol	653	640		378	353							
vCu, unblocked vol	1004	990	266	1016	989	621	269			625		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	91	100	96	87	100	96	99			99		
cM capacity (veh/h)	235	250	695	238	251	487	1164			956		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	51	51	8	625	5	342						
Volume Left	21	30	8	0	5	0						
Volume Right	30	21	0	8	0	5						
cSH	389	300	1164	1700	956	1700						
Volume to Capacity	0.13	0.17	0.01	0.37	0.01	0.20						
Queue Length 95th (ft)	11	15	0	0	0	0						
Control Delay (s)	15.7	19.5	8.1	0.0	8.8	0.0						
Lane LOS	C	C	A		A							
Approach Delay (s)	15.7	19.5	0.1		0.1							
Approach LOS	C	C										
Intersection Summary												
Average Delay			1.8									
Intersection Capacity Utilization			41.2%		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.

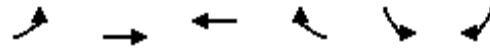
Channelized right turn lanes are not counted.

Tesoro Apartments
9: Atherton Dr. & Project Access

Cumulative + Project Conditions

AM

												
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)	17	116	17	8	411	1	49	0	21	5	0	63
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)	18	126	18	9	447	1	53	0	23	5	0	68
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	448			145			482	638	72	588	646	224
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	448			145			482	638	72	588	646	224
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 %	98			99			87	100	98	99	100	91
cM capacity (veh/h)	1109			1435			419	384	975	377	380	779
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1				
Volume Total	18	84	61	9	298	150	76	74				
Volume Left	18	0	0	9	0	0	53	5				
Volume Right	0	0	18	0	0	1	23	68				
cSH	1109	1700	1700	1435	1700	1700	506	723				
Volume to Capacity	0.02	0.05	0.04	0.01	0.18	0.09	0.15	0.10				
Queue Length 95th (ft)	1	0	0	0	0	0	13	9				
Control Delay (s)	8.3	0.0	0.0	7.5	0.0	0.0	13.4	10.5				
Lane LOS	A			A			B	B				
Approach Delay (s)	0.9			0.1			13.4	10.5				
Approach LOS							B	B				
Intersection Summary												
Average Delay	2.6											
Intersection Capacity Utilization	31.5%			ICU Level of Service					A			
Analysis Period (min)	15											



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	142	415	1	0	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	154	451	1	0	5
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	452				529	226
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	452				529	226
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	99
cM capacity (veh/h)	1105				480	777
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	77	77	301	151	5	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	1	5	
cSH	1700	1700	1700	1700	777	
Volume to Capacity	0.05	0.05	0.18	0.09	0.01	
Queue Length 95th (ft)	0	0	0	0	1	
Control Delay (s)	0.0	0.0	0.0	0.0	9.7	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		9.7	
Approach LOS					A	
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			21.5%		ICU Level of Service	A
Analysis Period (min)			15			

Tesoro Apartments

Cumulative + Project Conditions

1: SR 120 WB Ramp & Main Street

PM

												
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	1583	1770	1863			1863	1583
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1770	1583	1770	1863			1863	1583
Volume (vph)	0	0	0	585	0	670	394	1061	0	0	913	150
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	0	0	636	0	728	428	1153	0	0	992	163
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	25
Lane Group Flow (vph)	0	0	0	0	636	728	428	1153	0	0	992	138
Turn Type				Split		Free	Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases						Free						6
Actuated Green, G (s)					46.1	120.0	21.9	65.9			40.0	40.0
Effective Green, g (s)					46.1	120.0	21.9	65.9			40.0	40.0
Actuated g/C Ratio					0.38	1.00	0.18	0.55			0.33	0.33
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)					680	1583	323	1023			621	528
v/s Ratio Prot					c0.36		c0.24	0.62			c0.53	
v/s Ratio Perm						0.46						0.09
v/c Ratio					0.94	0.46	1.33	1.13			1.60	0.26
Uniform Delay, d1					35.5	0.0	49.0	27.0			40.0	29.2
Progression Factor					1.00	1.00	0.36	0.50			1.00	1.00
Incremental Delay, d2					20.1	1.0	148.3	58.6			276.4	1.2
Delay (s)					55.6	1.0	166.1	72.2			316.4	30.4
Level of Service					E	A	F	E			F	C
Approach Delay (s)		0.0			26.4			97.6			276.0	
Approach LOS		A			C			F			F	
Intersection Summary												
HCM Average Control Delay			124.2									
HCM Volume to Capacity ratio			1.26									
Actuated Cycle Length (s)			120.0									
Intersection Capacity Utilization			141.4%									
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
2: SR 120 EB Ramps & Main Street

Cumulative + Project Conditions

PM

												
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	
Frt		1.00	0.85					0.94		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1770	1583					1759		1770	1863	
Flt Permitted		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (perm)		1770	1583					1759		1770	1863	
Volume (vph)	550	0	631	0	0	0	0	906	636	260	1238	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)	598	0	686	0	0	0	0	985	691	283	1346	0
RTOR Reduction (vph)	0	0	32	0	0	0	0	21	0	0	0	0
Lane Group Flow (vph)	0	598	654	0	0	0	0	1655	0	283	1346	0
Turn Type	Split		Perm							Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases			4									
Actuated Green, G (s)		42.0	42.0					55.0		11.0	70.0	
Effective Green, g (s)		42.0	42.0					55.0		11.0	70.0	
Actuated g/C Ratio		0.35	0.35					0.46		0.09	0.58	
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)		620	554					806		162	1087	
v/s Ratio Prot		0.34						c0.94		c0.16	0.72	
v/s Ratio Perm			c0.41									
v/c Ratio		0.96	1.18					2.05		1.75	1.24	
Uniform Delay, d1		38.3	39.0					32.5		54.5	25.0	
Progression Factor		1.00	1.00					0.37		1.64	0.72	
Incremental Delay, d2		27.3	98.8					474.3		338.4	108.0	
Delay (s)		65.5	137.8					486.4		428.0	126.0	
Level of Service		E	F					F		F	F	
Approach Delay (s)		104.2			0.0			486.4			178.5	
Approach LOS		F			A			F			F	
Intersection Summary												
HCM Average Control Delay		270.1						HCM Level of Service		F		
HCM Volume to Capacity ratio		1.68										
Actuated Cycle Length (s)		120.0						Sum of lost time (s)		12.0		
Intersection Capacity Utilization		141.4%						ICU Level of Service		H		
Analysis Period (min)		15										
c Critical Lane Group												

Tesoro Apartments
3: Atherton Rd. & Main Street

Cumulative + Project Conditions

PM

												
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	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.97		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	3455		1770	3423		1770	1863	1583	1770	1863	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	3455		1770	3423		1770	1863	1583	1770	1863	1583
Volume (vph)	770	370	70	11	170	48	20	723	72	180	1109	580
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)	837	402	76	12	185	52	22	786	78	196	1205	630
RTOR Reduction (vph)	0	12	0	0	22	0	0	0	34	0	0	165
Lane Group Flow (vph)	837	466	0	12	215	0	22	786	44	196	1205	465
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)	33.0	45.5		2.4	14.9		4.1	44.6	44.6	11.5	52.0	52.0
Effective Green, g (s)	33.0	45.5		2.4	14.9		4.1	44.6	44.6	11.5	52.0	52.0
Actuated g/C Ratio	0.28	0.38		0.02	0.12		0.03	0.37	0.37	0.10	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
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)	487	1310		35	425		60	692	588	170	807	686
v/s Ratio Prot	c0.47	0.13		0.01	c0.06		0.01	0.42		c0.11	c0.65	
v/s Ratio Perm									0.03			0.29
v/c Ratio	1.72	0.36		0.34	0.51		0.37	1.14	0.07	1.15	1.49	0.68
Uniform Delay, d1	43.5	26.7		58.0	49.1		56.7	37.7	24.4	54.2	34.0	27.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	0.92	1.04	1.09
Incremental Delay, d2	332.0	0.2		5.8	1.0		3.8	78.1	0.2	75.4	222.5	0.5
Delay (s)	375.5	26.9		63.8	50.1		60.5	115.8	24.6	125.2	258.0	30.3
Level of Service	F	C		E	D		E	F	C	F	F	C
Approach Delay (s)		248.8			50.7			106.4			174.6	
Approach LOS		F			D			F			F	
Intersection Summary												
HCM Average Control Delay			176.0			HCM Level of Service			F			
HCM Volume to Capacity ratio			1.43									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			123.9%			ICU Level of Service			H			
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.

Tesoro Apartments
5: Yosemite Avenue & Cottage Ave.

Cumulative + Project Conditions

PM

												
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	0.95	1.00	1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3450		1770	1863	1583	1770	1783	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	3450		1770	1863	1583	1770	1783	
Volume (vph)	150	760	155	332	550	110	140	280	410	180	200	80
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)	163	826	168	361	598	120	152	304	446	196	217	87
RTOR Reduction (vph)	0	0	123	0	17	0	0	0	36	0	15	0
Lane Group Flow (vph)	163	826	45	361	701	0	152	304	410	196	289	0
Turn Type	Prot		Perm	Prot			Prot		pm+ov	Prot		
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4						2			
Actuated Green, G (s)	11.1	24.7	24.7	21.2	34.8		10.4	18.0	39.2	12.9	20.5	
Effective Green, g (s)	11.1	24.7	24.7	21.2	34.8		10.4	18.0	39.2	12.9	20.5	
Actuated g/C Ratio	0.12	0.27	0.27	0.23	0.37		0.11	0.19	0.42	0.14	0.22	
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)	212	942	421	404	1294		198	361	737	246	394	
v/s Ratio Prot	0.09	c0.23		c0.20	0.20		0.09	c0.16	0.13	c0.11	0.16	
v/s Ratio Perm			0.03						0.13			
v/c Ratio	0.77	0.88	0.11	0.89	0.54		0.77	0.84	0.56	0.80	0.73	
Uniform Delay, d1	39.6	32.6	25.7	34.7	22.7		40.0	36.0	20.2	38.7	33.6	
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	15.4	9.2	0.1	21.3	0.5		16.2	16.1	0.9	16.2	6.9	
Delay (s)	55.0	41.8	25.8	56.0	23.2		56.3	52.2	21.2	54.9	40.5	
Level of Service	D	D	C	E	C		E	D	C	D	D	
Approach Delay (s)		41.4			34.2			37.5			46.2	
Approach LOS		D			C			D			D	
Intersection Summary												
HCM Average Control Delay			38.9			HCM Level of Service			D			
HCM Volume to Capacity ratio			0.85									
Actuated Cycle Length (s)			92.8			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			77.4%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
6: Moffat Blvd. & Spreckels Rd.

Cumulative + Project Conditions

PM

												
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		1.00	0.95		0.97	0.95	
Frt	1.00	1.00	0.85	1.00	0.93		1.00	0.98		1.00	0.97	
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	1723		1770	3485		3433	3438	
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	1723		1770	3485		3433	3438	
Volume (vph)	110	140	275	30	110	110	183	609	70	120	506	120
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)	120	152	299	33	120	120	199	662	76	130	550	130
RTOR Reduction (vph)	0	0	225	0	37	0	0	9	0	0	20	0
Lane Group Flow (vph)	120	152	74	33	203	0	199	729	0	130	660	0
Turn Type	Prot		Perm	Prot			Split			Split		
Protected Phases	1	6		5	2		4	4		8	8	
Permitted Phases			6									
Actuated Green, G (s)	7.8	19.9	19.9	3.0	15.1		21.5	21.5		19.8	19.8	
Effective Green, g (s)	7.8	19.9	19.9	3.0	15.1		21.5	21.5		19.8	19.8	
Actuated g/C Ratio	0.10	0.25	0.25	0.04	0.19		0.27	0.27		0.25	0.25	
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)	172	462	393	66	324		475	934		848	849	
v/s Ratio Prot	c0.07	0.08		0.02	c0.12		0.11	c0.21		0.04	c0.19	
v/s Ratio Perm			0.05									
v/c Ratio	0.70	0.33	0.19	0.50	0.63		0.42	0.78		0.15	0.78	
Uniform Delay, d1	35.1	24.7	23.8	37.9	29.9		24.2	27.2		23.6	28.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	11.7	0.4	0.2	5.8	3.7		0.6	4.3		0.1	4.5	
Delay (s)	46.7	25.1	24.0	43.7	33.7		24.8	31.5		23.7	32.7	
Level of Service	D	C	C	D	C		C	C		C	C	
Approach Delay (s)		29.1			34.9			30.0			31.2	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			30.7			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			80.2			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												

Tesoro Apartments
7: Project Access & Spreckels Rd.

Cumulative + Project Conditions

PM

												
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)	10	0	15	15	0	10	0	732	27	19	827	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)	11	0	16	16	0	11	0	796	29	21	899	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh		1			1							
Upstream signal (ft)											1147	
pX, platoon unblocked	0.76	0.76	0.76	0.76	0.76		0.76					
vC, conflicting volume	1747	1765	899	1767	1751	810	899			825		
vC1, stage 1 conf vol	940	940		810	810							
vC2, stage 2 conf vol	807	825		957	940							
vCu, unblocked vol	1984	2008	867	2010	1989	810	867			825		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	100	94	88	100	97	100			97		
cM capacity (veh/h)	144	158	268	139	162	380	590			805		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	27	27	0	825	21	899						
Volume Left	11	16	0	0	21	0						
Volume Right	16	11	0	29	0	0						
cSH	199	186	1700	1700	805	1700						
Volume to Capacity	0.14	0.15	0.00	0.49	0.03	0.53						
Queue Length 95th (ft)	12	13	0	0	2	0						
Control Delay (s)	26.0	27.6	0.0	0.0	9.6	0.0						
Lane LOS	D	D			A							
Approach Delay (s)	26.0	27.6	0.0		0.2							
Approach LOS	D	D										
Intersection Summary												
Average Delay			0.9									
Intersection Capacity Utilization			53.5%		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.

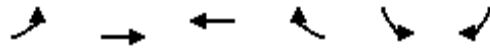
Channelized right turn lanes are not counted.

