Water Quality Study Report

Santa Cruz Route 1 HOV

Tier I - Corridor Analysis of
High Occupancy Vehicle (HOV) Lanes and Transportation System Management (TSM) Alternatives
(05 SCR-1-PM R7.24-16.13)
and
Tier II - Build Project Analysis of
41st Avenue to Soquel Avenue/Drive
Auxiliary Lanes and Chanticleer Avenue Pedestrian Overcrossing
(05 SCR-1-PM 13.5-14.9)

EA 0C7300

Prepared by the

State of California Department of Transportation

March 2013

U.S. Department of Transportation

Water Quality Study Report

TIER I - CORRIDOR ANALYSIS OF
HIGH OCCUPANCY VEHICLE (HOV) LANES
AND TRANSPORTATION SYSTEM MANAGEMENT (TSM) ALTERNATIVES
AND
TIER II - BUILD PROJECT ANALYSIS OF
41ST AVENUE TO SOQUEL AVENUE/DRIVE AUXILIARY LANES AND CHANTICLEER AVENUE PEDESTRIAN OVERCROSSING

San Andreas-Larkin Valley Road Interchange to Morrissey Boulevard Interchange in Santa Cruz County

05-SCR-1- PM R7.24/16.13 (KP R11.64/25.96)
EA 05-0C7300

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State Route 1 HOV Lane Widening Project (From Morrissey Boulevard to San Andreas Road) WATER QUALITY STUDY

Errata

June 10, 2015

This Errata sheet revises the Water Quality Study as described below.

1. **Table 10 - Project Area Groundwater Conditions**. Table 10 in the Water Quality Study Report is hereby superseded by the information in Table 1 – Subsurface Soil & Groundwater Conditions from the Preliminary Geotechnical Report (July 2007).

2. **Tables 20 and 21.** The following footnote is hereby added to these tables: Due to rounding, the sum of the values shown in the column titled "Increased Impervious Area from Tier II Project" is slightly less than 4.89 acres.

3. **References.** The following bibliographic reference is deleted:
   - Nolte Associates Inc. (March 2008). Job Number 203132 Geologic and Seismic Section, Highway 1 High Occupancy Vehicle Lane Widening Project. 0.2 Mi S. of San Andreas Rd UC to 0.2 Mi N. of Morrissey Blvd OC (PM: 7.5 to PM:16.04), Santa Cruz County, California.

   The above reference is replaced with:
   - Nolte Associates Inc. (July 2007). Preliminary Geotechnical Report, Highway 1 High Occupancy Vehicle Lane Widening Project. 0.4 Mi S. of San Andreas Rd/Larkin Valley Rd UC to 0.3 Mi N. of Morrissey Blvd OC (PM: 7.67 to PM:15.82), Santa Cruz County, California.

4. **Purpose and Need.** The purpose and need text provided in Section 1.3 of the report is hereby changed to replace the existing text of Section 1.3 with the following text.

   1.3 Purpose and Need

   Purpose

   The purpose of the proposed Tier I project on Route 1 within the project limits is to achieve the following:
   - Reduce congestion.
   - Promote the use of alternative transportation modes as means to increase transportation system capacity.
   - Encourage carpooling and ridesharing.

   The purpose of the Tier II project is to:
   - Reduce congestion.
   - Improve safety.

- Promote the use of alternative transportation modes as means to increase transportation system capacity.

The main distinction between the Tier I and Tier II project purposes is the Tier II project also addresses a congestion-related safety need within its limits but will not promote carpooling in the Route 1 corridor.

The Tier I and Tier II projects are intended to address specific deficiencies and needs on Route 1, as described in the following subsection.

Need

The Tier I and Tier II projects address the following needs resulting from deficiencies on Route 1 within the project limits:

- Several bottlenecks along Route 1 in the southbound and northbound directions cause recurrent congestion during peak hours.
- Travel time delays due to congestion are experienced by commuters, commerce, and emergency vehicles.
- "Cut-through" traffic, or traffic on local streets, occurs and is increasing because drivers seek to avoid congestion on the highway.
- Limited opportunities exist for pedestrians and bicyclists to safely get across Route 1 within the project corridor.

Within the Tier I project limits, in addition to the common needs identified above there is a need to address the following corridor-wide deficiencies:

- Insufficient incentives to increase transit service in the Route 1 corridor because congestion threatens reliability and cost-effective transit service delivery.
- Inadequate facilities to support carpool and rideshare vehicles over single-occupant vehicles, reducing travel time savings and reliability.

The Tier II project, in addition to the common needs identified above, also addresses the following need:

- Improve operational safety to address accident rates in excess of the statewide average.

5. **Project Description.** The project description text provided in Section 1.2 of the report is hereby changed to replace the existing text of Section 1.2 with the following text.

This section describes the proposed project improvements and the project alternatives developed to meet the purpose and need, while avoiding or minimizing environmental impacts. The alternatives are the Tier I Corridor HOV Lane Alternative, the Tier I Corridor TSM Alternative, and the Tier II Auxiliary Lane Alternative.

The proposed Tier I and Tier II project locations are in Santa Cruz County, California, on Route 1.The Tier I eastern project limit is just south of the village of Aptos, approximately 0.4 mile south of the San Andreas-Larkin Valley Road interchange; the Tier I project then traverses the villages of Soquel, Live Oak and unincorporated Santa Cruz County. The western Tier I project limit is in the City of Santa Cruz, approximately 0.4 mile north of the Morrissey Boulevard interchange, for a total length of 8.9 miles. The Tier II project limits, which lie within the Tier I corridor, begin at 41st Avenue on the east and extend a distance of 1.4 miles westward to Soquel Avenue.

Within the Tier I and Tier II project limits, Route 1 is a four-lane divided freeway with 12-foot lanes. In the southbound direction the existing inside paved shoulder width varies from approximately 4 feet to 18 feet and in the northbound direction the existing inside paved shoulder width varies from 7 feet to 18 feet. In the southbound direction in the project corridor, the outside shoulder width varies from 8 feet to 12 feet. In the northbound direction in the project corridor, the outside shoulder width varies from 6 feet to 8 feet.

The purpose of the Tier I project is to reduce congestion, promote the use of alternative transportation modes as means to increase transportation system capacity, and encourage carpooling and ridesharing. The purpose of the Tier II project is to reduce congestion, improve safety, and promote the use of alternative transportation modes as means to increase transportation system capacity.

Alternatives

This section describes the Tier I Corridor Alternatives and the Tier II Auxiliary Lane Alternative that were analyzed in this document. The Project Development Team studied various design alternatives and options. In an effort to reduce and avoid impacts, the Project Development Team also considered preliminary environmental information to better understand the impacts of those alternatives. The views of stakeholders were elicited through public information meetings and meetings with local agency staff and elected officials. From this preliminary analysis and public outreach, a longer list of alternatives and options was narrowed to include the alternatives described below.

The Tier I Corridor HOV Lane and TSM Alternatives were originally conceived as construction-level study alternatives, under the assumption that funding would be available in the near future. The Project Development Team recognized that funding sources to construct either of those alternatives would be limited in the short term and that implementation of the Tier I project would occur over a multi-year period. To make a decision on the types of transportation improvements that would occur within the corridor in the future, Tier I project implementation alternatives were identified. The team decided to study the HOV Lane and TSM Alternatives in a Tier I or Master Plan environmental

document. The Tier I/II DEIR/EA will allow for the identification of a preferred corridor alternative for the 8.9-mile-long project corridor and facilitate the programming of funds. At the same time, the team also recognized that there was sufficient funding to implement a construction-level Tier II project within the corridor that would have more immediate congestion-relief benefits. Accordingly, a Tier II Auxiliary Lane and Pedestrian/Bicycle Overcrossing Alternative is also defined and analyzed in the Tier I/II DEIR/EA.