Tesoro Apartments
9: Atherton Dr. & Project Access

Cumulative + Project Conditions

PM

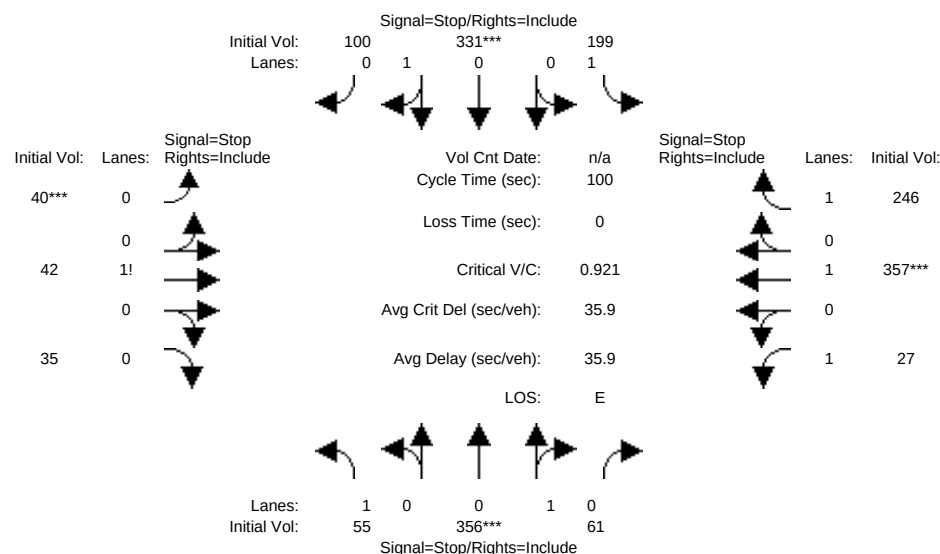
													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Sign Control	Free			Free				Stop			Stop		
Grade	0%			0%				0%			0%		
Volume (veh/h)	67	631	54	24	267	2	30	0	14	5	0	37	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	73	686	59	26	290	2	33	0	15	5	0	40	
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	292			745			1098	1205	372	847	1234	146	
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	292			745			1098	1205	372	847	1234	146	
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 %	94			97			78	100	98	98	100	95	
cM capacity (veh/h)	1266			859			149	167	625	232	160	874	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1					
Volume Total	73	457	287	26	193	99	48	46					
Volume Left	73	0	0	26	0	0	33	5					
Volume Right	0	0	59	0	0	2	15	40					
cSH	1266	1700	1700	859	1700	1700	197	658					
Volume to Capacity	0.06	0.27	0.17	0.03	0.11	0.06	0.24	0.07					
Queue Length 95th (ft)	5	0	0	2	0	0	23	6					
Control Delay (s)	8.0	0.0	0.0	9.3	0.0	0.0	29.1	10.9					
Lane LOS	A			A			D	B					
Approach Delay (s)	0.7			0.8			29.1	10.9					
Approach LOS							D	B					
Intersection Summary													
Average Delay	2.2												
Intersection Capacity Utilization	41.7%			ICU Level of Service				A					
Analysis Period (min)	15												



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	650	288	5	0	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	707	313	5	0	5
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	318				669	159
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	318				669	159
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	99
cM capacity (veh/h)	1238				391	858
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	353	353	209	110	5	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	5	5	
cSH	1700	1700	1700	1700	858	
Volume to Capacity	0.21	0.21	0.12	0.06	0.01	
Queue Length 95th (ft)	0	0	0	0	0	
Control Delay (s)	0.0	0.0	0.0	0.0	9.2	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		9.2	
Approach LOS					A	
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			21.3%		ICU Level of Service	A
Analysis Period (min)			15			

Level Of Service Computation Report
2000 HCM 4-Way Stop (Future Volume Alternative)
AM

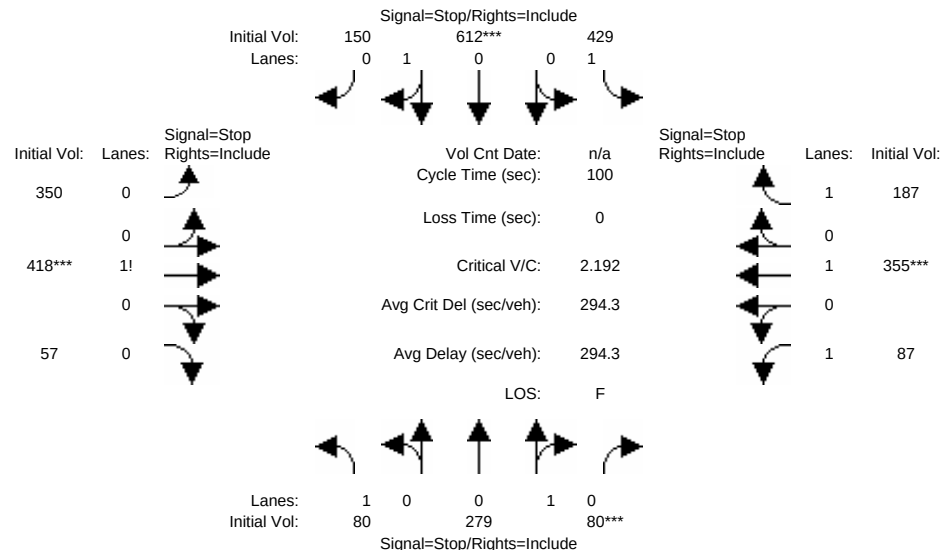
Intersection #44: Woodward/Main CumPP



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:												
Base Vol:	55	356	61	199	331	100	40	42	35	27	357	246
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:	55	356	61	199	331	100	40	42	35	27	357	246
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:	55	356	61	199	331	100	40	42	35	27	357	246
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:	55	356	61	199	331	100	40	42	35	27	357	246
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	55	356	61	199	331	100	40	42	35	27	357	246
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
Final Volume:	55	356	61	199	331	100	40	42	35	27	357	246
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	0.85	0.15	1.00	0.77	0.23	0.34	0.36	0.30	1.00	1.00	1.00
Final Sat.:	413	386	66	428	360	109	129	135	113	416	447	487
Capacity Analysis Module:												
Vol/Sat:	0.13	0.92	0.92	0.47	0.92	0.92	0.31	0.31	0.31	0.06	0.80	0.50
Crit Moves:	****			****			****			****		
Delay/Veh:	12.5	51.9	51.9	17.9	50.9	50.9	15.9	15.9	15.9	11.7	34.4	16.9
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:	12.5	51.9	51.9	17.9	50.9	50.9	15.9	15.9	15.9	11.7	34.4	16.9
LOS by Move:	B	F	F	C	F	F	C	C	C	B	D	C
ApproachDel:	47.3			40.5			15.9			26.6		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	47.3			40.5			15.9			26.6		
LOS by Appr:	E			E			C			D		
AllWayAvgQ:	0.1	5.2	5.2	0.8	5.3	5.3	0.4	0.4	0.4	0.1	3.0	0.9

Level Of Service Computation Report
2000 HCM 4-Way Stop (Future Volume Alternative)
PM

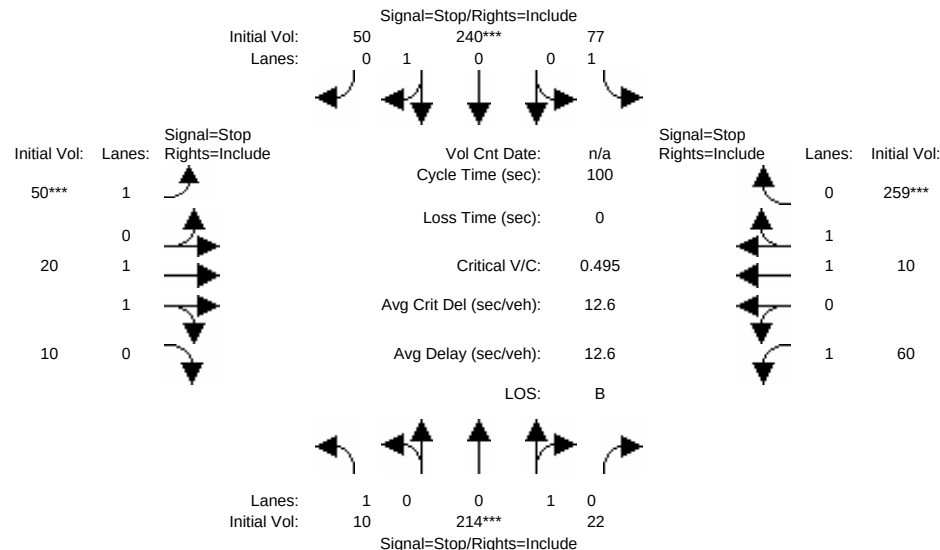
Intersection #44: Woodward/Main CumPP



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:												
Base Vol:	80	279	80	429	612	150	350	418	57	87	355	187
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:	80	279	80	429	612	150	350	418	57	87	355	187
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:	80	279	80	429	612	150	350	418	57	87	355	187
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:	80	279	80	429	612	150	350	418	57	87	355	187
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	80	279	80	429	612	150	350	418	57	87	355	187
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
Final Volume:	80	279	80	429	612	150	350	418	57	87	355	187
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	0.78	0.22	1.00	0.80	0.20	0.42	0.51	0.07	1.00	1.00	1.00
Final Sat.:	358	298	86	371	319	78	160	191	26	366	389	419
Capacity Analysis Module:												
Vol/Sat:	0.22	0.94	0.94	1.16	1.92	1.92	2.19	2.19	2.19	0.24	0.91	0.45
Crit Moves:			****		****			****			****	
Delay/Veh:	15.6	61.5	61.5	127.0	444	443.6	566.0	566	566.0	15.4	56.8	17.9
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:	15.6	61.5	61.5	127.0	444	443.6	566.0	566	566.0	15.4	56.8	17.9
LOS by Move:	C	F	F	F	F	F	F	F	F	C	F	C
ApproachDel:	53.1			329.6			566.0			39.5		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	53.1			329.6			566.0			39.5		
LOS by Appr:	F			F			F			E		
AllWayAvgQ:	0.3	5.3	5.3	11.8	47.6	47.6	57.9	57.9	57.9	0.3	4.8	0.8

Level Of Service Computation Report
2000 HCM 4-Way Stop (Future Volume Alternative)
AM

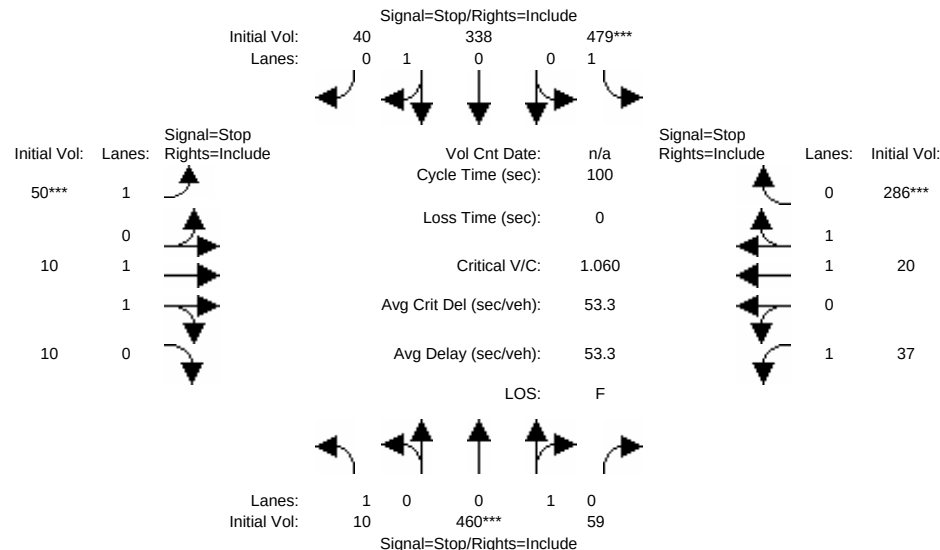
Intersection #84: Atherton/Van Ryn CumPP



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:												
Base Vol:	10	214	22	77	240	50	50	20	10	60	10	259
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:	10	214	22	77	240	50	50	20	10	60	10	259
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:	10	214	22	77	240	50	50	20	10	60	10	259
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:	10	214	22	77	240	50	50	20	10	60	10	259
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	10	214	22	77	240	50	50	20	10	60	10	259
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
Final Volume:	10	214	22	77	240	50	50	20	10	60	10	259
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	0.91	0.09	1.00	0.83	0.17	1.00	1.33	0.67	1.00	1.00	1.00
Final Sat.:	509	508	52	526	485	101	431	620	324	481	514	577
Capacity Analysis Module:												
Vol/Sat:	0.02	0.42	0.42	0.15	0.50	0.50	0.12	0.03	0.03	0.12	0.02	0.45
Crit Moves:	****			****			****			****		
Delay/Veh:	9.5	12.9	12.9	10.3	14.0	14.0	11.2	9.9	9.6	10.8	9.4	12.9
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:	9.5	12.9	12.9	10.3	14.0	14.0	11.2	9.9	9.6	10.8	9.4	12.9
LOS by Move:	A	B	B	B	B	B	B	A	A	B	A	B
ApproachDel:	12.8			13.2			10.7			12.4		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	12.8			13.2			10.7			12.4		
LOS by Appr:	B			B			B			B		
AllWayAvgQ:	0.0	0.6	0.6	0.2	0.9	0.9	0.1	0.0	0.0	0.1	0.0	0.7

Level Of Service Computation Report
2000 HCM 4-Way Stop (Future Volume Alternative)
PM

Intersection #84: Atherton/Van Ryn CumPP



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:												
Base Vol:	10	460	59	479	338	40	50	10	10	37	20	286
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:	10	460	59	479	338	40	50	10	10	37	20	286
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:	10	460	59	479	338	40	50	10	10	37	20	286
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:	10	460	59	479	338	40	50	10	10	37	20	286
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	10	460	59	479	338	40	50	10	10	37	20	286
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
Final Volume:	10	460	59	479	338	40	50	10	10	37	20	286
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	0.89	0.11	1.00	0.89	0.11	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	445	434	56	475	458	54	337	353	378	386	407	444
Capacity Analysis Module:												
Vol/Sat:	0.02	1.06	1.06	1.01	0.74	0.74	0.15	0.03	0.03	0.10	0.05	0.64
Crit Moves:	****			****			****					****
Delay/Veh:	10.8	84.0	84.0	70.3	26.6	26.6	14.6	12.7	12.0	12.9	11.9	23.8
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:	10.8	84.0	84.0	70.3	26.6	26.6	14.6	12.7	12.0	12.9	11.9	23.8
LOS by Move:	B	F	F	F	D	D	B	B	B	B	B	C
ApproachDel:	82.6			51.0			14.0			21.9		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	82.6			51.0			14.0			21.9		
LOS by Appr:	F			F			B			C		
AllWayAvgQ:	0.0	10.1	10.1	7.9	2.4	2.4	0.2	0.0	0.0	0.1	0.1	1.6

Tesoro Apartments

Cumulative + Project with Mitigations

1: SR 120 WB Ramp & Main Street

AM

												
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
Lane Util. Factor				0.95	0.95	0.88	0.97	0.95			0.95	1.00
Frt				1.00	1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95	0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				1681	1681	2787	3433	3539			3539	1583
Flt Permitted				0.95	0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)				1681	1681	2787	3433	3539			3539	1583
Volume (vph)	0	0	0	463	0	550	496	588	0	0	736	460
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	0	0	503	0	598	539	639	0	0	800	500
RTOR Reduction (vph)	0	0	0	0	0	486	0	0	0	0	0	154
Lane Group Flow (vph)	0	0	0	252	251	112	539	639	0	0	800	346
Turn Type				Split		Perm	Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases						8						6
Actuated Green, G (s)				18.7	18.7	18.7	19.7	73.3			49.6	49.6
Effective Green, g (s)				18.7	18.7	18.7	19.7	73.3			49.6	49.6
Actuated g/C Ratio				0.19	0.19	0.19	0.20	0.73			0.50	0.50
Clearance Time (s)				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
Lane Grp Cap (vph)				314	314	521	676	2594			1755	785
v/s Ratio Prot				c0.15	0.15		c0.16	0.18			c0.23	
v/s Ratio Perm						0.04						0.22
v/c Ratio				0.80	0.80	0.21	0.80	0.25			0.46	0.44
Uniform Delay, d1				38.9	38.9	34.4	38.2	4.3			16.4	16.3
Progression Factor				1.00	1.00	1.00	0.56	0.63			1.00	1.00
Incremental Delay, d2				13.7	13.3	0.2	6.1	0.2			0.9	1.8
Delay (s)				52.6	52.1	34.6	27.6	2.9			17.3	18.1
Level of Service				D	D	C	C	A			B	B
Approach Delay (s)		0.0			42.7			14.2			17.6	
Approach LOS		A			D			B			B	
Intersection Summary												
HCM Average Control Delay			24.2									
HCM Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			100.0									
Intersection Capacity Utilization			65.5%									
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
2: SR 120 EB Ramps & Main Street