The Tier I corridor analysis includes three alternatives: a Tier I Corridor HOV Lane Alternative, a Tier I Corridor TSM Alternative, and a Tier I No Build Alternative. As funding becomes available, the high-priority improvements in the corridor would become subsequent incremental (Tier II) construction-level projects and would be subject to separate environmental reviews.

The Tier II corridor analysis considers an Auxiliary Lane Alternative and Pedestrian/Bicycle Overcrossing, and a No Build Alternative. The Tier II project is located between 41st Avenue and Soquel Avenue/Drive. It is anticipated that construction of the Tier II project could begin in 2016.

Common Design Features of the Tier I Corridor HOV Lane and TSM Alternatives

The Tier I HOV Lane and TSM Alternatives share many features, such as: the addition of auxiliary lanes, new pedestrian/bicycle overcrossings over Route 1, and Transportation Operations System elements. These common design features are described below.

Auxiliary Lanes

Auxiliary lanes are designed to reduce conflicts between traffic entering and exiting the highway by connecting the on-ramp of one interchange to the off-ramp of the next; they are not designed to serve through traffic. Auxiliary lanes would be constructed to improve merging operations at the locations listed below:

- Freedom Boulevard and Rio Del Mar Boulevard – northbound and southbound
- Rio Del Mar Boulevard and State Park Drive – northbound and southbound
- State Park Drive and Park Avenue – both directions in the TSM Alternative; southbound only in the HOV Lane Alternative
- Park Avenue and Bay Avenue/Porter Street – northbound and southbound
- 41st Avenue and Soquel Avenue/Drive – northbound and southbound

New Pedestrian/Bicycle Overcrossings

Both Tier I alternatives would construct new pedestrian/bicycle overcrossings of Route 1 at the following locations:

- Mar Vista Drive – The crossing would start on the north side of Route 1 and parallel the highway eastward for approximately 600 feet, doubling back westward as it climbs before crossing the highway and McGregor Drive at a right angle and then

descending by switchbacks to and along Mar Vista Drive for approximately 550 feet; the final design will be determined as part of the Tier II design/environmental analysis of this facility.

- Chanticleer Avenue – The crossing would start at the Chanticleer Avenue cul-de-sac on the north side of Route 1 and run parallel the highway for approximately 400 feet to the west and then cross Route 1 and Soquel Avenue (frontage road) on a curved alignment, terminating just west of Chanticleer Avenue on the south side of the highway and Soquel Avenue (frontage road).
- Trevethan Avenue – The crossing would start on the north side of Route 1 at Trevethan Avenue and parallel the highway approximately 600 feet before crossing on an angle and continuing along the banks of the western tributary to Arana Gulch to terminate close to Harbor High School; multiple configurations are possible, with the final design to be determined as part of the subsequent design/environmental analysis of this facility.

Other Common Features of the Tier I Corridor Alternatives

The Tier I Corridor Alternatives would include reconstruction of the Santa Cruz Branch Rail Line bridges over Route 1 and the State Park Drive, Capitola Avenue, 41st Avenue, and Soquel Avenue overcrossings. The Santa Cruz Branch Line railroad underpass structures are proposed to be modified or replaced to accommodate highway widening to match the ultimate six-through-lane concept, including shoulder and sidewalk facilities to accommodate pedestrians and bicycles. These modifications will lower the highway profile to provide standard clearances. In addition the Aptos Creek Bridge would be widened.

Both build alternatives would include Transportation Operations System elements such as changeable message signs, closed-circuit television, microwave detection systems, and vehicle detection systems. In addition, ramp metering and HOV on-ramp bypass lanes with highway patrol enforcement areas would be constructed on the Route 1 ramps within the Tier I project limits; however, only the HOV Lane Alternative would include HOV lanes on the mainline.

Table 1-4 summarizes the major features of the Tier I Corridor Alternatives.

Tier I Corridor HOV Lane Alternative

The Tier I Corridor HOV Lane Alternative includes the following main components, which are discussed in detail below and are shown in Figure 1-3 and in plan view in Appendix G:

- Highway mainline to include northbound and southbound HOV lanes throughout the project limits;
- Auxiliary lanes;

- Highway interchange reconfigurations and improvements such as ramp metering, on-ramp HOV bypass lanes and California Highway Patrol enforcement areas, and stormwater drainage/treatment facilities;
- Construction of three pedestrian/bicycle overcrossings;
- Reconstruction of two Santa Cruz Branch Rail Line overcrossings in Aptos;
- Widening of the Aptos Creek Bridge;
- Replacement of the Capitola Avenue overcrossing;
- Retaining walls;
- Soundwalls; and
- Traffic signal coordination and other transportation operation system improvements.

The Tier I Corridor HOV Lane Alternative would expand the existing four-lane highway to a six through-lane facility by adding HOV lanes in both the northbound and southbound directions. HOV lanes would be constructed entirely within the existing median where possible. In those areas where the median is not wide enough to accommodate additional lanes, widening would occur outside of the existing freeway footprint. The southernmost 1.5 miles of the freeway can accommodate an HOV lane inside the existing median. From approximately Freedom Boulevard to Soquel Drive, the existing median is not wide enough to accommodate an HOV lane, so the space needed for the additional lanes would be achieved through a combination of median conversion within existing right-of-way and acquisition of property adjacent to the freeway. Plan drawings depicting the Tier I Corridor HOV Lane Alternative are presented in Appendix G, Figures HOV-1 through HOV-20.

Table 1-4: Major Project Features
Tier I Project Alternatives

Project Features	HOV Lane Alternative	TSM Alternative	No Build Alternative
Highway Mainline Changes			
HOV lanes	X		
Lower highway profile at Santa Cruz Branch Line bridge crossings[1]	X	X	
Auxiliary Lane Improvements			
Northbound and southbound between Freedom Boulevard and Rio Del Mar Boulevard	X	X	
Northbound and southbound between Rio Del Mar Boulevard and State Park Drive	X	X	
Northbound between State Park Drive and Park Avenue		X	
Southbound between State Park Drive and Park Avenue	X	X	
Northbound and southbound between Park Avenue and Bay Avenue/Porter Street	X	X	
Northbound and southbound from 41st Avenue to Soquel Avenue/Drive	X	X	
Highway Interchange Improvements			
Reconfigure all nine interchanges within project limits	X		
Reconstruct State Park Drive, 41st Avenue, and Soquel overcrossings		X	
Ramp metering	X	X	
On-ramp HOV bypass lanes	X	X	
On-ramp California Highway Patrol enforcement areas	X	X	
Stormwater drainage and treatment facilities	X	X	
New Pedestrian/Bicycle Overcrossings			
Mar Vista Drive Crossing	X	X	
Chanticleer Avenue Crossing	X	X	
Trevethan Avenue Crossing	X	X	
Santa Cruz Branch Line Bridges Replacement	X	X	
Aptos Creek Bridge Widening	X	X	
Capitola Avenue Overcrossing Replacement	X	X	
Retaining Walls	X	X	
Soundwalls	X	X	
Traffic Signal Coordination	X	X	X
Transportation Operations System	X	X	X
Transit-Supportive Improvements	X		

[1] Existing highway profile does not meet vertical clearance standards for railroad bridge crossings.

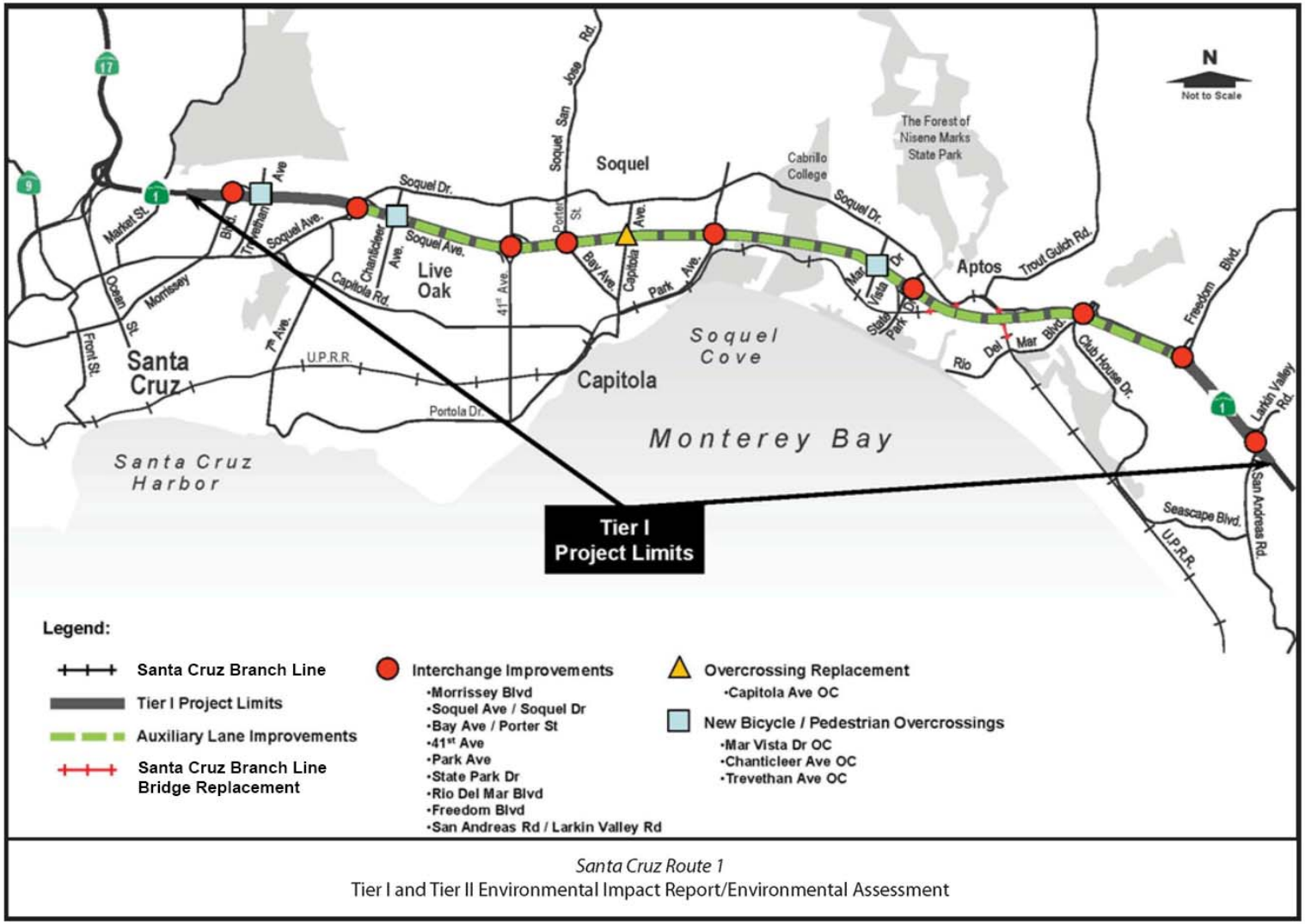


Figure 1-3: Tier I Corridor HOV Lane Alternative – Project Features

The Tier I Corridor HOV Lane Alternative would expand the existing four-lane highway to a six through-lane facility by adding HOV lanes in both the northbound and southbound directions. HOV lanes would be constructed entirely within the existing median where possible. In those areas where the median is not wide enough to accommodate additional lanes, widening would occur outside of the existing freeway footprint. The southernmost 1.5 miles of the freeway can accommodate an HOV lane inside the existing median. From approximately Freedom Boulevard to Soquel Drive, the existing median is not wide enough to accommodate an HOV lane, so the space needed for the additional lanes would be achieved through a combination of median conversion within existing right-of-way and acquisition of property adjacent to the freeway. Plan drawings depicting the Tier I Corridor HOV Lane Alternative are presented in Appendix G, Figures HOV-1 through HOV-20.

A mandatory standard median width (22 feet) set by Caltrans in its Highway Design Manual is proposed through most of the project corridor, north of Freedom Boulevard. The mandatory standard median width comprises two 10-foot-wide inside shoulders and a 2-foot-wide barrier. Where meeting the mandatory median width standard would result in acquiring property on the non-highway side of existing frontage roads, inside shoulder widths of 5 feet are proposed to reduce property requirements and impacts. Five feet is a nonstandard inside shoulder width for a Caltrans facility. This exception to shoulder-width design standards has received conceptual review in meetings between Caltrans and the project sponsor. All projects requiring design exceptions must ultimately be approved by Caltrans.

The Tier I Corridor HOV Lane Alternative would modify or reconstruct all nine interchanges within the project corridor to improve merging operations and ramp geometry by increasing the length of lanes for acceleration and deceleration, adding HOV bypass lanes and mixed-flow lanes to on-ramps, and improving sight distances. The Bay Avenue/Porter Street and 41st Avenue interchanges would be modified to operate as one interchange with frontage roads connecting the two interchanges. Where feasible, design deficiencies on existing ramps would be corrected to meet current design standards. Ramp metering and HOV bypass lanes would be provided on all Route 1 on-ramps. This alternative would include auxiliary lanes between all interchange ramps (with the exception of a northbound auxiliary lane between State Park Drive and Park Avenue) and Transportation Operations System elements, such as changeable message signs, microwave detection systems, and vehicle detection systems. Bridge structures and the Capitola Avenue overcrossing would be modified or replaced to accommodate the HOV lanes. New and widened highway crossing structures would include shoulder and sidewalk facilities to accommodate pedestrians and bicycles. The HOV Lane Alternative would include three new pedestrian/bicycle overcrossings of Route 1. The two existing Santa Cruz Branch Line structures over Route 1 in Aptos would be replaced with longer bridges at the same elevation, and the highway profile would be lowered to achieve standard vertical clearance under the bridges to make room

for the HOV and auxiliary lanes. In addition, this design configuration would reduce environmental impacts. The existing Route 1 bridge over Aptos Creek would be widened on the outside to accommodate the HOV lanes in each direction. The existing Capitola Avenue overcrossing would be replaced with a longer structure.

Retaining walls would be constructed to minimize property acquisitions and reduce environmental impacts. At locations where frontage roads are adjacent to Route 1, concrete barriers would be constructed to separate the highway and frontage road.

Changes to Highway Mainline with the Tier I Corridor HOV Lane Alternative

- Route 1 would be expanded to allow for two standard-width (12-foot) mixed-flow lanes, one standard-width (12-foot) HOV lane, and standard-width outside (10-foot) shoulders in each direction.
- The proposed lanes would be constructed within the existing 45-foot median. In locations where the existing median width is less than 45 feet, widening would occur both in the median and at the outside, generally within the existing Route 1 right-of-way.
- Where auxiliary lanes are proposed, widening by approximately 12 feet outside of the existing highway footprint would occur.
- A mandatory standard median width of 22 feet is proposed through most of the corridor.
- The highway centerline would be shifted northward in the vicinity of the Santa Cruz Branch Line crossings in Aptos to reduce impacts to wetlands. The bridge over Aptos Creek would be widened to allow for four new lanes: two HOV, two auxiliary, and pedestrian/bicycle facilities.
- Route 1 would be lowered to obtain vertical clearance at the Santa Cruz Branch Line crossings in Aptos (see Appendix G, Figures HOV-14 and HOV-15). A mandatory standard median width of 22 feet is proposed to minimize impact to the railroad bridge.
- At three locations, median and inside shoulder widths would be nonstandard to reduce impacts to adjacent streets. The three locations are: McGregor Drive, Cabrillo College Drive, and Kennedy Drive. At these three constrained locations, the inside shoulder in the constrained direction would be a nonstandard 5 feet, and the median would be a nonstandard 17 feet.