Cumulative + Project with Mitigations

AM

												
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	
Lane Util. Factor	0.95	0.95	0.88					0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected	0.95	0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1681	1681	2787					3539	1583	1770	3539	
Flt Permitted	0.95	0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1681	1681	2787					3539	1583	1770	3539	
Volume (vph)	360	0	196	0	0	0	0	724	250	180	1059	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)	391	0	213	0	0	0	0	787	272	196	1151	0
RTOR Reduction (vph)	0	0	153	0	0	0	0	0	122	0	0	0
Lane Group Flow (vph)	196	195	60	0	0	0	0	787	150	196	1151	0
Turn Type	Split		Perm						Perm		Prot	
Protected Phases	4	4						2			1	6
Permitted Phases			4						2			
Actuated Green, G (s)	16.8	16.8	16.8					55.3	55.3	15.9	75.2	
Effective Green, g (s)	16.8	16.8	16.8					55.3	55.3	15.9	75.2	
Actuated g/C Ratio	0.17	0.17	0.17					0.55	0.55	0.16	0.75	
Clearance Time (s)	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	
Lane Grp Cap (vph)	282	282	468					1957	875	281	2661	
v/s Ratio Prot	c0.12	0.12						0.22		c0.11	c0.33	
v/s Ratio Perm			0.02						0.09			
v/c Ratio	0.70	0.69	0.13					0.40	0.17	0.70	0.43	
Uniform Delay, d1	39.2	39.2	35.4					12.8	11.0	39.8	4.6	
Progression Factor	1.00	1.00	1.00					0.75	0.72	1.52	1.62	
Incremental Delay, d2	7.2	7.1	0.1					0.6	0.4	6.9	0.4	
Delay (s)	46.4	46.3	35.5					10.2	8.4	67.4	7.8	
Level of Service	D	D	D					B	A	E	A	
Approach Delay (s)		42.5			0.0			9.8			16.5	
Approach LOS		D			A			A			B	
Intersection Summary												
HCM Average Control Delay			19.3					HCM Level of Service			B	
HCM Volume to Capacity ratio			0.52									
Actuated Cycle Length (s)			100.0					Sum of lost time (s)		8.0		
Intersection Capacity Utilization			65.5%					ICU Level of Service		C		
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
4: Woodward Avenue & Main Street

Cumulative + Project with Mitigations

AM

												
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	0.97	0.95		1.00	0.95	1.00	0.97	0.95		0.97	0.95	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3433	3299		1770	3539	1583	3433	3462		3433	3416	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3433	3299		1770	3539	1583	3433	3462		3433	3416	
Volume (vph)	40	42	35	27	357	246	55	356	61	199	331	100
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)	43	46	38	29	388	267	60	387	66	216	360	109
RTOR Reduction (vph)	0	29	0	0	0	206	0	13	0	0	24	0
Lane Group Flow (vph)	43	55	0	29	388	61	60	440	0	216	445	0
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	2.0	11.5		2.2	11.7	11.7	2.1	14.6		6.7	19.2	
Effective Green, g (s)	2.0	11.5		2.2	11.7	11.7	2.1	14.6		6.7	19.2	
Actuated g/C Ratio	0.04	0.23		0.04	0.23	0.23	0.04	0.29		0.13	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)	135	744		76	812	363	141	991		451	1286	
v/s Ratio Prot	0.01	0.02		c0.02	c0.11		0.02	c0.13		c0.06	0.13	
v/s Ratio Perm						0.04						
v/c Ratio	0.32	0.07		0.38	0.48	0.17	0.43	0.44		0.48	0.35	
Uniform Delay, d1	23.8	15.6		23.7	17.0	15.8	23.9	14.9		20.5	11.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.4	0.0		3.2	0.4	0.2	2.1	0.3		0.8	0.2	
Delay (s)	25.2	15.6		26.9	17.5	16.0	25.9	15.2		21.3	11.6	
Level of Service	C	B		C	B	B	C	B		C	B	
Approach Delay (s)		18.8			17.3			16.5			14.6	
Approach LOS		B			B			B			B	
Intersection Summary												
HCM Average Control Delay			16.3			HCM Level of Service			B			
HCM Volume to Capacity ratio			0.41									
Actuated Cycle Length (s)			51.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			44.0%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
8: Atherton Dr. & Spreckels Rd.

Cumulative + Project with Mitigations

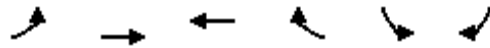
AM

												
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	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.92		1.00	0.99		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3464		1770	3269		1770	1849		1770	1724	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3464		1770	3269		1770	1849		1770	1724	
Volume (vph)	106	62	10	10	241	250	10	208	11	77	136	134
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)	115	67	11	11	262	272	11	226	12	84	148	146
RTOR Reduction (vph)	0	7	0	0	206	0	0	2	0	0	36	0
Lane Group Flow (vph)	115	71	0	11	328	0	11	236	0	84	258	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	5.0	17.1		0.8	12.9		0.8	14.8		4.4	18.4	
Effective Green, g (s)	5.0	17.1		0.8	12.9		0.8	14.8		4.4	18.4	
Actuated g/C Ratio	0.09	0.32		0.02	0.24		0.02	0.28		0.08	0.35	
Clearance Time (s)	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	
Lane Grp Cap (vph)	167	1116		27	794		27	515		147	597	
v/s Ratio Prot	c0.06	0.02		0.01	c0.10		0.01	0.13		c0.05	c0.15	
v/s Ratio Perm												
v/c Ratio	0.69	0.06		0.41	0.41		0.41	0.46		0.57	0.43	
Uniform Delay, d1	23.3	12.5		25.9	16.9		25.9	15.8		23.4	13.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	11.2	0.0		9.7	0.4		9.7	0.6		5.3	0.5	
Delay (s)	34.5	12.5		35.6	17.3		35.6	16.5		28.7	13.8	
Level of Service	C	B		D	B		D	B		C	B	
Approach Delay (s)		25.6			17.6			17.3			17.1	
Approach LOS		C			B			B			B	
Intersection Summary												
HCM Average Control Delay			18.6			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.49									
Actuated Cycle Length (s)			53.1			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			52.6%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
10: Woodward Avenue & Moffat Blvd.

Cumulative + Project with Mitigations
AM

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.97	
Flt Protected	0.95	1.00		0.97	1.00	
Satd. Flow (prot)	1770	1583		1811	1803	
Flt Permitted	0.95	1.00		0.97	1.00	
Satd. Flow (perm)	1770	1583		1811	1803	
Volume (vph)	90	198	376	282	160	50
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	98	215	409	307	174	54
RTOR Reduction (vph)	0	190	0	0	12	0
Lane Group Flow (vph)	98	25	0	716	216	0
Turn Type	Perm		Split			
Protected Phases	4		2	2	6	
Permitted Phases	4					
Actuated Green, G (s)	7.1	7.1		29.0	12.6	
Effective Green, g (s)	7.1	7.1		29.0	12.6	
Actuated g/C Ratio	0.12	0.12		0.48	0.21	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	207	185		865	374	
v/s Ratio Prot	c0.06			c0.40	c0.12	
v/s Ratio Perm		0.02				
v/c Ratio	0.47	0.14		0.83	0.58	
Uniform Delay, d1	25.1	24.0		13.7	21.7	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.7	0.3		6.6	2.2	
Delay (s)	26.8	24.4		20.3	23.8	
Level of Service	C	C		C	C	
Approach Delay (s)	25.1			20.3	23.8	
Approach LOS	C			C	C	
Intersection Summary						
HCM Average Control Delay			22.1	HCM Level of Service		C
HCM Volume to Capacity ratio			0.71			
Actuated Cycle Length (s)			60.7	Sum of lost time (s)		12.0
Intersection Capacity Utilization	62.1%			ICU Level of Service		B
Analysis Period (min)			15			
c Critical Lane Group						



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↑↑	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00		1.00	
Frt		1.00	1.00		0.97	
Flt Protected		1.00	1.00		0.96	
Satd. Flow (prot)		1863	1863		1744	
Flt Permitted		1.00	1.00		0.96	
Satd. Flow (perm)		1863	1863		1744	
Volume (vph)	0	338	415	0	140	33
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	367	451	0	152	36
RTOR Reduction (vph)	0	0	0	0	15	0
Lane Group Flow (vph)	0	367	451	0	173	0
Turn Type						
Protected Phases		4	8		6	
Permitted Phases						
Actuated Green, G (s)		6.6	6.6		4.3	
Effective Green, g (s)		6.6	6.6		4.3	
Actuated g/C Ratio		0.35	0.35		0.23	
Clearance Time (s)		4.0	4.0		4.0	
Vehicle Extension (s)		3.0	3.0		3.0	
Lane Grp Cap (vph)		651	651		397	
v/s Ratio Prot		0.20	c0.24		c0.10	
v/s Ratio Perm						
v/c Ratio		0.56	0.69		0.44	
Uniform Delay, d1		5.0	5.3		6.3	
Progression Factor		1.00	1.00		1.00	
Incremental Delay, d2		1.1	3.2		0.8	
Delay (s)		6.1	8.5		7.0	
Level of Service		A	A		A	
Approach Delay (s)		6.1	8.5		7.0	
Approach LOS		A	A		A	
Intersection Summary						
HCM Average Control Delay			7.3		HCM Level of Service	A
HCM Volume to Capacity ratio			0.59			
Actuated Cycle Length (s)			18.9		Sum of lost time (s)	8.0
Intersection Capacity Utilization			38.3%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

Tesoro Apartments
12: Moffat Blvd. & Austin Rd.

Cumulative + Project with Mitigations

AM

												
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
Frt	1.00	0.96						0.98			1.00	0.85
Flt Protected	0.95	1.00						0.98			0.98	1.00
Satd. Flow (prot)	1770	1781						1792			1826	1583
Flt Permitted	0.95	1.00						0.98			0.98	1.00
Satd. Flow (perm)	1770	1781						1792			1826	1583
Volume (vph)	169	219	90	0	0	0	70	70	20	40	60	345
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)	184	238	98	0	0	0	76	76	22	43	65	375
RTOR Reduction (vph)	0	14	0	0	0	0	0	6	0	0	0	188
Lane Group Flow (vph)	184	322	0	0	0	0	0	168	0	0	108	188
Turn Type	Split			Split			Split			Split		pm+ov
Protected Phases	4	4		8	8		2	2		6	6	4
Permitted Phases												6
Actuated Green, G (s)	12.9	12.9						5.0			4.1	17.0
Effective Green, g (s)	12.9	12.9						5.0			4.1	17.0
Actuated g/C Ratio	0.38	0.38						0.15			0.12	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)	672	676						264			220	978
v/s Ratio Prot	0.10	c0.18						c0.09			c0.06	0.07
v/s Ratio Perm												0.05
v/c Ratio	0.27	0.48						0.64			0.49	0.19
Uniform Delay, d1	7.3	8.0						13.6			14.0	4.7
Progression Factor	1.00	1.00						1.00			1.00	1.00
Incremental Delay, d2	0.2	0.5						5.0			1.7	0.1
Delay (s)	7.5	8.5						18.6			15.7	4.8
Level of Service	A	A						B			B	A
Approach Delay (s)		8.2			0.0			18.6			7.2	
Approach LOS		A			A			B			A	
Intersection Summary												
HCM Average Control Delay			9.3				HCM Level of Service			A		
HCM Volume to Capacity ratio			0.52									
Actuated Cycle Length (s)			34.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			39.1%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
13: SR 99 NB & Austin Rd.

Cumulative + Project with Mitigations

AM

												
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
Frt					1.00	0.85		1.00			1.00	0.85
Flt Protected					0.95	1.00		0.98			1.00	1.00
Satd. Flow (prot)					1770	1583		1825			1863	1583
Flt Permitted					0.95	1.00		0.82			1.00	1.00
Satd. Flow (perm)					1770	1583		1528			1863	1583
Volume (vph)	0	0	0	275	0	50	99	140	0	0	170	650
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	0	0	299	0	54	108	152	0	0	185	707
RTOR Reduction (vph)	0	0	0	0	0	39	0	0	0	0	0	362
Lane Group Flow (vph)	0	0	0	0	299	15	0	260	0	0	185	345
Turn Type				Perm		Perm	Perm					Perm
Protected Phases					8			2			6	
Permitted Phases				8		8	2					6
Actuated Green, G (s)					9.5	9.5		16.7			16.7	16.7
Effective Green, g (s)					9.5	9.5		16.7			16.7	16.7
Actuated g/C Ratio					0.28	0.28		0.49			0.49	0.49
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)					492	440		746			910	773
v/s Ratio Prot											0.10	
v/s Ratio Perm					0.17	0.01		0.17				c0.22
v/c Ratio					0.61	0.03		0.35			0.20	0.45
Uniform Delay, d1					10.7	9.0		5.4			5.0	5.7
Progression Factor					1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2					2.1	0.0		0.3			0.1	0.4
Delay (s)					12.9	9.0		5.7			5.1	6.1
Level of Service					B	A		A			A	A
Approach Delay (s)		0.0			12.3			5.7			5.9	
Approach LOS		A			B			A			A	
Intersection Summary												
HCM Average Control Delay			7.4				HCM Level of Service		A			
HCM Volume to Capacity ratio			0.51									
Actuated Cycle Length (s)			34.2				Sum of lost time (s)		8.0			
Intersection Capacity Utilization			78.3%				ICU Level of Service		D			
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
1: SR 120 WB Ramp & Main Street

Cumulative + Project with Mitigations

PM

												
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
Lane Util. Factor				0.95	0.95	0.88	0.97	0.95			0.95	1.00
Frt				1.00	1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95	0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				1681	1681	2787	3433	3539			3539	1583
Flt Permitted				0.95	0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)				1681	1681	2787	3433	3539			3539	1583
Volume (vph)	0	0	0	585	0	670	394	1061	0	0	913	150
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	0	0	636	0	728	428	1153	0	0	992	163
RTOR Reduction (vph)	0	0	0	0	0	143	0	0	0	0	0	45
Lane Group Flow (vph)	0	0	0	318	318	585	428	1153	0	0	992	118
Turn Type				Split		Perm	Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases						8						6
Actuated Green, G (s)				24.6	24.6	24.6	16.7	67.4			46.7	46.7
Effective Green, g (s)				24.6	24.6	24.6	16.7	67.4			46.7	46.7
Actuated g/C Ratio				0.25	0.25	0.25	0.17	0.67			0.47	0.47
Clearance Time (s)				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
Lane Grp Cap (vph)				414	414	686	573	2385			1653	739
v/s Ratio Prot				0.19	0.19		c0.12	0.33			c0.28	
v/s Ratio Perm						c0.21						0.07
v/c Ratio				0.77	0.77	0.85	0.75	0.48			0.60	0.16
Uniform Delay, d1				35.0	35.0	36.0	39.6	7.9			19.7	15.4
Progression Factor				1.00	1.00	1.00	0.69	0.16			1.00	1.00
Incremental Delay, d2				8.3	8.3	10.0	3.9	0.5			1.6	0.5
Delay (s)				43.4	43.4	46.0	31.1	1.8			21.4	15.8
Level of Service				D	D	D	C	A			C	B
Approach Delay (s)		0.0			44.8			9.7			20.6	
Approach LOS		A			D			A			C	
Intersection Summary												
HCM Average Control Delay			24.4									
HCM Volume to Capacity ratio			0.70									
Actuated Cycle Length (s)			100.0									
Intersection Capacity Utilization			79.0%									
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
2: SR 120 EB Ramps & Main Street