Auxiliary Lane Improvements with the Tier I Corridor HOV Lane Alternative

The auxiliary lane improvements are discussed above in Section 1.5 Common Design Features of the Tier I Corridor HOV Lane and TSM Alternatives.

Interchange Improvements with the Tier I Corridor HOV Lane Alternative

All nine interchanges within the project corridor would be modified under the Tier I Corridor HOV Lane Alternative, including overcrossing and undercrossing widening or replacement. These

modifications would improve merging operations and ramp geometrics, and accessibility and safety for pedestrians and bicyclists. Major interchange improvements would include the following:

- Reconfiguration of intersections, including replacement or widening of highway overcrossings and undercrossings.
- Intersections of freeway ramps with local roads would be modified to shorten the pedestrian and bike crossing distances. Additionally, free right turns would be eliminated where feasible and traffic signals installed to improve traffic flow and slow vehicle traffic speeds through the bike and pedestrian crossing areas.
- Local roadways would be widened at the interchanges to accommodate the anticipated travel demand.
- Drainage and stormwater runoff treatment facilities would be provided.

Interchange improvements and design reconfigurations proposed for each interchange are listed in Table 1-5.

Table 1-5: Interchange Improvements and Reconfigurations
Tier I Corridor HOV Lane Alternative

Route 1 Interchange Location	Project Plan Sheet No.[1]	Tier I Corridor HOV Lane Alternative Features
San Andreas/ Larkin Valley Roads Interchange	HOV-20	The existing northbound cloverleaf off-ramp free right-turn onto Larkin Valley Road would be eliminated in favor of a signalized 90-degree intersection.
		A signalized intersection would be provided at the San Andreas Road ramps and the free right-turns would be eliminated.
		The existing on-ramps would be widened to accommodate HOV bypass lanes.
		The southbound Route 1 bridge over San Andreas/Larkin Valley Road would be widened into the median to accommodate the HOV lanes.
		San Andreas/Larkin Valley Roads would be widened within the Tier I project limits to add turn lanes.
		New sidewalks would be added along San Andreas/Larkin Valley Roads within the Tier I project limits.
Freedom Boulevard Interchange	HOV-18	The existing ramp termini at Freedom Boulevard would be modified to provide less-skewed intersections with Freedom Boulevard. These intersections would be signalized, and free right-turns would be eliminated.
		The southbound off-ramp would be widened to two exit lanes.
		The existing on-ramps would be widened to accommodate HOV bypass lanes.
		Freedom Boulevard would be widened within the Tier I project limits to add turn lanes.
		The Freedom Boulevard/Bonita Drive intersection would be enlarged to add turn lanes and achieve acceptable level of service.
		The Freedom Boulevard bridge would be replaced with a wider structure that would accommodate a new turn lane on Freedom Boulevard and the new HOV lanes on Route 1.
		New sidewalks would be added along Freedom Boulevard within the Tier I project limits.

Table 1-5: Interchange Improvements and Reconfigurations
Tier I Corridor HOV Lane Alternative

Route 1 Interchange Location	Project Plan Sheet No.[1]	Tier I Corridor HOV Lane Alternative Features
Rio Del Mar Boulevard Interchange	HOV-16	The northbound on-ramp would be realigned to form the north leg of a four-way intersection with Rio Del Mar Boulevard and the northbound off-ramp. This intersection would be signalized, and free right turns would be eliminated
		The northbound off-ramp would be widened to two exit lanes.
		The southbound ramps would be widened, the intersection with Rio Del Mar Boulevard signalized, and free right-turns eliminated.
		The existing on-ramps would be widened to accommodate HOV bypass lanes.
		Soquel Drive would be shifted northward to accommodate the roadway widening along the northbound off-ramp.
		Rio Del Mar Boulevard would be widened within the Tier I project limits to add turn lanes and a through lane in each direction.
		The Rio Del Mar Boulevard bridge over Route 1 would be replaced with a longer, wider bridge to accommodate a new turn lane and a through lane in each direction on Rio Del Mar Boulevard and the new HOV lanes on Route 1.
		Sidewalk would be added along eastbound Rio Del Mar Boulevard within the Tier I project limits; the sidewalk on westbound Rio Del Mar Boulevard would be retained.
State Park Drive Interchange	HOV-13	The existing northbound cloverleaf on-ramp free-right turn would be changed to a signalized right turn.
		The existing northbound off-ramp terminus would be modified to form, together with the realigned northbound on-ramp terminus, the south leg of a signalized intersection with State Park Drive.
		The northbound and southbound off-ramps would be widened to two exit lanes.
		The existing on-ramps would be widened to accommodate HOV bypass lanes.
		State Park Drive would be widened within the Tier I project limits to add turn lanes and a through lane in each direction.
		The State Park Drive bridge over Route 1 would be replaced with a longer, wider bridge to accommodate a new through-lane in each direction on State Park Drive and the new HOV lanes on Route 1.
		Sidewalk would be added along eastbound State Park Drive within the Tier I project limits; the sidewalk along westbound State Park Drive would be retained.
Park Avenue Interchange	HOV-10	The existing diamond interchange ramp design would be retained and ramps would be widened.
		The northbound and southbound off-ramps would be widened to two exit lanes.
		The existing on-ramps would be widened to accommodate HOV bypass lanes.
		Park Avenue would be widened within the Tier I project limits to add turn lanes.
		The two Route 1 bridges over Park Avenue would be replaced with one, wider structure to accommodate the new HOV lanes on Route 1.
		Sidewalk would be added within the Tier I project limits along westbound Park Avenue; the sidewalk along eastbound Park Avenue would be retained.
Bay Avenue/ Porter Street and 41st Avenue Interchanges	HOV-7	Improvements at the Bay Avenue/Porter Street and 41st Avenue interchanges would be designed so that these two interchanges would work as a single interchange connected by a collector/frontage road running between the interchanges.
		The freeway ramps would be reconstructed to form less-skewed intersections with Bay Avenue/Porter Street.

Table 1-5: Interchange Improvements and Reconfigurations
Tier I Corridor HOV Lane Alternative

Route 1 Interchange Location	Project Plan Sheet No.[1]	Tier I Corridor HOV Lane Alternative Features
		The existing southbound Route 1 off-ramp to Bay Avenue/Porter Street would be eliminated. Southbound traffic bound for Bay Avenue/Porter Street would exit at the 41st Avenue two-lane off-ramp and continue on a new southbound collector/frontage road to Bay Avenue/Porter Street.
		The existing two-lane on-ramp from Porter Street to northbound Route 1 would be modified to become a northbound collector/frontage road serving traffic bound for 41st Avenue or northbound Route 1.
		Northbound traffic exiting Route 1 would either bear right to intersect with Porter Street and continue north, or stay left and continue on a new structure over Porter Street, join the northbound collector/frontage road, and end at a new signalized intersection at 41st Avenue.
		At 41st Avenue, southbound on- and off-ramps would be eliminated and replaced with a diagonal off-ramp and a collector/frontage road serving traffic bound for Bay Avenue/Porter Street or southbound Route 1. The new ramp and collector/frontage road would form a signalized intersection with 41st Avenue.
		At 41st Avenue, the northbound on-ramps would be realigned.
		New on-ramps would include HOV bypass lanes.
		41st Avenue would be widened within the Tier I project limits to add turn lanes and eastbound though lanes over Route 1.
		Bay Avenue/Porter Street would be widened to add right-turn lanes at the on-ramps.
		A new bridge over Soquel Creek and Soquel Wharf Road would be constructed for the new southbound collector/frontage road from 41st Avenue to Bay Avenue/Porter Street.
		The 41st Avenue bridge over Route 1 would be replaced with a longer, wider bridge to accommodate the new eastbound through lane and turn lanes on 41st Avenue, and the new HOV lanes on Route 1. Northbound and southbound Class I bike paths would be constructed between 41st Avenue and Bay Avenue/Porter Street on either side of the new collector/frontage roads, respectively.
Soquel Avenue/ Drive Interchange	HOV-3	The northbound off-ramp would be realigned to a signalized 90-degree intersection with Soquel Drive. The existing access to Commercial Way would be eliminated.
		The westbound Soquel Drive on-ramp to northbound Route 1 would be modified to eliminate the free right-turn access.
		The existing northbound loop on-ramp from eastbound Soquel Avenue would be realigned and its free-right terminus would become a signalized 90-degree intersection.
		A new, wider southbound diagonal off-ramp that adds turn lanes at its terminus and a new loop on-ramp would form the north leg of a signalized intersection at Soquel Avenue.
		The existing southbound hook on-ramp would be widened to add an HOV bypass lane and realigned to be made standard.
		The northbound and southbound off-ramps would be widened to two exit lanes.
		All new on-ramps would include HOV bypass lanes.
		Soquel Avenue within the Tier I project limits would be widened to add an eastbound through lane and turn lanes.