Cumulative + Project with Mitigations

PM

												
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	
Lane Util. Factor	0.95	0.95	0.88					0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected	0.95	0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1681	1681	2787					3539	1583	1770	3539	
Flt Permitted	0.95	0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1681	1681	2787					3539	1583	1770	3539	
Volume (vph)	550	0	631	0	0	0	0	906	636	260	1238	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)	598	0	686	0	0	0	0	985	691	283	1346	0
RTOR Reduction (vph)	0	0	82	0	0	0	0	0	407	0	0	0
Lane Group Flow (vph)	299	299	604	0	0	0	0	985	284	283	1346	0
Turn Type	Split		Perm					Perm		Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases			4						2			
Actuated Green, G (s)	26.3	26.3	26.3					41.1	41.1	20.6	65.7	
Effective Green, g (s)	26.3	26.3	26.3					41.1	41.1	20.6	65.7	
Actuated g/C Ratio	0.26	0.26	0.26					0.41	0.41	0.21	0.66	
Clearance Time (s)	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	
Lane Grp Cap (vph)	442	442	733					1455	651	365	2325	
v/s Ratio Prot	0.18	0.18						c0.28		c0.16	0.38	
v/s Ratio Perm			c0.22						0.18			
v/c Ratio	0.68	0.68	0.82					0.68	0.44	0.78	0.58	
Uniform Delay, d1	33.0	33.0	34.7					24.0	21.1	37.5	9.5	
Progression Factor	1.00	1.00	1.00					0.78	2.82	1.08	1.06	
Incremental Delay, d2	4.1	4.1	7.5					1.5	1.3	8.1	0.8	
Delay (s)	37.1	37.1	42.2					20.2	60.9	48.5	10.8	
Level of Service	D	D	D					C	E	D	B	
Approach Delay (s)		39.8			0.0			37.0			17.4	
Approach LOS		D			A			D			B	
Intersection Summary												
HCM Average Control Delay			30.8					HCM Level of Service			C	
HCM Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			100.0					Sum of lost time (s)		12.0		
Intersection Capacity Utilization			79.0%					ICU Level of Service		D		
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
4: Woodward Avenue & Main Street

Cumulative + Project with Mitigations

PM

												
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	0.97	0.95		1.00	0.95	1.00	0.97	0.95		0.97	0.95	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	0.97		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3433	3475		1770	3539	1583	3433	3421		3433	3435	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3433	3475		1770	3539	1583	3433	3421		3433	3435	
Volume (vph)	350	418	57	87	355	187	80	279	80	429	612	150
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)	380	454	62	95	386	203	87	303	87	466	665	163
RTOR Reduction (vph)	0	13	0	0	0	162	0	26	0	0	20	0
Lane Group Flow (vph)	380	503	0	95	386	41	87	364	0	466	808	0
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	13.0	21.6		6.0	14.6	14.6	4.5	14.7		13.9	24.1	
Effective Green, g (s)	13.0	21.6		6.0	14.6	14.6	4.5	14.7		13.9	24.1	
Actuated g/C Ratio	0.18	0.30		0.08	0.20	0.20	0.06	0.20		0.19	0.33	
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)	618	1040		147	716	320	214	697		661	1147	
v/s Ratio Prot	c0.11	c0.14		0.05	0.11		0.03	0.11		c0.14	c0.24	
v/s Ratio Perm						0.03						
v/c Ratio	0.61	0.48		0.65	0.54	0.13	0.41	0.52		0.70	0.70	
Uniform Delay, d1	27.3	20.7		32.1	25.8	23.6	32.6	25.6		27.2	20.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	0.4		9.4	0.8	0.2	1.3	0.7		3.4	2.0	
Delay (s)	29.1	21.1		41.5	26.6	23.8	33.8	26.3		30.7	22.9	
Level of Service	C	C		D	C	C	C	C		C	C	
Approach Delay (s)		24.5			27.8			27.7			25.7	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			26.1			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			72.2			Sum of lost time (s)				8.0		
Intersection Capacity Utilization			58.2%			ICU Level of Service				B		
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
8: Atherton Dr. & Spreckels Rd.

Cumulative + Project with Mitigations

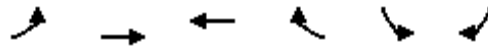
PM

												
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	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.90		1.00	0.99		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3525		1770	3176		1770	1844		1770	1724	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3525		1770	3176		1770	1844		1770	1724	
Volume (vph)	344	369	10	10	102	222	10	193	14	369	245	243
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)	374	401	11	11	111	241	11	210	15	401	266	264
RTOR Reduction (vph)	0	2	0	0	207	0	0	3	0	0	35	0
Lane Group Flow (vph)	374	410	0	11	145	0	11	222	0	401	495	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	19.3	30.1		1.1	11.9		1.1	16.8		20.7	36.4	
Effective Green, g (s)	19.3	30.1		1.1	11.9		1.1	16.8		20.7	36.4	
Actuated g/C Ratio	0.23	0.36		0.01	0.14		0.01	0.20		0.24	0.43	
Clearance Time (s)	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	
Lane Grp Cap (vph)	403	1253		23	446		23	366		433	741	
v/s Ratio Prot	c0.21	c0.12		0.01	0.05		0.01	0.12		c0.23	c0.29	
v/s Ratio Perm												
v/c Ratio	0.93	0.33		0.48	0.32		0.48	0.61		0.93	0.67	
Uniform Delay, d1	32.0	19.9		41.5	32.8		41.5	30.9		31.3	19.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	27.3	0.2		14.8	0.4		14.8	2.8		25.6	2.3	
Delay (s)	59.3	20.1		56.4	33.2		56.4	33.8		56.9	21.6	
Level of Service	E	C		E	C		E	C		E	C	
Approach Delay (s)		38.7			33.9			34.8			36.8	
Approach LOS		D			C			C			D	
Intersection Summary												
HCM Average Control Delay			36.8			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.71									
Actuated Cycle Length (s)			84.7			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			73.8%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
10: Woodward Avenue & Moffat Blvd.

Cumulative + Project with Mitigations
PM

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.97	
Flt Protected	0.95	1.00		0.97	1.00	
Satd. Flow (prot)	1770	1583		1799	1801	
Flt Permitted	0.95	1.00		0.97	1.00	
Satd. Flow (perm)	1770	1583		1799	1801	
Volume (vph)	80	612	474	200	305	100
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	665	515	217	332	109
RTOR Reduction (vph)	0	572	0	0	13	0
Lane Group Flow (vph)	87	93	0	732	428	0
Turn Type	Perm		Split			
Protected Phases	4		2	2	6	
Permitted Phases		4				
Actuated Green, G (s)	11.3	11.3		35.6	21.5	
Effective Green, g (s)	11.3	11.3		35.6	21.5	
Actuated g/C Ratio	0.14	0.14		0.44	0.27	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	249	222		797	482	
v/s Ratio Prot	0.05			c0.41	c0.24	
v/s Ratio Perm		c0.06				
v/c Ratio	0.35	0.42		0.92	0.89	
Uniform Delay, d1	31.2	31.6		21.0	28.3	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	1.3		15.4	17.7	
Delay (s)	32.1	32.9		36.4	45.9	
Level of Service	C	C		D	D	
Approach Delay (s)	32.8			36.4	45.9	
Approach LOS	C			D	D	
Intersection Summary						
HCM Average Control Delay			37.2		HCM Level of Service	D
HCM Volume to Capacity ratio			0.83			
Actuated Cycle Length (s)			80.4		Sum of lost time (s)	12.0
Intersection Capacity Utilization			73.3%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00		1.00	
Frt		1.00	1.00		0.99	
Flt Protected		1.00	1.00		0.96	
Satd. Flow (prot)		1863	1863		1758	
Flt Permitted		1.00	1.00		0.96	
Satd. Flow (perm)		1863	1863		1758	
Volume (vph)	0	927	554	0	350	41
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1008	602	0	380	45
RTOR Reduction (vph)	0	0	0	0	6	0
Lane Group Flow (vph)	0	1008	602	0	419	0
Turn Type						
Protected Phases		4	8		6	
Permitted Phases						
Actuated Green, G (s)		36.8	36.8		17.4	
Effective Green, g (s)		36.8	36.8		17.4	
Actuated g/C Ratio		0.59	0.59		0.28	
Clearance Time (s)		4.0	4.0		4.0	
Vehicle Extension (s)		3.0	3.0		3.0	
Lane Grp Cap (vph)		1102	1102		492	
v/s Ratio Prot		c0.54	0.32		c0.24	
v/s Ratio Perm						
v/c Ratio		0.91	0.55		0.85	
Uniform Delay, d1		11.3	7.7		21.2	
Progression Factor		1.00	1.00		1.00	
Incremental Delay, d2		11.5	0.6		13.3	
Delay (s)		22.8	8.2		34.5	
Level of Service		C	A		C	
Approach Delay (s)		22.8	8.2		34.5	
Approach LOS		C	A		C	
Intersection Summary						
HCM Average Control Delay			21.0		HCM Level of Service	C
HCM Volume to Capacity ratio			0.89			
Actuated Cycle Length (s)			62.2		Sum of lost time (s)	8.0
Intersection Capacity Utilization			77.3%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						

Tesoro Apartments
12: Moffat Blvd. & Austin Rd.

Cumulative + Project with Mitigations

PM

												
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	0.98			0.95			0.98			1.00	0.85
Flt Protected	0.95	1.00			0.98			0.98			0.97	1.00
Satd. Flow (prot)	1770	1830			1750			1791			1807	1583
Flt Permitted	0.95	1.00			0.98			0.98			0.97	1.00
Satd. Flow (perm)	1770	1830			1750			1791			1807	1583
Volume (vph)	656	601	80	1	1	1	60	90	30	80	50	494
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)	713	653	87	1	1	1	65	98	33	87	54	537
RTOR Reduction (vph)	0	5	0	0	1	0	0	8	0	0	0	193
Lane Group Flow (vph)	713	735	0	0	2	0	0	188	0	0	141	344
Turn Type	Split			Split			Split			Split		pm+ov
Protected Phases	4	4		8	8		2	2		6	6	4
Permitted Phases												6
Actuated Green, G (s)	39.5	39.5			0.6			9.7			7.5	47.0
Effective Green, g (s)	39.5	39.5			0.6			9.7			7.5	47.0
Actuated g/C Ratio	0.54	0.54			0.01			0.13			0.10	0.64
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)	954	986			14			237			185	1101
v/s Ratio Prot	c0.40	0.40			c0.00			c0.11			c0.08	0.17
v/s Ratio Perm												0.05
v/c Ratio	0.75	0.75			0.14			0.79			0.76	0.31
Uniform Delay, d1	13.0	13.0			36.1			30.8			32.0	5.9
Progression Factor	1.00	1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2	3.2	3.1			4.7			16.5			16.8	0.2
Delay (s)	16.3	16.1			40.8			47.4			48.8	6.1
Level of Service	B	B			D			D			D	A
Approach Delay (s)		16.2			40.8			47.4			15.0	
Approach LOS		B			D			D			B	
Intersection Summary												
HCM Average Control Delay			18.5			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.75									
Actuated Cycle Length (s)			73.3			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			66.2%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

Tesoro Apartments
13: SR 99 NB & Austin Rd.

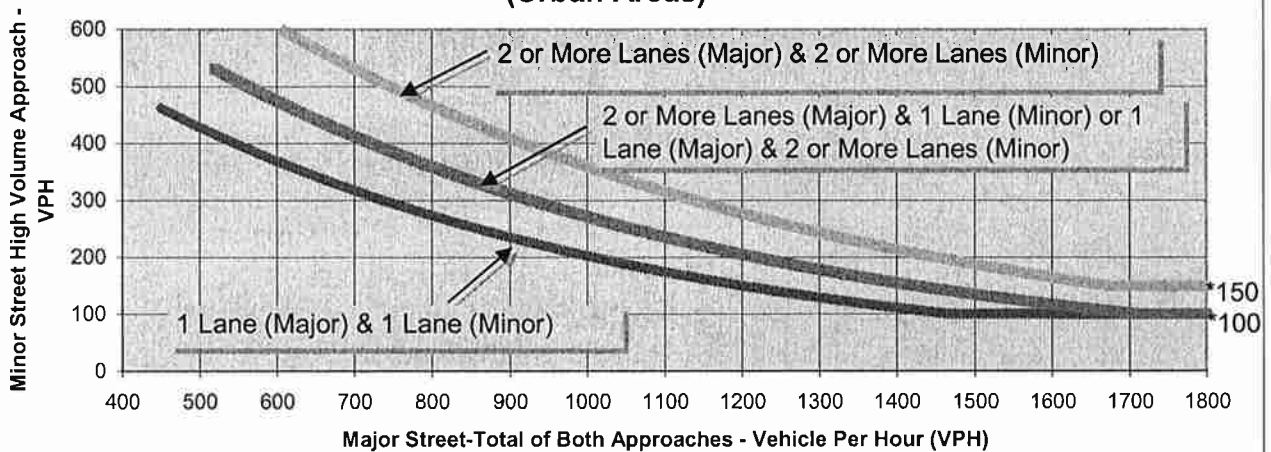
Cumulative + Project with Mitigations

PM

												
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
Frt					1.00	0.85		1.00			1.00	0.85
Flt Protected					0.95	1.00		1.00			1.00	1.00
Satd. Flow (prot)					1770	1583		1856			1863	1583
Flt Permitted					0.95	1.00		0.96			1.00	1.00
Satd. Flow (perm)					1770	1583		1794			1863	1583
Volume (vph)	0	0	0	414	0	70	56	690	0	0	210	350
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	0	0	450	0	76	61	750	0	0	228	380
RTOR Reduction (vph)	0	0	0	0	0	41	0	0	0	0	0	177
Lane Group Flow (vph)	0	0	0	0	450	35	0	811	0	0	228	203
Turn Type				Perm		Perm	Perm					Perm
Protected Phases					8			2			6	
Permitted Phases				8		8	2					6
Actuated Green, G (s)					16.2	16.2		27.8			27.8	27.8
Effective Green, g (s)					16.2	16.2		27.8			27.8	27.8
Actuated g/C Ratio					0.31	0.31		0.53			0.53	0.53
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)					551	493		959			996	846
v/s Ratio Prot											0.12	
v/s Ratio Perm					0.25	0.02		0.45				0.13
v/c Ratio					0.82	0.07		0.85			0.23	0.24
Uniform Delay, d1					16.5	12.6		10.3			6.4	6.5
Progression Factor					1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2					9.1	0.1		7.0			0.1	0.1
Delay (s)					25.7	12.7		17.2			6.5	6.6
Level of Service					C	B		B			A	A
Approach Delay (s)		0.0			23.8			17.2			6.6	
Approach LOS		A			C			B			A	
Intersection Summary												
HCM Average Control Delay			15.7				HCM Level of Service		B			
HCM Volume to Capacity ratio			0.83									
Actuated Cycle Length (s)			52.0				Sum of lost time (s)		8.0			
Intersection Capacity Utilization			94.0%				ICU Level of Service		F			
Analysis Period (min)			15									
c Critical Lane Group												

APPENDIX B:
SIGNAL WARRANTS

**Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)**



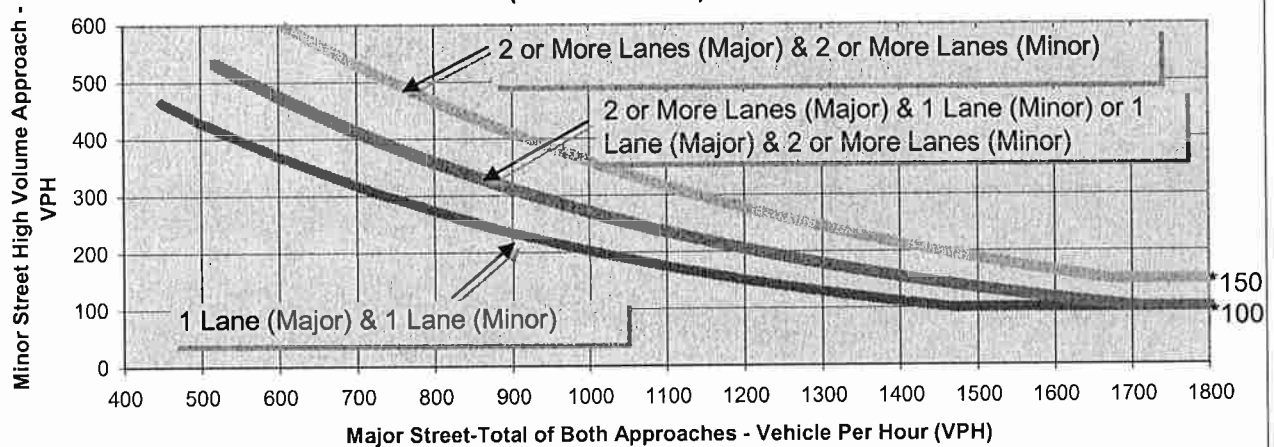
*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	<u>Warrant Met</u>
Number of Lanes	Two or More Lane (Y/N)	N	N	<u>YES</u>
	One Lane (Y/N)	Y	Y	
Traffic Volume (VPH) *		1630	825	
*Note: Traffic Volume for Major Street is Total Volume of Both Approches. Traffic Volume for Minor Street is the Volume of High Volume Approach.				

- ☐ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☒ Cumulative Plus Project Conditions

Figure 9-8
PEAK HOUR VOLUME WARRANT
(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.

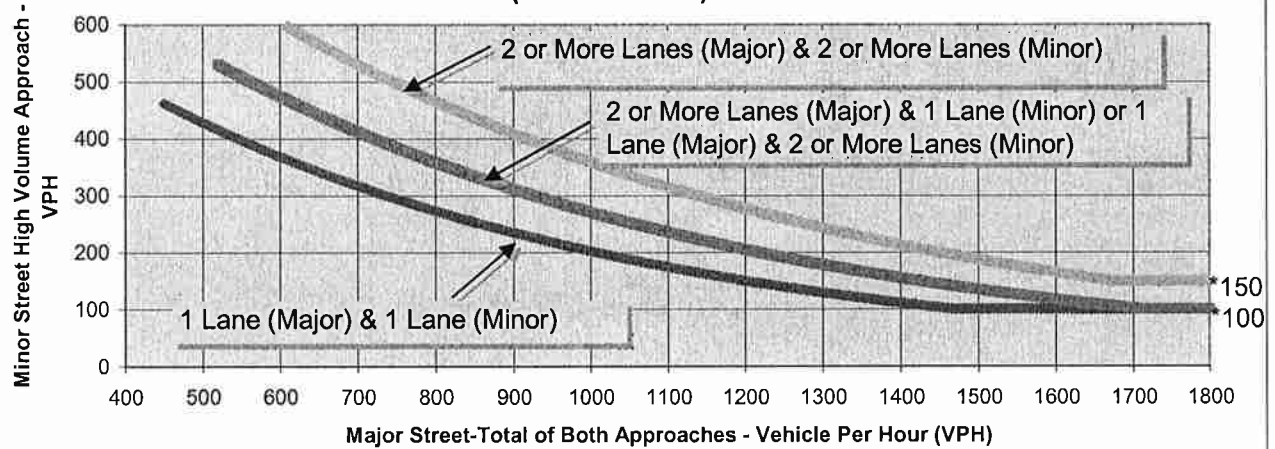
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	N	Y	YES
	One Lane (Y/N)	Y	N	
Traffic Volume (VPH) *		1074	723	

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

- ☐ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☒ Cumulative Plus Project Conditions

**Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)**



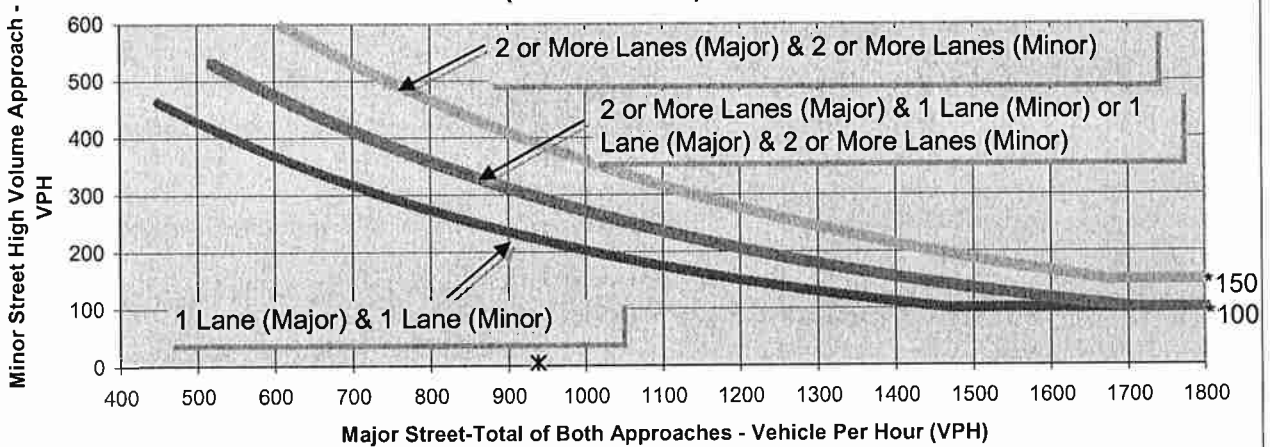
*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	<u>Warrant Met</u>
Number of Lanes	Two or More Lane (Y/N)	N	N	<u>NO</u>
	One Lane (Y/N)	Y	Y	
	Traffic Volume (VPH) *		1045	
*Note: Traffic Volume for Major Street is Total Volume of Both Approches. Traffic Volume for Minor Street is the Volume of High Volume Approach.				

- ☐ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☒ Cumulative Plus Project Conditions

**Figure 9-8
PEAK HOUR VOLUME WARRANT
(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.

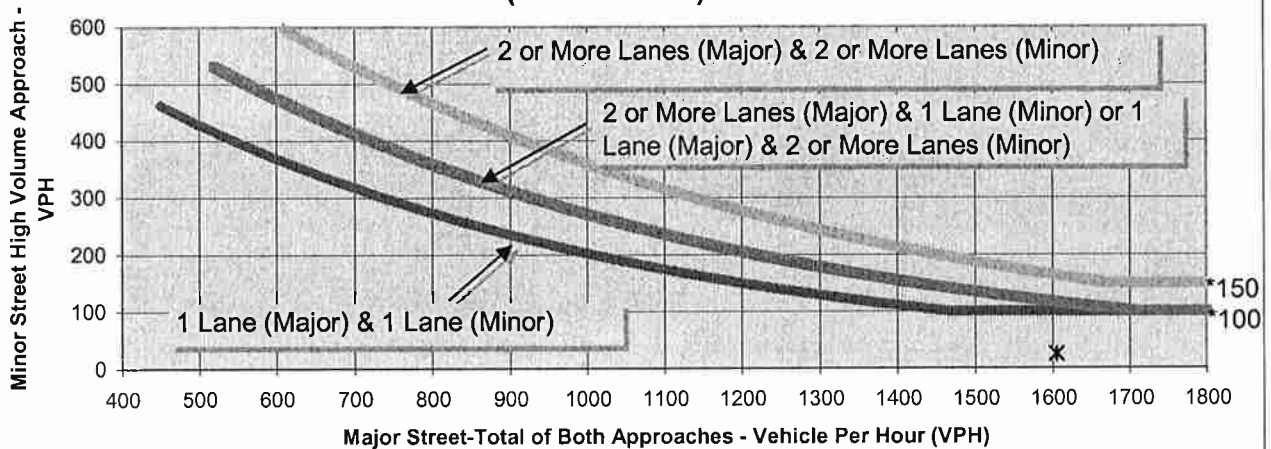
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	N	N	<u>NO</u>
	One Lane (Y/N)	Y	Y	
Traffic Volume (VPH) *		938	5	

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

- ☐ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☒ Cumulative Plus Project Conditions

**Figure 9-8
PEAK HOUR VOLUME WARRANT
(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: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	<u>Warrant Met</u>
Number of Lanes	Two or More Lane (Y/N)	Y	N	<u>NO</u>
	One Lane (Y/N)	N	Y	
Traffic Volume (VPH) *		1605	25	

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

- ☐ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☒ Cumulative Plus Project Conditions

APPENDIX C:
FREEWAY FACILITY LOS CALCULATION WORKSHEETS

HCS+: Basic Freeway Segments Release 5.21

Phone:
E-mail:

Fax:

Operational
Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Union to Main
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing Conditions
Description: Tesoro Apartments TIS

Flow Inputs and
Adjustments

Volume, V	2040	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	567	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	1190	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:	Base	
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	58.0	mi/h
	Urban Freeway	

LOS and Performance
Measures

Flow rate, vp	1190	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
Density, D	20.5	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:
E-mail:

Fax:

Operational
Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Union to Main
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing Conditions
Description: Tesoro Apartments TIS

Flow Inputs and
Adjustments

Volume, V	2940	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	817	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	1715	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:	Base	
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	58.0	mi/h
	Urban Freeway	

LOS and Performance
Measures

Flow rate, vp	1715	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
Density, D	29.6	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:
E-mail:

Fax:

Analysis Operational

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Main to SR 99
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing Conditions
Description: Tesoro Apartments TIS

Adjustments Flow Inputs and

Volume, V	1895	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	526	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	1105	pc/h/ln

Adjustments Speed Inputs and

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:	Base	
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	58.0	mi/h

Urban Freeway

Measures LOS and Performance

Flow rate, vp	1105	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
Density, D	19.1	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:
E-mail:

Fax:

Operational

Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Main to SR 99
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing Conditions
Description: Tesoro Apartments TIS

Flow Inputs and

Adjustments

Volume, V	2695	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	749	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	1572	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:	Base	
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	58.0	mi/h
	Urban Freeway	

LOS and Performance

Measures

Flow rate, vp	1572	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
Density, D	27.1	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:
E-mail:

Fax:

Analysis Operational

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: SR 99 to Main
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing Conditions
Description: Tesoro Apartments TIS

Adjustments Flow Inputs and

Volume, V	3235	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	899	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	1887	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:	Base	
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	58.0	mi/h
	Urban Freeway	

Measures

Flow rate, vp	1887	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	57.5	mi/h
Number of lanes, N	2	
Density, D	32.8	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:
E-mail:

Fax:

Analysis	Operational

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	6/3/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	SR 99 to Main
Jurisdiction:	Lathrop/San Joaquin
Analysis Year:	2007 Existing Conditions
Description:	Tesoro Apartments TIS

Adjustments Flow Inputs and

Volume, V	2735	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	760	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	1595	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:	Base	
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	58.0	mi/h
	Urban Freeway	

Measures LOS and Performance

Flow rate, vp	1595	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
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.

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Operational
Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Main to Union
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing Conditions
Description: Tesoro Apartments TIS

Flow Inputs and
Adjustments

Volume, V	3165	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	879	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	1846	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:	Base	
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	58.0	mi/h
	Urban Freeway	

LOS and Performance
Measures

Flow rate, vp	1846	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	57.7	mi/h
Number of lanes, N	2	
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.

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Operational
Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Main to Union
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing Conditions
Description: Tesoro Apartments TIS

Flow Inputs and
Adjustments

Volume, V	2405	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	668	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	1403	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:	Base	
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	58.0	mi/h

Urban Freeway

LOS and Performance
Measures

Flow rate, vp	1403	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
Density, D	24.2	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

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Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Union to Main
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing PP Conditions
Description: Tesoro Apartments TIS

Flow Inputs and

Adjustments

Volume, V	2040	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	567	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	1190	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:	Base	
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	58.0	mi/h
	Urban Freeway	

LOS and Performance

Measures

Flow rate, vp	1190	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
Density, D	20.5	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational
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Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Union to Main
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing PP Conditions
Description: Tesoro Apartments TIS

Flow Inputs and
Adjustments

Volume, V	3006	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	835	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	1754	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:	Base	
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	58.0	mi/h
	Urban Freeway	

LOS and Performance
Measures

Flow rate, vp	1754	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	57.9	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.

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Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Main to SR 99
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing PP Conditions
Description: Tesoro Apartments TIS

Flow Inputs and

Adjustments

Volume, V	2695	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	749	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	1572	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:	Base	
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	58.0	mi/h
	Urban Freeway	

LOS and Performance

Measures

Flow rate, vp	1572	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
Density, D	27.1	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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Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: SR 99 to Main
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing PP Conditions
Description: Tesoro Apartments TIS

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	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	1887	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:	Base	
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	58.0	mi/h
	Urban Freeway	

LOS and Performance

Measures

Flow rate, vp	1887	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	57.5	mi/h
Number of lanes, N	2	
Density, D	32.8	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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Operational
Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: SR 99 to Main
Jurisdiction: Lathrop/San Joaquin
Analysis Year:
Description: Tesoro Apartments TIS

Flow Inputs and
Adjustments

Volume, V	2735	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	760	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	1595	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:	Base	
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	58.0	mi/h

Urban Freeway

LOS and Performance
Measures

Flow rate, vp	1595	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
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.

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Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Main to Union
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing PP Conditions
Description: Tesoro Apartments TIS

Adjustments

Volume, V	3233	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	898	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	1886	pc/h/ln

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:	Base	
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	58.0	mi/h
	Urban Freeway	

Measures

Flow rate, v_p	1886	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	57.5	mi/h
Number of lanes, N	2	
Density, D	32.8	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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Operational
Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Main to Union
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing PP Conditions
Description: Tesoro Apartments TIS

Flow Inputs and
Adjustments

Volume, V	2441	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	678	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	1424	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:	Base	
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	58.0	mi/h
	Urban Freeway	

LOS and Performance
Measures

Flow rate, vp	1424	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	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.