Table 1-5: Interchange Improvements and Reconfigurations
Tier I Corridor HOV Lane Alternative

Route 1 Interchange Location	Project Plan Sheet No.[1]	Tier I Corridor HOV Lane Alternative Features
		Salisbury Lane would be shifted eastward to form an intersection with the realigned northbound off-ramp and loop on-ramp.
		The Soquel Drive bridge over Route 1 would be replaced with a longer, wider bridge to add an eastbound through lane and a turn lane to Soquel Drive and accommodate the new HOV lanes on Route 1.
		The culvert at Arana Gulch would be extended underneath the widened Route 1 and new southbound off-ramp.
		Sidewalk would be added along eastbound Soquel Drive within the Tier I (and Tier II) project limits; the sidewalk along westbound Soquel Drive would be retained.
Morrissey Boulevard Interchange	HOV-1	The southbound exit would be realigned to terminate at a new signalized intersection with Morrissey Boulevard.
		The existing southbound on-ramp would be eliminated and replaced with a new, wider diagonal ramp with a signalized terminus.
		The existing southbound off- and on-ramp at Elk Street would be eliminated.
		The existing northbound loop on-ramp would be eliminated, as would access to Rooney Street from this northbound loop.
		The northbound off-ramp would be widened to two exit lanes.
		New on-ramps would include HOV bypass lanes.
		Morrissey Boulevard is being replaced with a wider bridge to add an eastbound through lane and turn lanes, and realigned to form a straight line between its intersections with Fairmont Avenue and Rooney Street.
		The Morrissey Boulevard bridge is being replaced with a longer, wider bridge to accommodate a new eastbound through lane and turn lanes on Morrissey Boulevard and new HOV lanes on Route 1.
		Sidewalk would be added along eastbound Morrissey Boulevard within the Tier I project limits; the sidewalk along westbound Morrissey Boulevard would be retained.
Transit-Related Facilities	NA	Both on-ramps and both off-ramps at the reconfigured Park Avenue interchange include options for bus pads and bus shelters.
		Ramps and collectors at the Bay Avenue/Porter Street and 41st Avenue interchanges include options for bus pads and shelters.

[1] Project plan sheets are provided in Appendix G of the project's Environmental Impact Report/Environmental Assessment

Transit Supportive Planning and Design

The Tier I Corridor HOV Lane Alternative would not preclude the development of the following features from being added in the future to facilitate freeway-oriented transit services and operations:

- The reconfigured Park Avenue and Bay Avenue/Porter Street/41st Avenue interchanges would allow for future bus pads and bus stop shelters to be constructed as part of a separate project.

- Future park-and-ride lots are under consideration by RTC at the Larkin Valley Road/San Andreas Road and 41st Avenue interchanges, to be coordinated with the bus facilities as part of a future project.

The aforementioned features are not part of the proposed project and would be subject to future environmental clearance. The proposed Tier I project is simply taking into consideration potential future transit projects as a collaborative planning effort.

New Pedestrian/Bicycle Overcrossings

The proposed pedestrian/bicycle overcrossings are discussed above in Section 1.5 Common Design Features of the Tier I Corridor HOV Lane and TSM Alternatives.

Tier I Corridor TSM Alternative

The Tier I Corridor TSM Alternative was formulated to provide Route 1 improvements that would partially address the purpose and need, and could be achieved at lower cost and with fewer impacts than the Tier I Corridor HOV Lane Alternative. TSM strategies typically consist of improvements that can benefit the operations of existing facilities without increasing the number of through lanes.

As discussed in Section 1.5 Common Design Features of the Tier I Corridor HOV Lane and TSM Alternatives, the Tier I Corridor TSM Alternative proposes to add auxiliary lanes, ramp metering and HOV on-ramp bypass lanes; improve existing nonstandard geometric elements at various ramps; and incorporate other TSM elements, such as changeable message signs, closed circuit television, microwave detection systems, and vehicle detection systems.). In short, the TSM Alternative shares many of the Tier I Corridor HOV Lane Alternative features, except HOV lanes would not be constructed along the mainline and the Soquel Drive interchange would be the only interchange reconfigured. Plan drawings depicting the TSM Alternative are presented in Appendix H, Figures TSM-1 through TSM-20. An overview of the major features of the TSM Alternative is provided in Figure 1-4 and in plan view in Appendix H.

Auxiliary Lanes

The majority of auxiliary lane improvements are discussed above in Section 1.5 Common Design Features of the Tier I Corridor HOV Lane and TSM Alternatives. In addition, the TSM Alternative would have both a southbound and northbound auxiliary lane between State Park Drive and Park Avenue — improvements that are not included in the HOV Lane Alternative.

Interchange Improvements

Improvements to interchanges proposed under the Tier I Corridor TSM Alternative include the following:

- The Soquel Avenue northbound off-ramp from Route 1 would be realigned and widened from one to two exit lanes for a distance of approximately 1,300 feet,

widening to four lanes at its intersection with Soquel Drive. The northbound off-ramp/Commercial Way connection would be eliminated, and Commercial Way would become a cul-de-sac north of the realigned ramp. The intersection of the northbound off-ramp with Soquel Drive would be enlarged to achieve an acceptable level of service for the anticipated traffic volume.