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Operational
Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Union to Main
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative Conditions
Description: Tesoro Apartments TIS

Flow Inputs and
Adjustments

Volume, V	4615	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1254	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	1756	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:	Base	
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	59.5	mi/h
	Urban Freeway	

LOS and Performance
Measures

Flow rate, vp	1756	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	59.4	mi/h
Number of lanes, N	3	
Density, D	29.6	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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Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Main to SR 99
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative Conditions
Description: Tesoro Apartments TIS

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	1158	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:	Base	
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	59.5	mi/h
	Urban Freeway	

LOS and Performance
Measures

Flow rate, vp	1158	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	59.5	mi/h
Number of lanes, N	3	
Density, D	19.5	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

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Analyst: Fehr & Peers
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Date Performed: 6/3/2007
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Main to SR 99
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative Conditions
Description: Tesoro Apartments TIS

Flow Inputs and
Adjustments

Volume, V	4396	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	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:	Base	
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	59.5	mi/h
	Urban Freeway	

LOS and Performance
Measures

Flow rate, vp	1672	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	59.5	mi/h
Number of lanes, N	3	
Density, D	28.1	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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Operational
Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: SR 99 to Main
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative Conditions
Description: Tesoro Apartments TIS

Flow Inputs and
Adjustments

Volume, V	5808	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1578	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	2210	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:	Base	
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	59.5	mi/h

Urban Freeway

LOS and Performance
Measures

Flow rate, vp	2210	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	53.5	mi/h
Number of lanes, N	3	
Density, D	41.3	pc/mi/ln
Level of service, LOS	E	

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: 6/3/2007
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: SR 99 to Main
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative Conditions
Description: Tesoro Apartments TIS

Flow Inputs and

Adjustments

Volume, V	3570	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	970	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	1358	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:	Base	
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	59.5	mi/h
	Urban Freeway	

LOS and Performance

Measures

Flow rate, vp	1358	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	59.5	mi/h
Number of lanes, N	3	
Density, D	22.8	pc/mi/ln
Level of service, LOS	C	

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: 6/3/2007
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Main to Union
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative Conditions
Description: Tesoro Apartments TIS

Flow Inputs and

Adjustments

Volume, V	5684	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1545	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	2162	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:	Base	
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	59.5	mi/h
	Urban Freeway	

LOS and Performance

Measures

Flow rate, vp	2162	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	54.7	mi/h
Number of lanes, N	3	
Density, D	39.5	pc/mi/ln
Level of service, LOS	E	

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: 6/3/2007
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Main to Union
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative Conditions
Description: Tesoro Apartments TIS

Flow Inputs and
Adjustments

Volume, V	2823	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	767	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	1074	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:	Base	
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	59.5	mi/h
	Urban Freeway	

LOS and Performance
Measures

Flow rate, vp	1074	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	59.5	mi/h
Number of lanes, N	3	
Density, D	18.1	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

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Analysis
Operational

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Union to Main
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative Conditions
Description: Tesoro Apartments TIS

Adjustments Flow Inputs and

Volume, V	3155	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	857	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	1200	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:	Base	
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	59.5	mi/h
	Urban Freeway	

Measures LOS and Performance

Flow rate, vp	1200	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	59.5	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.

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Analysis

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Union to Main
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative PP Conditions
Description: Tesoro Apartments TIS

Flow Inputs and

Adjustments

Volume, V	3172	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	862	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	1207	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:	Base	
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	59.5	mi/h
	Urban Freeway	

LOS and Performance

Measures

Flow rate, vp	1207	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	59.5	mi/h
Number of lanes, N	3	
Density, D	20.3	pc/mi/ln
Level of service, LOS	C	

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: 6/3/2007
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Union to Main
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative PP Conditions
Description: Tesoro Apartments TIS

Flow Inputs and
Adjustments

Volume, V	4615	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1254	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	1756	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:	Base	
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	59.5	mi/h
	Urban Freeway	

LOS and Performance
Measures

Flow rate, vp	1756	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	59.4	mi/h
Number of lanes, N	3	
Density, D	29.6	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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Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	6/3/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Main to SR 99
Jurisdiction:	Lathrop/San Joaquin
Analysis Year:	2007 Cumulative PP Conditions
Description:	Tesoro Apartments TIS

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	1158	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:	Base	
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	59.5	mi/h
	Urban Freeway	

LOS and Performance

Measures

Flow rate, v_p	1158	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	59.5	mi/h
Number of lanes, N	3	
Density, D	19.5	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

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Analysis _____ Operational _____

Analyst: Fehr & Peers
Agency or Company: Fehr & Peers
Date Performed: 6/3/2007
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Eastbound
From/To: Main to SR 99
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative PP Conditions
Description: Tesoro Apartments TIS

Flow Inputs and
Adjustments

Volume, V	4396	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	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:	Base	
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	59.5	mi/h
	Urban Freeway	

Measures LOS and Performance

Flow rate, vp	1672	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	59.5	mi/h
Number of lanes, N	3	
Density, D	28.1	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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OperationalAnalysis

Analyst: Fehr & Peers
 Agency or Company: Fehr & Peers
 Date Performed: 6/3/2007
 Analysis Time Period: AM Peak Hour
 Freeway/Direction: SR 120 Westbound
 From/To: SR 99 to Main
 Jurisdiction: Lathrop/San Joaquin
 Analysis Year: 2007 Cumulative PP Conditions
 Description: Tesoro Apartments TIS

Flow Inputs andAdjustments

Volume, V	5808	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1578	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	2210	pc/h/ln

Speed Inputs andAdjustments

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:	Base	
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	59.5	mi/h
	Urban Freeway	

LOS and PerformanceMeasures

Flow rate, vp	2210	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	53.5	mi/h
Number of lanes, N	3	
Density, D	41.3	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

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Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	6/3/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	SR 99 to Main
Jurisdiction:	Lathrop/San Joaquin
Analysis Year:	2007 Cumulative PP Conditions
Description:	Tesoro Apartments TIS

Flow Inputs and

Adjustments

Volume, V	3570	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	970	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	1358	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:	Base	
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	59.5	mi/h
	Urban Freeway	

LOS and Performance

Measures

Flow rate, vp	1358	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	59.5	mi/h
Number of lanes, N	3	
Density, D	22.8	pc/mi/ln
Level of service, LOS	C	

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: 6/3/2007
Analysis Time Period: AM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Main to Union
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative PP Conditions
Description: Tesoro Apartments TIS

Flow Inputs and

Adjustments

Volume, V	5752	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	1563	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	2188	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:	Base	
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	59.5	mi/h
	Urban Freeway	

LOS and Performance

Measures

Flow rate, vp	2188	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	54.1	mi/h
Number of lanes, N	3	
Density, D	40.5	pc/mi/ln
Level of service, LOS	E	

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: 6/3/2007
Analysis Time Period: PM Peak Hour
Freeway/Direction: SR 120 Westbound
From/To: Main to Union
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative PP Conditions
Description: Tesoro Apartments TIS

Flow Inputs and
Adjustments

Volume, V	2859	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	777	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	1088	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:	Base	
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	59.5	mi/h

Urban Freeway

LOS and Performance
Measures

Flow rate, vp	1088	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	59.5	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.

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
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Diverge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: SR 120 Eastbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2040	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	355	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? No

Volume on adjacent ramp	210	vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent	
		Ramp		
Volume, V (vph)	2040	355	210	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v ₁₅	567	99	58	v
Trucks and buses	10	5	10	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, f _{HV}	0.952	0.976	0.952	
Driver population factor, f _P	1.00	1.00	1.00	
Flow rate, v _p	2380	404	245	pcph

Estimation of V₁₂ Diverge Areas

L = (Equation 25-8 or 25-9)

EQ

P = 1.000 Using Equation 0

FD

$v = v + (v - v) P = 2380$ pc/h

12 R F R FD

Capacity Checks

	Actual	Maximum	LOS F?
$v = v$	2380	4700	No
$F_i F$			
$v = v - v$	1976	4700	No
$F O F R$			
v	404	2100	No
R			
$v v$	0 pc/h	(Equation 25-15 or 25-16)	
3 or av ₃₄			

Is $v > 2700$ pc/h? No
 3 or av34

Is $v > 1.5 v / 2$ No
 3 or av34 12

If yes, $v =$ (Equation 25-18)
 12A

Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?
v	2380	4600	No
12			!

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v - 0.009 L = 21.1$ pc/mi/ln
 R 12 D

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

Speed Estimation

Intermediate speed variable, $D = 0.269$
 S

Space mean speed in ramp influence area, $S = 58.8$ mph
 R

Space mean speed in outer lanes, $S = N/A$ mph
 0

Space mean speed for all vehicles, $S = 58.8$ mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
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Diverge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: SR 120 Eastbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2940	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	570	vph
Length of first accel/decel lane	400	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)	2940	570	vph
Peak-hour factor, PHF	0.90	0.90	
Peak 15-min volume, v ₁₅	817	158	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, f _{HV}	0.952	0.976	
Driver population factor, f _P	1.00	1.00	
Flow rate, v _p	3430	649	pcph

Estimation of V₁₂ Diverge Areas

L = (Equation 25-8 or 25-9)

EQ

P = 1.000 Using Equation 0

FD

$v = v + (v - v) P = 3430$ pc/h

12 R F R FD

Capacity Checks

	Actual	Maximum	LOS F?
$v = v$	3430	4700	No
$F_i F$			
$v = v - v$	2781	4700	No
$F O F R$			
v	649	2100	No
R			
$v v$	0 pc/h	(Equation 25-15 or 25-16)	
3 or av ₃₄			

Is $v > 2700$ pc/h? No
 3 or av34

Is $v > 1.5 v / 2$ No
 3 or av34 12

If yes, $v =$ (Equation 25-18)
 12A

Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?
v	3430	4600	No
12			!
Level of Service Determination (if not F)			

Density, $D = 4.252 + 0.0086 v - 0.009 L = 30.2$ pc/mi/ln
 R 12 D

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

Speed Estimation

Intermediate speed variable, $D = 0.291$
 S

Space mean speed in ramp influence area, $S = 58.3$ mph
 R

Space mean speed in outer lanes, $S = N/A$ mph
 0

Space mean speed for all vehicles, $S = 58.3$ mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: SR 120 Eastbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1685	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	50.0	mph
Volume on ramp	210	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)	1685	210	vph
Peak-hour factor, PHF	0.90	0.90	
Peak 15-min volume, v15	468	58	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	1966	239	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)

EQ

P = 1.000 Using Equation 0

FM

$v = v(P) = 1966 \text{ pc/h}$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	2205	4700	No
FO			
$v \quad v$	0 pc/h	(Equation 25-4 or 25-5)	
3 or av34			
Is $v \quad v > 2700 \text{ pc/h?}$		No	
3 or av34			
Is $v \quad v > 1.5 v / 2$		No	
3 or av34	12		

If yes, $v =$ (Equation 25-8)
12A

Flow Entering Merge Influence Area			
	Actual	Max Desirable	Violation?
v	1966	4400	No
12			!

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 19.4$ pc/mi/ln
R 12 A

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

Speed Estimation

Intermediate speed variable, $M = 0.306$
S

Space mean speed in ramp influence area, $S_R = 58.0$ mph

Space mean speed in outer lanes, $S_0 = N/A$ mph

Space mean speed for all vehicles, $S = 58.0$ mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: SR 120 Eastbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2370	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	50.0	mph
Volume on ramp	325	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)	2370	325	vph
Peak-hour factor, PHF	0.90	0.90	
Peak 15-min volume, v15	658	90	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	2765	370	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)

EQ

P = 1.000 Using Equation 0

FM

$v = v(P) = 2765 \text{ pc/h}$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	3135	4700	No
FO			
$v \quad v$	0 pc/h	(Equation 25-4 or 25-5)	
3 or av34			
Is $v \quad v > 2700 \text{ pc/h?}$		No	
3 or av34			
Is $v \quad v > 1.5 v / 2$		No	
3 or av34	12		

If yes, $v =$ (Equation 25-8)
12A

Flow Entering Merge Influence Area			
	Actual	Max Desirable	Violation?
v	2765	4400	No
12			!

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 26.6$ pc/mi/ln
R 12 A

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

Speed Estimation

Intermediate speed variable, $M = 0.361$
S

Space mean speed in ramp influence area, $S = 56.7$ mph
R

Space mean speed in outer lanes, $S = N/A$ mph
0

Space mean speed for all vehicles, $S = 56.7$ mph

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: SR 120 Westbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3235	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	600	vph
Length of first accel/decel lane	200	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)	3235	600	vph
Peak-hour factor, PHF	0.90	0.90	
Peak 15-min volume, v15	899	167	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	3774	683	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)

EQ

P = 1.000 Using Equation 0

FD

$v = v + (v - v) P = 3774$ pc/h

12 R F R FD

Capacity Checks

	Actual	Maximum	LOS F?
$v = v$	3774	4700	No
$F_i F$			
$v = v - v$	3091	4700	No
$F O F R$			
v	683	2100	No
R			
$v v$	0 pc/h	(Equation 25-15 or 25-16)	
3 or av34			

Is $v \ v \ > 2700 \text{ pc/h?}$ 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			
	Actual	Max Desirable	Violation?
v	3774	4600	No
12			!

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 \ v \ - 0.009 \ L \ = \ 34.9 \ \text{pc/mi/ln}$
R 12 D

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

Speed Estimation

Intermediate speed variable, $D \ = \ 0.294$
S

Space mean speed in ramp influence area, $S \ = \ 58.2 \ \text{mph}$
R

Space mean speed in outer lanes, $S \ = \ \text{N/A} \ \text{mph}$
0

Space mean speed for all vehicles, $S \ = \ 58.2 \ \text{mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: SR 120 Westbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2735	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	590	vph
Length of first accel/decel lane	200	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)	2735	590	vph
Peak-hour factor, PHF	0.90	0.90	
Peak 15-min volume, v15	760	164	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	3191	672	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)

EQ

P = 1.000 Using Equation 0

FD

$v = v + (v - v) P = 3191$ pc/h

12 R F R FD

Capacity Checks

	Actual	Maximum	LOS F?
$v = v$	3191	4700	No
$F_i F$			
$v = v - v$	2519	4700	No
$F_O F R$			
v	672	2100	No
R			
$v v$	0 pc/h	(Equation 25-15 or 25-16)	
3 or av34			

Is $v \ v \ > 2700 \text{ pc/h?}$ 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			
	Actual	Max Desirable	Violation?
v	3191	4600	No
12			!

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 \ v \ - 0.009 \ L \ = \ 29.9 \ \text{pc/mi/ln}$
 R 12 D

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

Speed Estimation

Intermediate speed variable, $D \ = \ 0.293$
 S

Space mean speed in ramp influence area, $S \ = \ 58.2 \ \text{mph}$
 R

Space mean speed in outer lanes, $S \ = \ \text{N/A} \ \text{mph}$
 0

Space mean speed for all vehicles, $S \ = \ 58.2 \ \text{mph}$

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: SR 120 Westbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2635	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	50.0	mph
Volume on ramp	530	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)	2635	530	vph
Peak-hour factor, PHF	0.90	0.90	
Peak 15-min volume, v15	732	147	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	3074	604	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)

EQ

P = 1.000 Using Equation 0

FM

$v = v(P) = 3074 \text{ pc/h}$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	3678	4700	No
FO			
$v \quad v$	0 pc/h	(Equation 25-4 or 25-5)	
3 or av34			
Is $v \quad v > 2700 \text{ pc/h?}$		No	
3 or av34			
Is $v \quad v > 1.5 v / 2$		No	
3 or av34	12		

If yes, $v =$ (Equation 25-8)
12A

Flow Entering Merge Influence Area			
	Actual	Max Desirable	Violation?
v	3074	4400	No
12			!

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 30.8$ pc/mi/ln
R 12 A

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

Speed Estimation

Intermediate speed variable, $M = 0.425$
S

Space mean speed in ramp influence area, $S_R = 55.2$ mph

Space mean speed in outer lanes, $S_0 = N/A$ mph

Space mean speed for all vehicles, $S = 55.2$ mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: SR 120 Westbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2145	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	260	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)	2145	260	vph
Peak-hour factor, PHF	0.90	0.90	
Peak 15-min volume, v15	596	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	2503	296	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)

EQ

P = 1.000 Using Equation 0

FM

$v = v(P) = 2503 \text{ pc/h}$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	2799	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			
	Actual	Max Desirable	Violation?
v	2503	4400	No
12			!

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 24.0$ pc/mi/ln
R 12 A

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

Speed Estimation

Intermediate speed variable, $M = 0.350$
S

Space mean speed in ramp influence area, $S_R = 56.9$ mph

Space mean speed in outer lanes, $S_O = N/A$ mph

Space mean speed for all vehicles, $S = 56.9$ mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 8/9/2007
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: SR 120 Eastbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing PP Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2040	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	372	vph
Length of first accel/decel lane	400	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)	2040	372	vph
Peak-hour factor, PHF	0.90	0.90	
Peak 15-min volume, v15	567	103	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	2380	424	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)

EQ

P = 1.000 Using Equation 0

FD

$v = v + (v - v) P = 2380$ pc/h

12 R F R FD

Capacity Checks

	Actual	Maximum	LOS F?
$v = v$	2380	4700	No
$F_i F$			
$v = v - v$	1956	4700	No
$F O F R$			
v	424	2100	No
R			
$v v$	0 pc/h	(Equation 25-15 or 25-16)	
3 or av34			

Is $v_v > 2700$ pc/h? No
3 or av34

Is $v_v > 1.5 v_{12} / 2$ No
3 or av34 12

If yes, $v_{12A} =$ (Equation 25-18)

Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?
v_{12}	2380	4600	No
			!

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 21.1$ pc/mi/ln

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

Speed Estimation

Intermediate speed variable, $D = 0.271$
S

Space mean speed in ramp influence area, $S_R = 58.8$ mph

Space mean speed in outer lanes, $S_0 = N/A$ mph

Space mean speed for all vehicles, $S = 58.8$ mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: SR 120 Eastbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing PP Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3006	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	636	vph
Length of first accel/decel lane	400	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)	3006	636	vph
Peak-hour factor, PHF	0.90	0.90	
Peak 15-min volume, v15	835	177	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	3507	724	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)

EQ

P = 1.000 Using Equation 0

FD

$v = v + (v - v) P = 3507$ pc/h

12 R F R FD

Capacity Checks

	Actual	Maximum	LOS F?
$v = v$	3507	4700	No
$F_i F$			
$v = v - v$	2783	4700	No
$F_O F R$			
v	724	2100	No
R			
$v v$	0 pc/h	(Equation 25-15 or 25-16)	
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 25-18)
 12A

Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?
v	3507	4600	No
12			!
Level of Service Determination (if not F)			

Density, $D = 4.252 + 0.0086 v - 0.009 L = 30.8$ pc/mi/ln
 R 12 D

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

Speed Estimation

Intermediate speed variable, $D = 0.298$
 S

Space mean speed in ramp influence area, $S = 58.1$ mph
 R

Space mean speed in outer lanes, $S = N/A$ mph
 0

Space mean speed for all vehicles, $S = 58.1$ mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: SR 120 Eastbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing PP Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1688	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	50.0	mph
Volume on ramp	210	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)	1688	210	vph
Peak-hour factor, PHF	0.90	0.90	
Peak 15-min volume, v15	469	58	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	1969	239	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)

EQ

P = 1.000 Using Equation 0

FM

$v = v(P) = 1969 \text{ pc/h}$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	2208	4700	No
FO			
$v \quad v$	0 pc/h	(Equation 25-4 or 25-5)	
3 or av34			
Is $v \quad v > 2700 \text{ pc/h?}$		No	
3 or av34			
Is $v \quad v > 1.5 v / 2$		No	
3 or av34	12		

If yes, $v =$ (Equation 25-8)
12A

Flow Entering Merge Influence Area			
	Actual	Max Desirable	Violation?
v	1969	4400	No
12			!

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 19.5$ pc/mi/ln
R 12 A

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

Speed Estimation

Intermediate speed variable, $M = 0.306$
S

Space mean speed in ramp influence area, $S = 58.0$ mph
R

Space mean speed in outer lanes, $S = N/A$ mph
0

Space mean speed for all vehicles, $S = 58.0$ mph

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: SR 120 Eastbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing PP Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2370	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	50.0	mph
Volume on ramp	325	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)	2370	325	vph
Peak-hour factor, PHF	0.90	0.90	
Peak 15-min volume, v15	658	90	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	2765	370	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)

EQ

P = 1.000 Using Equation 0

FM

$v = v(P) = 2765 \text{ pc/h}$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	3135	4700	No
FO			
$v \quad v$	0 pc/h	(Equation 25-4 or 25-5)	
3 or av34			
Is $v \quad v > 2700 \text{ pc/h?}$		No	
3 or av34			
Is $v \quad v > 1.5 v / 2$		No	
3 or av34	12		

If yes, $v =$ (Equation 25-8)
12A

Flow Entering Merge Influence Area			
	Actual	Max Desirable	Violation?
v	2765	4400	No
12			!

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 26.6$ pc/mi/ln
R 12 A

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

Speed Estimation

Intermediate speed variable, $M = 0.361$
S

Space mean speed in ramp influence area, $S = 56.7$ mph
R

Space mean speed in outer lanes, $S = N/A$ mph
0

Space mean speed for all vehicles, $S = 56.7$ mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: SR 120 Westbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing PP Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3235	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	600	vph
Length of first accel/decel lane	200	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)	3235	600	vph
Peak-hour factor, PHF	0.90	0.90	
Peak 15-min volume, v15	899	167	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	3774	683	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)

EQ

P = 1.000 Using Equation 0

FD

$v = v + (v - v) P = 3774$ pc/h

12 R F R FD

Capacity Checks

	Actual	Maximum	LOS F?
$v = v$	3774	4700	No
$F_i F$			
$v = v - v$	3091	4700	No
$F_O F R$			
v	683	2100	No
R			
$v v$	0 pc/h	(Equation 25-15 or 25-16)	
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 25-18)
12A

Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?
v	3774	4600	No
12			!

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v - 0.009 L = 34.9$ pc/mi/ln
R 12 D

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

Speed Estimation

Intermediate speed variable, $D = 0.294$
S

Space mean speed in ramp influence area, $S = 58.2$ mph
R

Space mean speed in outer lanes, $S = N/A$ mph
0

Space mean speed for all vehicles, $S = 58.2$ mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: SR 120 Westbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing PP Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2735	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	590	vph
Length of first accel/decel lane	200	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)	2735	590	vph
Peak-hour factor, PHF	0.90	0.90	
Peak 15-min volume, v15	760	164	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	3191	672	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)

EQ

P = 1.000 Using Equation 0

FD

$v = v + (v - v) P = 3191$ pc/h

12 R F R FD

Capacity Checks

	Actual	Maximum	LOS F?
$v = v$	3191	4700	No
$F_i F$			
$v = v - v$	2519	4700	No
$F O F R$			
v	672	2100	No
R			
$v v$	0 pc/h	(Equation 25-15 or 25-16)	
3 or av34			

Is $v \ v \ > 2700 \text{ pc/h?}$ No
 3 or av_{34}
 Is $v \ v \ > 1.5 \ v \ /2$ No
 3 or av_{34} 12
 If yes, $v \ =$ (Equation 25-18)
 12A

Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?
v	3191	4600	No
12			!
Level of Service Determination (if not F)			

Density, $D = 4.252 + 0.0086 \ v \ - 0.009 \ L \ = \ 29.9 \ \text{pc/mi/ln}$
 R 12 D

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

Speed Estimation

Intermediate speed variable, $D \ = \ 0.293$
 S
 Space mean speed in ramp influence area, $S \ = \ 58.2 \ \text{mph}$
 R
 Space mean speed in outer lanes, $S \ = \ \text{N/A} \ \text{mph}$
 0
 Space mean speed for all vehicles, $S \ = \ 58.2 \ \text{mph}$

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: SR 120 Westbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing PP Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2635	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	50.0	mph
Volume on ramp	598	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)	2635	598	vph
Peak-hour factor, PHF	0.90	0.90	
Peak 15-min volume, v15	732	166	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	3074	681	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)

EQ

P = 1.000 Using Equation 0

FM

$v = v(P) = 3074 \text{ pc/h}$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	3755	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			
	Actual	Max Desirable	Violation?
v	3074	4400	No
12			!

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 31.3$ pc/mi/ln

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

Speed Estimation

Intermediate speed variable, $M = 0.438$
 S

Space mean speed in ramp influence area, $S_R = 54.9$ mph

Space mean speed in outer lanes, $S_O = N/A$ mph

Space mean speed for all vehicles, $S = 54.9$ mph

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: SR 120 Westbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Existing PP Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2145	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	50.0	mph
Volume on ramp	296	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)	2145	296	vph
Peak-hour factor, PHF	0.90	0.90	
Peak 15-min volume, v15	596	82	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	2503	337	pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)

EQ

P = 1.000 Using Equation 0

FM

$v = v(P) = 2503 \text{ pc/h}$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	2840	4700	No
FO			
$v \quad v$	0 pc/h	(Equation 25-4 or 25-5)	
3 or av34			
Is $v \quad v > 2700 \text{ pc/h?}$		No	
3 or av34			
Is $v \quad v > 1.5 v / 2$		No	
3 or av34	12		

If yes, $v =$ (Equation 25-8)
12A

Flow Entering Merge Influence Area			
	Actual	Max Desirable	Violation?
v	2503	4400	No
12			!

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 24.3$ pc/mi/ln
R 12 A

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

Speed Estimation

Intermediate speed variable, $M = 0.338$
S

Space mean speed in ramp influence area, $S_R = 57.2$ mph

Space mean speed in outer lanes, $S_O = N/A$ mph

Space mean speed for all vehicles, $S = 57.2$ mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: SR 120 Eastbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3155	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	540	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? Yes

Volume on adjacent ramp	430	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent	
		Ramp		
Volume, V (vph)	3155	540	430	vph
Peak-hour factor, PHF	0.92	0.92	0.92	
Peak 15-min volume, v15	857	147	117	v
Trucks and buses	10	5	5	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.976	0.976	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3601	602	479	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)

EQ

P = 0.642 Using Equation 5

FD

$v = v + (v - v) P = 2528$ pc/h

12 R F R FD

Capacity Checks

	Actual	Maximum	LOS F?
$v = v$	3601	7050	No
$F_i F$			
$v = v - v$	2999	7050	No
$FO F R$			
v	602	2100	No
R			
$v v$	1073 pc/h	(Equation 25-15 or 25-16)	
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 25-18)
 12A

Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?
v	2528	4600	No
12			!
Level of Service Determination (if not F)			

Density, $D = 4.252 + 0.0086 v - 0.009 L = 22.4$ pc/mi/ln
 R 12 D

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

Speed Estimation

Intermediate speed variable, $D = 0.287$
 S

Space mean speed in ramp influence area, $S = 58.4$ mph
 R

Space mean speed in outer lanes, $S = 71.0$ mph
 0

Space mean speed for all vehicles, $S = 61.7$ mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: SR 120 Eastbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4615	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1115	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? Yes

Volume on adjacent ramp	896	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp	Adjacent	
			Ramp		
Volume, V (vph)	4615	1115	896	vph	
Peak-hour factor, PHF	0.92	0.92	0.92		
Peak 15-min volume, v15	1254	303	243	v	
Trucks and buses	10	5	5	%	
Recreational vehicles	0	0	0	%	
Terrain type:	Level	Level	Level		
Grade	0.00	%	0.00	%	0.00
Length	0.00	mi	0.00	mi	0.00
Trucks and buses PCE, ET	1.5	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2	1.2		
Heavy vehicle adjustment, fHV	0.952	0.976	0.976		
Driver population factor, fP	1.00	1.00	1.00		
Flow rate, vp	5267	1242	998	pcph	

Estimation of V12 Diverge Areas

L =

(Equation 25-8 or 25-9)

EQ

P =

0.571 Using Equation 5

FD

$v = v + (v - v) P$

$12 \quad R \quad F \quad R \quad FD$

$= 3541 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
$v = v$	5267	7050	No
$F_i \quad F$			
$v = v - v$	4025	7050	No
$F_O \quad F \quad R$			
v	1242	2000	No
R			
$v \quad v$	1726 pc/h	(Equation 25-15 or 25-16)	
3 or av^{34}			

Is $v \times v > 2700 \text{ pc/h?}$ No
 $3 \text{ or } av^{34}$
 Is $v \times v > 1.5 \times v / 2$ No
 $3 \text{ or } av^{34} \times 12$
 If yes, $v =$ (Equation 25-18)
 $12A$

Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?
v	3541	4600	No
12			!
Level of Service Determination (if not F)			

Density, $D = 4.252 + 0.0086 \times v - 0.009 \times L = 31.1 \text{ pc/mi/ln}$
 $R \times 12 \times D$

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

Speed Estimation

Intermediate speed variable, $D = 0.540$
 S
 Space mean speed in ramp influence area, $S = 52.6 \text{ mph}$
 R
 Space mean speed in outer lanes, $S = 68.5 \text{ mph}$
 0
 Space mean speed for all vehicles, $S = 56.9 \text{ mph}$

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: SR 120 Eastbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2615	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	430	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? Yes

Volume on adjacent Ramp	540	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent	
		Ramp		
Volume, V (vph)	2615	430	540	vph
Peak-hour factor, PHF	0.92	0.92	0.92	
Peak 15-min volume, v15	711	117	147	v
Trucks and buses	10	5	5	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.976	0.976	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2985	479	602	pcph

Estimation of V12 Merge Areas

L = 391.50 (Equation 25-2 or 25-3)

EQ

P = 0.591 Using Equation 1

FM

$v = v(P) = 1766 \text{ pc/h}$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	3464	7050	No
FO			
v v	1219 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			
	Actual	Max Desirable	Violation?
v	1766	4400	No
12			!

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 19.6$ pc/mi/ln
R 12 A

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

Speed Estimation

Intermediate speed variable, $M = 0.323$
S

Space mean speed in ramp influence area, $S_R = 57.6$ mph

Space mean speed in outer lanes, $S_0 = 62.4$ mph

Space mean speed for all vehicles, $S = 59.2$ mph

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: SR 120 Eastbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3500	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	896	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? Yes

Volume on adjacent Ramp	1115	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent	
		Ramp		
Volume, V (vph)	3500	896	1115	vph
Peak-hour factor, PHF	0.92	0.92	0.92	
Peak 15-min volume, v15	951	243	303	v
Trucks and buses	10	5	5	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.976	0.976	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3995	998	1242	pcph

Estimation of V12 Merge Areas

L = 718.70 (Equation 25-2 or 25-3)

EQ

P = 0.591 Using Equation 1

FM

$v = v(P) = 2363$ pc/h

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	4993	7050	No
FO			
v v	1632 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			
	Actual	Max Desirable	Violation?
v	2363	4400	No
12			!