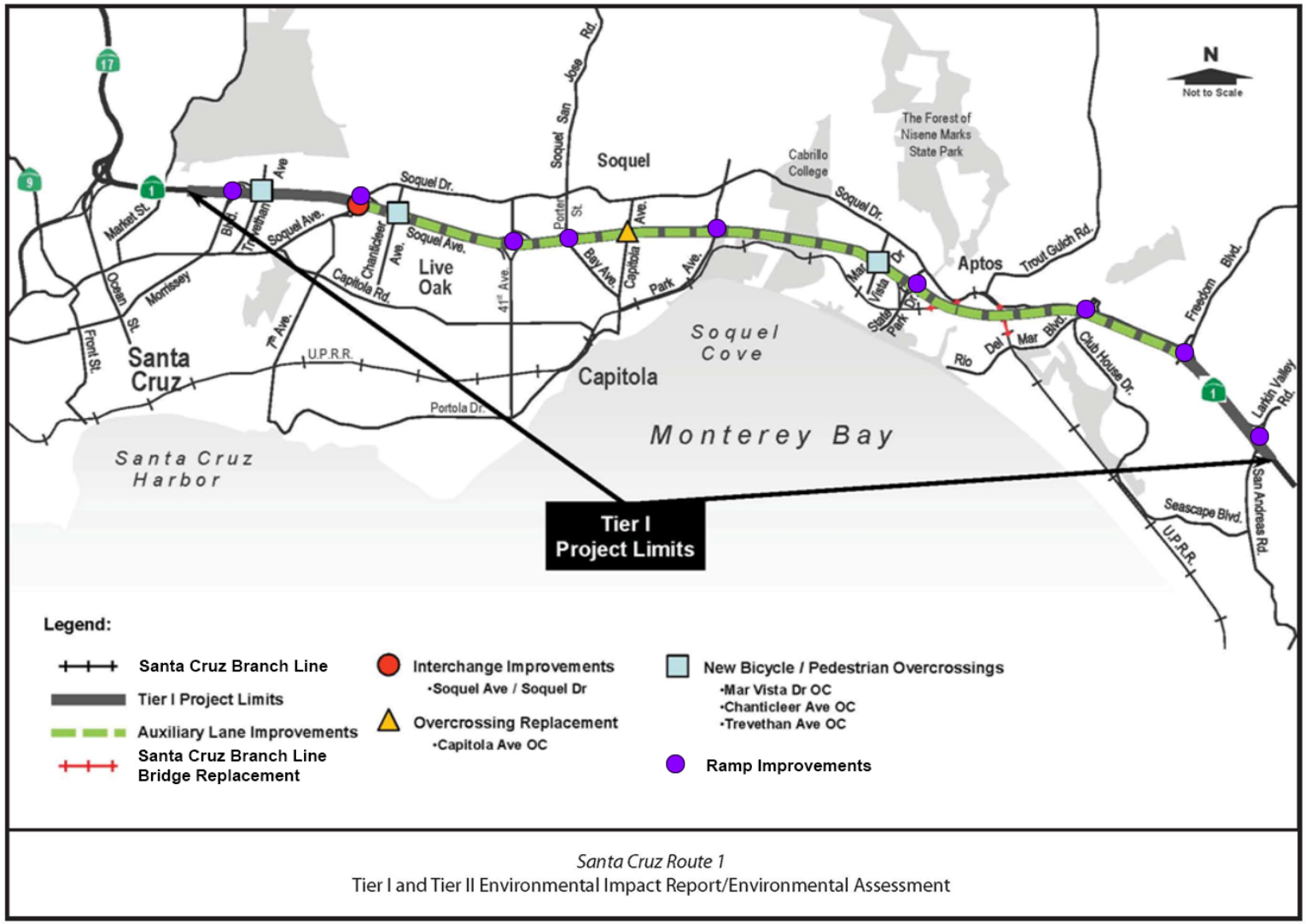
- Improve existing nonstandard geometric elements at various ramps.
- Provide HOV bypass lanes on all except northbound Morrissey Boulevard on-ramps.
- Add California Highway Patrol enforcement areas at on-ramps with HOV bypass lanes.

New Pedestrian/Bicycle Overcrossings

The proposed pedestrian/bicycle overcrossings are discussed above in Section 1.5 Common Design Features of the Tier I Corridor HOV Lane and TSM Alternatives.

Other Improvements

The details of the other improvements are included above in Section 1.5 Common Design Features of the Tier I Corridor HOV Lane and TSM Alternatives.



Santa Cruz Route 1
Tier I and Tier II Environmental Impact Report/Environmental Assessment

Figure 1-4: Tier I Corridor TSM Alternative – Project Features

Tier II Auxiliary Lane Alternative

The Tier II Auxiliary Lane Alternative would construct northbound and southbound auxiliary lanes on Route 1 from 41st Avenue to Soquel Drive and make other improvements, as discussed below. Figure 1-5 shows features of the Auxiliary Lane Alternative, and Appendix I provides a plan view of the proposed Tier II project. To construct the Auxiliary Lane Alternative, right-of-way would be acquired along Soquel Avenue west of Chanticleer Avenue and at the Chanticleer Avenue cul-de-sac north of Route 1 to accommodate the bicycle/pedestrian overcrossing.

Auxiliary Lanes

The Tier II Auxiliary Lane Alternative proposes to widen Route 1 by adding an auxiliary lane in both the northbound and southbound directions between the 41st Avenue and Soquel Avenue/Drive interchanges. The total roadway widening would be approximately 1.4 miles in length. Southbound, the auxiliary lane would begin at the existing Soquel Avenue on-ramp and end at the existing off-ramp to 41st Avenue. Northbound, the auxiliary lane would begin just south of the 41st Avenue overcrossing, at the existing loop on-ramp from northbound 41st Avenue. North of the overcrossing, the on-ramp from 41st Avenue to northbound Route 1 would merge with the new auxiliary lane, approximately 1,000 feet downstream from the loop ramp.

The new auxiliary lanes would be 12 feet wide. In the southbound direction, the width needed for the new lane would be added in the median, and the median barrier would be shifted approximately 5 feet toward the northbound side of the freeway to make room for the new lane and a standard 10-foot-wide shoulder. Where the new southbound lane meets the existing ramps, outside shoulder widening would occur to achieve standard 10-foot-wide shoulders. In the northbound direction, the Tier II project proposes to pave a 10-foot-wide median shoulder and widen to the outside to add the 12-foot-wide auxiliary lane and a new 10–foot-wide shoulder.

As part of the widening in the northbound direction, the Tier II project proposes to repair an existing pavement failure in the outside lane and shoulder by improving the pavement section, installing a retaining wall and, if necessary, replacing the underlying County-owned sanitary sewer line crossing Route 1. A new concrete median battier would also be constructed.

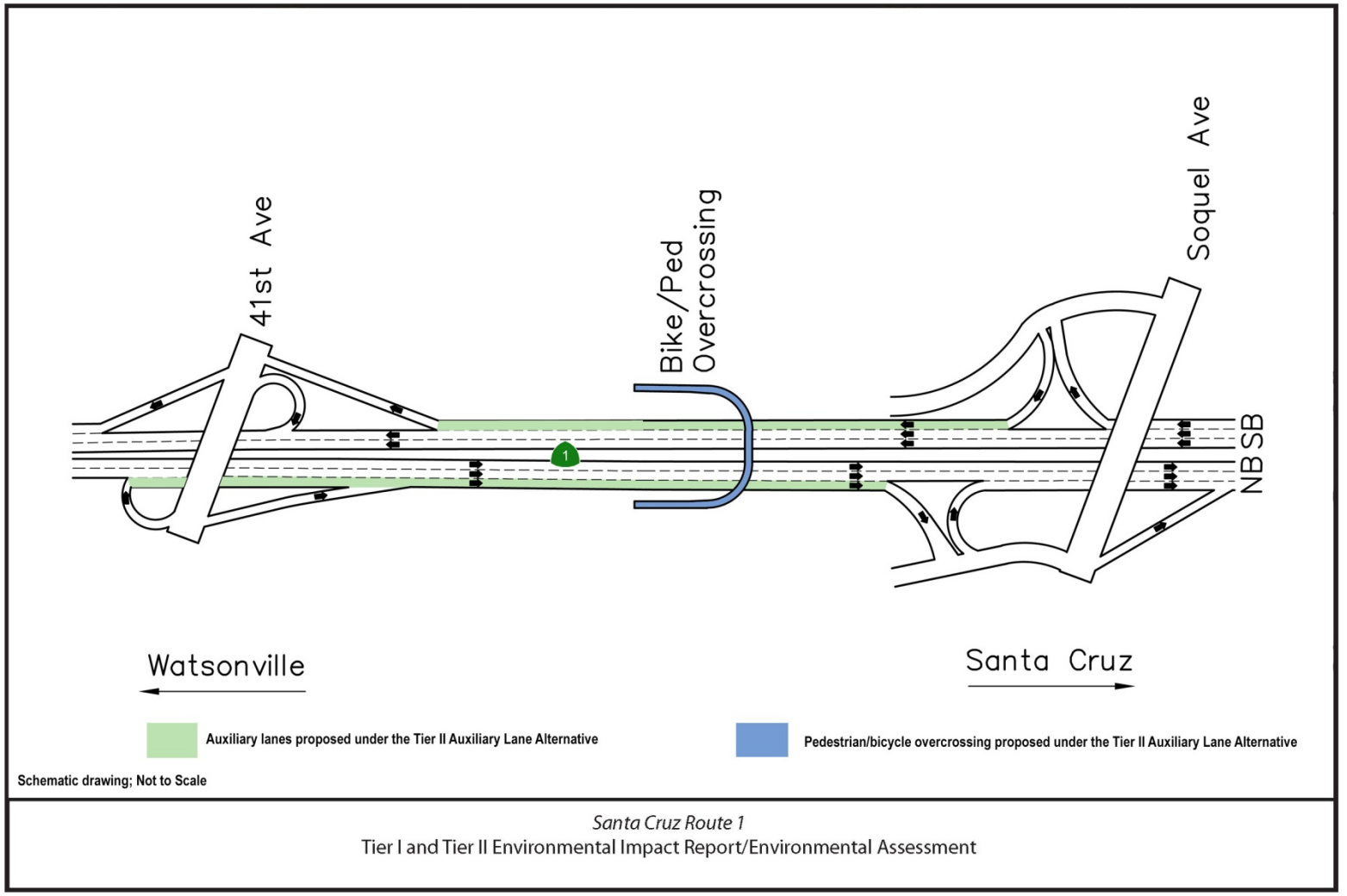


Figure 1-5: Tier II Auxiliary Lane Alternative – Project Features

Pedestrian/Bicycle Overcrossing

A new horseshoe-shaped pedestrian overcrossing is proposed over Route 1 at Chanticleer Avenue.[1] The overcrossing would vary in width from 14 feet along the ramps to 16 feet around the curves. Ramps from Chanticleer Avenue up to the overcrossing would be at approximately a 5 percent grade. Up to where the overcrossing exceeds approximately 10 feet in height, the ramp would be built on
retained fill; beyond that point, the bridge would rest on columns along the north right-of-way of Route 1, in the Route 1 median, behind the curb between Route 1 and Soquel Avenue, and along the south side of Soquel Avenue. The design of the ramps and bridge would include architectural texture or other aesthetic treatment. (See Section 2.16 for a visual simulation of the proposed Chanticleer Avenue pedestrian/bicycle overcrossing.)

In addition, a new 360-foot-long by 6-foot-wide sidewalk would be constructed along the south side of Soquel Avenue, starting at Chanticleer Avenue. The sidewalk would be separated from the street by a 4-foot-wide strip.

Retaining Walls

Retaining walls would be constructed as part of the roadway widening, with four separate walls: three on the north side of Route 1 and one on the south side. One of the retaining walls would start after the 41st Avenue on-ramp and extend approximately 150 feet; two other retaining walls on the northbound side would be 375 and 408 feet. On the southbound side, a 350-foot-long wall would be constructed along the highway mainline and Soquel Avenue, over the Rodeo Gulch culvert.

Three of the walls would be located to allow widening for an additional mainline lane on Route 1 in each direction in the future. The wall proposed along the northbound on-ramp at 41st Avenue would have to be demolished and replaced if the highway were to be widened in the future. Two of the walls would span Rodeo Creek Gulch, where there is an existing 9-foot arch concrete culvert, and one would be constructed within a narrow jurisdictional wetland area on the northbound side of Route 1, adjacent to a 39-inch culvert crossing.

No Build Alternative

The No Build Alternative offers a basis for comparing the effects of the Tier I Corridor Alternatives and the Tier II Auxiliary Lane Alternative with doing none of the proposed improvements. The No Build Alternative assumes there would be no major construction on Route 1 through the Tier I project limits other than currently planned and programmed improvements and continued routine maintenance. The following planned and programmed

[1] The overcrossing at Chanticleer is included in both the Tier I and Tier II Projects. The Tier I program of improvements encompasses the current Tier II Auxiliary Lane Project, which has been identified as the first phase of the overall program of improvements.

improvements included in the No Build Alternative are contained in the 2010 Regional Transportation Plan:

- Construction of auxiliary lanes between the Soquel Drive and Morrissey Boulevard interchanges for the Soquel to Morrissey Auxiliary Lanes Project; construction completed in December 2013.
- Replacement of the La Fonda Avenue overcrossing of Route 1, included as part of the Soquel to Morrissey Auxiliary Lanes project; construction completed in 2013.
- Reconstruction of bridges and addition of a merge lane in each direction between Highway 17 and the Morrissey/La Fonda area for the Highway 1/17 Merge Lanes Project; construction completed in 2008.
- Installation of median barrier on Route 1 from Freedom Boulevard to Rio Del Mar Boulevard.

Improvements of roadways and roadsides on Rio Del Mar Boulevard from Esplanade to Route 1, which includes the addition of bike lanes, transit turnouts, left-turn pockets, merge lanes, and intersection improvements. Roadwork includes major rehabilitation and ongoing maintenance. If the No Build Alternative is selected, it is highly likely that other improvements could be expected in the future.

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Executive Summary

The Highway 1 High Occupancy Vehicle Lane Widening Project is located in the communities of Santa Cruz, Live Oak, Soquel, Capitola, Seacliff, Aptos, and Rio Del Mar. The proposed project is located in Santa Cruz County along Highway 1 between Post Mile 7.24 and 16.13 (Kilometer Post 11.64 and 25.96). The project limits begin on the southerly end of the Larkin Valley Road/San Andreas Road interchange and extend to the northerly end at the Morrissey Boulevard interchange. The purpose of the project is to improve safety, reduce congestion, encourage carpooling and the use of public/mass transportation as means to increase capacity, and improve operations.

The purpose of this Water Quality Study Report is to evaluate the potential for water quality impacts to existing surface watercourses and/or groundwater resources within the project limits. The general approach of the project is to evaluate whether there will be significant effects from the project on the water quality. The components of this study include any proposed project activity that may result in impacts to water resources, erosion of the stream banks, and an increase in sediment load and other pollutants to surface and ground waters.

The project would be separated into Tier I and Tier II projects in the Environmental Document. The Tier I portion of the document analyzes 2 build alternatives and a no-build alternative for the 8.9-mile corridor at a program level. The Tier II portion analyzes a build alternative and a no-build alternative for a construction level project on Highway 1 between 41st Avenue and Soquel Drive.

The project's overall design goal will be to avoid water resources to the Maximum Extent Practicable, to promote infiltration of storm water runoff, to maximize treatment of storm water runoff, and to reduce erosion by metering or detaining post-project runoff rates to pre-project rates. By meeting these goals and incorporating other applicable National Pollutant Discharge Elimination System requirements, water quality impacts should be minimized and therefore should not be significant.

Tier I Project

The proposed Tier I project limits begin on the southerly end of the Larkin Valley Road/San Andreas Road interchange and extend to the northerly end at the Morrissey Boulevard interchange. Three alternatives are currently under consideration under the Tier I project: a High Occupancy Vehicle Lane Alternative, a Transportation System Management Alternative, and a No-Build Alternative.

The Tier I project is within the jurisdiction of the Central Coast Regional Water Quality Control Board. Sixteen waterways and two lagoons cross or run parallel to Highway 1 along this reach: Valencia Channel, Valencia Lagoon., Valencia Creek, Aptos Creek, Ord Gulch, Borregas Creek, Pot Belly Creek, Tannery Gulch, an unnamed tributary to Tannery Gulch, Nobel Creek, Soquel Creek, Soquel Lagoon, Rodeo Creek Gulch, Arana Gulch, the three tributaries to Arana Gulch, and an unnamed Water of the U.S. at Station 49+65. These water bodies discharge into the Monterey Bay and eventually to the Pacific Ocean. The main areas where potential water quality

impacts may occur are within the creeks crossing Highway 1, and the biotic/aquatic or wetland areas adjacent to creek crossings and parallel to Highway 1. These areas are surface water resources under the jurisdiction of the California Department of Fish and Wildlife, the United States Army Corps of Engineers, or the California Coastal Commission. The Soquel Lagoon and the Aptos Creek outlets are those identified as Critical Coastal Areas. Of the direct receiving water bodies (waterways) that cross or run parallel to Highway 1, Aptos Creek, Valencia Creek, Soquel Creek, Soquel Lagoon, and Rodeo Creek Gulch are listed in the 2010 Clean Water Act's 303(d) list for Water Quality Limited Segments. Areas of special biological significance were noted within the Central Coast Regional Water Quality Control Board boundaries, but these areas are not located in the Highway 1 project limits.