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 28.1$ pc/mi/ln
R 12 A

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

Speed Estimation

Intermediate speed variable, $M = 0.398$
S

Space mean speed in ramp influence area, $S = 55.8$ mph
R

Space mean speed in outer lanes, $S = 60.9$ mph
0

Space mean speed for all vehicles, $S = 57.4$ mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: SR 120 Westbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	5808	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	1013	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? Yes

Volume on adjacent ramp	889	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent	
		Ramp		
Volume, V (vph)	5808	1013	889	vph
Peak-hour factor, PHF	0.92	0.92	0.92	
Peak 15-min volume, v15	1578	275	242	v
Trucks and buses	10	5	5	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.976	0.976	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	6629	1129	990	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)

EQ

P = 0.542 Using Equation 5

FD

$v = v + (v - v) P = 4112$ pc/h

12 R F R FD

Capacity Checks

	Actual	Maximum	LOS F?
$v = v$	6629	7050	No
$F_i F$			
$v = v - v$	5500	7050	No
$FO F R$			
v	1129	2000	No
R			
$v v$	2517 pc/h	(Equation 25-15 or 25-16)	
3 or av34			

Is $v \cdot v > 2700 \text{ pc/h?}$ No
 $3 \text{ or } av^{34}$
 Is $v \cdot v > 1.5 \cdot v / 2$ No
 $3 \text{ or } av^{34} \cdot 12$
 If yes, $v =$ (Equation 25-18)
 $12A$

Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?
v	4112	4600	No
12			!
Level of Service Determination (if not F)			

Density, $D = 4.252 + 0.0086 \cdot v - 0.009 \cdot L = 37.8 \text{ pc/mi/ln}$
 $R \cdot 12 \cdot D$

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

Speed Estimation

Intermediate speed variable, $D = 0.530$
 S
 Space mean speed in ramp influence area, $S = 52.8 \text{ mph}$
 R
 Space mean speed in outer lanes, $S = 65.4 \text{ mph}$
 0
 Space mean speed for all vehicles, $S = 57.0 \text{ mph}$

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: SR 120 Westbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3570	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	1255	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? Yes

Volume on adjacent ramp	508	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent	
		Ramp		
Volume, V (vph)	3570	1255	508	vph
Peak-hour factor, PHF	0.92	0.92	0.92	
Peak 15-min volume, v15	970	341	138	v
Trucks and buses	10	5	5	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.976	0.976	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	4074	1398	566	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)

EQ

P = 0.594 Using Equation 5

FD

$v = v + (v - v) P = 2987$ pc/h

12 R F R FD

Capacity Checks

	Actual	Maximum	LOS F?
$v = v$	4074	7050	No
$F_i F$			
$v = v - v$	2676	7050	No
$F_O F R$			
v	1398	2000	No
R			
$v v$	1087 pc/h	(Equation 25-15 or 25-16)	
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 25-18)
 12A

Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?
v	2987	4600	No
12			!
Level of Service Determination (if not F)			

Density, $D = 4.252 + 0.0086 v - 0.009 L = 28.1$ pc/mi/ln
 R 12 D

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

Speed Estimation

Intermediate speed variable, $D = 0.554$
 S

Space mean speed in ramp influence area, $S = 52.3$ mph
 R

Space mean speed in outer lanes, $S = 71.0$ mph
 0

Space mean speed for all vehicles, $S = 56.2$ mph

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: SR 120 Westbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4795	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	889	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? Yes

Volume on adjacent Ramp	1013	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent	
		Ramp		
Volume, V (vph)	4795	889	1013	vph
Peak-hour factor, PHF	0.92	0.92	0.92	
Peak 15-min volume, v15	1303	242	275	v
Trucks and buses	10	5	5	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.976	0.976	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	5473	990	1129	pcph

Estimation of V12 Merge Areas

L = 1033.28 (Equation 25-2 or 25-3)

EQ

P = 0.591 Using Equation 1

FM

$v = v(P) = 3237$ pc/h

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	6463	7050	No
FO			
v v	2236 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			
	Actual	Max Desirable	Violation?
v	3237	4400	No
12			!

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 34.9$ pc/mi/ln
R 12 A

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

Speed Estimation

Intermediate speed variable, $M = 0.553$
S

Space mean speed in ramp influence area, $S_R = 52.3$ mph

Space mean speed in outer lanes, $S_0 = 58.8$ mph

Space mean speed for all vehicles, $S = 54.3$ mph

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: SR 120 Westbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2315	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	50.0	mph
Volume on ramp	508	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? Yes

Volume on adjacent Ramp	1255	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent	
		Ramp		
Volume, V (vph)	2315	508	1255	vph
Peak-hour factor, PHF	0.92	0.92	0.92	
Peak 15-min volume, v15	629	138	341	v
Trucks and buses	10	5	5	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.976	0.976	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2642	566	1398	pcph

Estimation of V12 Merge Areas

L = 1121.51 (Equation 25-2 or 25-3)

EQ

P = 0.591 Using Equation 1

FM

$v = v(P) = 1563 \text{ pc/h}$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	3208	7050	No
FO			
v v	1079 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			
	Actual	Max Desirable	Violation?
v	1563	4400	No
12			!

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 18.7$ pc/mi/ln
R 12 A

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

Speed Estimation

Intermediate speed variable, $M = 0.304$
S

Space mean speed in ramp influence area, $S_R = 58.0$ mph

Space mean speed in outer lanes, $S_0 = 62.9$ mph

Space mean speed for all vehicles, $S = 59.6$ mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: SR 120 Eastbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative PP Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3172	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	556	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? Yes

Volume on adjacent ramp	430	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent	
		Ramp		
Volume, V (vph)	3172	556	430	vph
Peak-hour factor, PHF	0.92	0.92	0.92	
Peak 15-min volume, v15	862	151	117	v
Trucks and buses	10	5	5	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.976	0.976	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3620	619	479	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)

EQ

P = 0.641 Using Equation 5

FD

$v = v + (v - v) P = 2543$ pc/h

12 R F R FD

Capacity Checks

	Actual	Maximum	LOS F?
$v = v$	3620	7050	No
$F_i F$			
$v = v - v$	3001	7050	No
$F O F R$			
v	619	2100	No
R			
$v v$	1077 pc/h	(Equation 25-15 or 25-16)	
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 25-18)
12A

Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?
v_{12}	2543	4600	No
			!
Level of Service Determination (if not F)			

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 22.5$ pc/mi/ln

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

Speed Estimation

Intermediate speed variable, $D = 0.289$
S

Space mean speed in ramp influence area, $S_R = 58.4$ mph

Space mean speed in outer lanes, $S_0 = 71.0$ mph

Space mean speed for all vehicles, $S = 61.6$ mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: SR 120 Eastbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative PP Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4615	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	1181	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? Yes

Volume on adjacent ramp	896	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent	
		Ramp		
Volume, V (vph)	4615	1181	896	vph
Peak-hour factor, PHF	0.92	0.92	0.92	
Peak 15-min volume, v15	1254	321	243	v
Trucks and buses	10	5	5	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.976	0.976	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	5267	1316	998	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)

EQ

P = 0.568 Using Equation 5

FD

$v = v + (v - v) P = 3559$ pc/h

12 R F R FD

Capacity Checks

	Actual	Maximum	LOS F?
$v = v$	5267	7050	No
$F_i F$			
$v = v - v$	3951	7050	No
$F O F R$			
v	1316	2100	No
R			
$v v$	1708 pc/h	(Equation 25-15 or 25-16)	
3 or av34			

Is $v_v > 2700$ pc/h? No
 3 or av34

Is $v_v > 1.5 v_{12} / 2$ No
 3 or av34 12

If yes, $v_{12A} =$ (Equation 25-18)

Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?
v_{12}	3559	4600	No
			!
Level of Service Determination (if not F)			

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 31.3$ pc/mi/ln

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

Speed Estimation

Intermediate speed variable, $D = 0.351$
 S

Space mean speed in ramp influence area, $S_R = 56.9$ mph

Space mean speed in outer lanes, $S_0 = 68.5$ mph

Space mean speed for all vehicles, $S = 60.2$ mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: SR 120 Eastbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative PP Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2615	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	50.0	mph
Volume on ramp	430	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? Yes

Volume on adjacent Ramp	557	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent	
		Ramp		
Volume, V (vph)	2615	430	557	vph
Peak-hour factor, PHF	0.92	0.92	0.92	
Peak 15-min volume, v15	711	117	151	v
Trucks and buses	10	5	5	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.976	0.976	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2985	479	621	pcph

Estimation of V12 Merge Areas

L = 1176.30 (Equation 25-2 or 25-3)

EQ

P = 0.591 Using Equation 1

FM

$v = v(P) = 1766 \text{ pc/h}$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	3464	7050	No
FO			
v v	1219 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			
	Actual	Max Desirable	Violation?
v	1766	4400	No
12			!

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 19.6$ pc/mi/ln
R 12 A

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

Speed Estimation

Intermediate speed variable, $M = 0.308$
S

Space mean speed in ramp influence area, $S = 57.9$ mph
R

Space mean speed in outer lanes, $S = 62.4$ mph
0

Space mean speed for all vehicles, $S = 59.4$ mph

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: SR 120 Eastbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative PP Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3500	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	50.0	mph
Volume on ramp	896	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? Yes

Volume on adjacent Ramp	1181	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent	
		Ramp		
Volume, V (vph)	3500	896	1181	vph
Peak-hour factor, PHF	0.92	0.92	0.92	
Peak 15-min volume, v15	951	243	321	v
Trucks and buses	10	5	5	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.976	0.976	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3995	998	1316	pcph

Estimation of V12 Merge Areas

L = 1503.50 (Equation 25-2 or 25-3)

EQ

P = 0.591 Using Equation 1

FM

$v = v(P) = 2363$ pc/h

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	4993	7050	No
FO			
v v	1632 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			
	Actual	Max Desirable	Violation?
v	2363	4400	No
12			!

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 28.1$ pc/mi/ln
R 12 A

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

Speed Estimation

Intermediate speed variable, $M = 0.383$
S

Space mean speed in ramp influence area, $S_R = 56.2$ mph

Space mean speed in outer lanes, $S_0 = 60.9$ mph

Space mean speed for all vehicles, $S = 57.6$ mph

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: SR 120 Westbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative PP Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	5808	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	1013	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? Yes

Volume on adjacent ramp	956	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp	Adjacent	
			Ramp		
Volume, V (vph)	5808	1013	956	vph	
Peak-hour factor, PHF	0.92	0.92	0.92		
Peak 15-min volume, v15	1578	275	260	v	
Trucks and buses	10	5	5	%	
Recreational vehicles	0	0	0	%	
Terrain type:	Level	Level	Level		
Grade	0.00	%	0.00	%	0.00
Length	0.00	mi	0.00	mi	0.00
Trucks and buses PCE, ET	1.5	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2	1.2		
Heavy vehicle adjustment, fHV	0.952	0.976	0.976		
Driver population factor, fP	1.00	1.00	1.00		
Flow rate, vp	6629	1129	1065	pcph	

Estimation of V12 Diverge Areas

L =

(Equation 25-8 or 25-9)

EQ

P =

0.542 Using Equation 5

FD

$v = v + (v - v) P$

12 R F R FD

4112 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v = v$	6629	7050	No
$F_i F$			
$v = v - v$	5500	7050	No
$F_O F R$			
v	1129	2100	No
R			
$v v$	2517 pc/h	(Equation 25-15 or 25-16)	
3 or av^{34}			

Is $v \times v > 2700 \text{ pc/h?}$ No
3 or av34

Is $v \times v > 1.5 \times v / 2$ No
3 or av34 12

If yes, $v =$ (Equation 25-18)
12A

Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?
v	4112	4600	No
12			!

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 \times v - 0.009 \times L = 37.8 \text{ pc/mi/ln}$
R 12 D

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

Speed Estimation

Intermediate speed variable, $D = 0.335$
S

Space mean speed in ramp influence area, $S = 57.3 \text{ mph}$
R

Space mean speed in outer lanes, $S = 65.4 \text{ mph}$
0

Space mean speed for all vehicles, $S = 60.1 \text{ mph}$

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: SR 120 Westbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative PP Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3570	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	1255	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? Yes

Volume on adjacent ramp	544	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent	
		Ramp		
Volume, V (vph)	3570	1255	544	vph
Peak-hour factor, PHF	0.92	0.92	0.92	
Peak 15-min volume, v15	970	341	148	v
Trucks and buses	10	5	5	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.976	0.976	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	4074	1398	606	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)

EQ

P = 0.594 Using Equation 5

FD

$v = v + (v - v) P = 2987$ pc/h

12 R F R FD

Capacity Checks

	Actual	Maximum	LOS F?
$v = v$	4074	7050	No
$F_i F$			
$v = v - v$	2676	7050	No
$F O F R$			
v	1398	2000	No
R			
$v v$	1087 pc/h	(Equation 25-15 or 25-16)	
3 or av34			

Is $v \times v > 2700 \text{ pc/h?}$ No
3 or av34

Is $v \times v > 1.5 \times v / 2$ No
3 or av34 12

If yes, $v =$ (Equation 25-18)
12A

Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?
v	2987	4600	No
12			!

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 \times v - 0.009 \times L = 28.1 \text{ pc/mi/ln}$
R 12 D

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

Speed Estimation

Intermediate speed variable, $D = 0.554$
S

Space mean speed in ramp influence area, $S = 52.3 \text{ mph}$
R

Space mean speed in outer lanes, $S = 71.0 \text{ mph}$
0

Space mean speed for all vehicles, $S = 56.2 \text{ mph}$

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Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: AM Peak Hour
Freeway/Dir of Travel: SR 120 Westbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative PP Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4796	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	50.0	mph
Volume on ramp	956	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? Yes

Volume on adjacent Ramp	1013	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent	
		Ramp		
Volume, V (vph)	4796	956	1013	vph
Peak-hour factor, PHF	0.92	0.92	0.92	
Peak 15-min volume, v15	1303	260	275	v
Trucks and buses	10	5	5	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.976	0.976	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	5474	1065	1129	pcph

Estimation of V12 Merge Areas

L = 1834.35 (Equation 25-2 or 25-3)

EQ

P = 0.591 Using Equation 1

FM

$v = v(P) = 3238$ pc/h

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	6539	7050	No
FO			
v v	2236 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			
	Actual	Max Desirable	Violation?
v	3238	4400	No
12			!

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 35.4$ pc/mi/ln
R 12 A

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

Speed Estimation

Intermediate speed variable, $M = 0.559$
S

Space mean speed in ramp influence area, $S_R = 52.1$ mph

Space mean speed in outer lanes, $S_0 = 58.8$ mph

Space mean speed for all vehicles, $S = 54.2$ mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst: Fehr & Peers
Agency/Co.: Fehr & Peers
Date performed: 7/3/2007
Analysis time period: PM Peak Hour
Freeway/Dir of Travel: SR 120 Westbound
Junction: Main Street
Jurisdiction: Lathrop/San Joaquin
Analysis Year: 2007 Cumulative PP Conditions
Description: Tesoro Apartments TIS

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2315	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	50.0	mph
Volume on ramp	544	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? Yes

Volume on adjacent Ramp	1255	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent	
		Ramp		
Volume, V (vph)	2315	544	1255	vph
Peak-hour factor, PHF	0.92	0.92	0.92	
Peak 15-min volume, v15	629	148	341	v
Trucks and buses	10	5	5	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.976	0.976	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2642	606	1398	pcph

Estimation of V12 Merge Areas

L = 1130.07 (Equation 25-2 or 25-3)

EQ

P = 0.591 Using Equation 1

FM

$v = v(P) = 1563 \text{ pc/h}$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	3248	7050	No
FO			
v v	1079 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			
	Actual	Max Desirable	Violation?
v	1563	4400	No
12			!

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_A - 0.00627 L = 19.0$ pc/mi/ln
R 12 A

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

Speed Estimation

Intermediate speed variable, $M = 0.305$
S

Space mean speed in ramp influence area, $S_R = 58.0$ mph

Space mean speed in outer lanes, $S_0 = 62.9$ mph

Space mean speed for all vehicles, $S = 59.5$ mph