The Tier I project is within the Soquel Valley (3-1), Pajaro Valley (3-2), and the West Santa Cruz Terrace (3-26) groundwater basins. Based on United States Geological Survey topography maps, there are four perennial streams: Soquel Creek, Rodeo Creek Gulch, Aptos Creek, and Valencia Creek. In addition, groundwater elevations are shallow at the Freedom Boulevard/Rob Roy Junction overcrossing – 3 to 20 feet (1 to 6 meters), and at the Morrissey Avenue overcrossing – 1 foot (0.3 meter). Further borings will have to be performed during the design phase to evaluate groundwater depths beyond these areas.

Preliminary risk level assessment has determined that this Tier I project has both Risk Level 2 and Risk Level 3 areas. As this 8.9-mile corridor is separated into portions, each will have a new risk level assessment preformed along with a separate assessment of treatment Best Management Practices and hydromodification requirements.

The primary potential for water quality impacts from the Tier I project is soil erosion or suspended solids being introduced into the waterways due to construction activities, or from additional runoff from added impervious areas. Water quality will also be impacted by temporary and permanent encroachment into existing wetlands and Waters of the United States and the State of California. The Tier I project will have less than significant impacts to water quality. Design features for the Tier I project impacts to storm water runoff can be addressed with use of pollution control measures or Best Management Practices. The use of permanent stormwater treatment Best Management Practices under both build alternatives will result in a reduced pollutant loading to receiving waters, which would continue unabated with the no-build alternative.

Consideration of Best Management Practices is required by the California Department of Transportation's National Municipal Separate Storm Sewer Systems (MS4) permit (Order No. 2012-0011-DWQ), adopted in September 2012, by the California State Water Resources Control Board. Mitigation for wetland and Waters of the United States and State impacts will be addressed through consultation with appropriate regulatory agencies.

Short-term impacts are generally from construction activities, such as grading work or dewatering. Temporary Best Management Practices will be considered for this Tier I project to prevent potential water quality degradation during construction. Long-term impacts from the Tier I project could result from floodplain and wetland fill, and potential increases to velocity

and volume of downstream flows due to added impervious areas. Storm water runoff from the Highway 1 corridor potentially carries pollutants into natural flowing streams as well as into adjacent jurisdictional biotic/aquatic areas. Permanent Best Management Practices will be considered to address these impacts, to promote infiltration, reduce erosion, and collect and treat roadway runoff.

Tier II Project

The Tier II project is located on Highway 1 between 41st Avenue and Soquel Avenue, between Highway 1 post miles 13.5 and 14.9 in Santa Cruz County. The Tier II portion of the environmental documentation examines a project-level build alternative and a no-build alternative.

Because the Tier II project covers a smaller portion of Highway 1, generally only discussions within the area between the 41st Avenue interchange and the Soquel Avenue interchange, or the creeks Soquel Creek, Rodeo Creek Gulch, or Arana Gulch are pertinent to the Tier II project, unless otherwise stated below.

The Tier II project is a smaller project than either of the Tier I project alternatives; The Tier II project would have fewer impacts than the impacts of the Tier I project alternatives.

The Tier II construction activities, such as grading and vegetation removal, can increase erosion and can temporarily impact water quality through storm water runoff. Storm water runoff from the Tier II project drains into Soquel Creek, Rodeo Creek Gulch, and Arana Gulch, and eventually discharges to Monterey Bay. The Tier II project is a smaller project and would have fewer temporary water quality impacts than the Tier I project.

The proposed Tier II project does not involve substantial excavations that affect groundwater. Excavation work for the Tier II proposed widening mostly involves roadbed construction and footings for the proposed pedestrian overcrossing and retaining walls. Two of the retaining walls would span Rodeo Creek Gulch. Because Rodeo Creek Gulch is a perennial stream, dewatering may be necessary for construction within the creek.

The proposed Tier II project includes two new retaining walls within jurisdictional biotic/aquatic areas along the northbound side of Highway 1. This proposed change would have a permanent impact on water quality due to permanent filling of the existing water resources. Additional potential temporary impacts may occur with temporary streambed disturbance, including the installation and removal of a temporary creek diversion system.

The Tier II project proposes an increase in impervious area of 4.89 acres. Storm water runoff volumes and velocities from the Tier II project area are expected to increase with the implementation of the Tier II project due to the increase in impervious surfaces. However, in comparison with the overall watershed of the creeks, the increase in flow due to the proposed widening of the highway would be less than significant.

Based on the risk assessments, the Tier II project was classified as Risk Level 2 and Risk Level 3. The Tier I project was determined to have a "Less than Significant" impact for all questions. Because the Tier II project is a smaller project than the Tier I project and is located within the Tier I project footprint, it will also have a less than significant impact.

1 GENERAL DESCRIPTION

The purpose of the Water Quality Study Report is to fulfill the requirements of the National Environmental Policy Act and the California Environmental Quality Act, and to provide information, to the extent possible, for National Pollution Discharge Elimination System permitting. The document includes a discussion of the proposed project, the physical setting of the project area, and the regulatory framework with respect to water quality; it also provides data on surface water and groundwater resources within the project area and the water quality of these waters, describes water quality impairments and beneficial uses, and identifies potential water quality impacts/benefits associated with the proposed project, and recommends avoidance and/or minimization measures for potentially adverse impacts.

1.1 Introduction

The California Department of Transportation, in cooperation with the Federal Highway Administration and the Santa Cruz County Regional Transportation Commission, proposes to improve State Route 1 (Route 1) in Santa Cruz County for a distance of approximately 8.9 miles, from approximately 0.4 miles south of the San Andreas-Larkin Valley Road Interchange through the Morrissey Boulevard Interchange. Figure 1 provides a project location map. Figure 2 displays the project limits.

Route 1 is the primary route connecting communities in Santa Cruz County and is the only continuous commuter route linking Watsonville, Capitola, Aptos, Cabrillo College, Santa Cruz and the University of California at Santa Cruz. Approximately one quarter of commuters using Route 1 continue on Route 17 to jobs in Santa Clara County. Route 1 also is the southern terminus for Routes 9 and 17, which bring heavy tourist traffic to coastal destinations in Santa Cruz and Monterey Counties. Route 1 between San Andreas Road and the Route 1/Route 17 interchange is a four-lane divided freeway with a median varying in width from 8.2 to 62.6 feet. Within the project limits there are nine interchanges, two overcrossings, and two Santa Cruz Branch Rail Line overpass bridge structures.

This project uses a “tiered” approach to its environmental documentation. Tiering is a staged approach that addresses broad programs and issues related to the entire corridor in the Tier I analysis. As specific projects within the corridor are ready for implementation, impacts of that action are evaluated in subsequent Tier II studies. The tiered process supports decision making on issues that are ripe for decision and provides a means to preserve those decisions. The Tier I portion of the project documentation provides fact-based analyses that supports informed decision making on the 8.9-mile corridor and discloses issues associated with the selection of a Tier I Corridor alternative. Identification of a Tier I Corridor alternative will not result directly in construction; however, it will provide the basis for decision makers to select a program of transportation improvements within the corridor.

The Tier II portion of the environmental documentation examines a project-level Auxiliary Lane Alternative and a No-Build Alternative. The Tier II corridor segment is within the project limits of the Tier I corridor and would represent the first implementation phase of transportation

improvements for the 8.9-mile corridor. As mentioned above, all Tier II corridor projects will be subject to separate environmental review.

1.2 Project Description

1.2.1 Tier I Project

The three Tier I alternatives currently under consideration are the High Occupancy Vehicle Lane Alternative, the Transportation System Management Alternative, and the No-Build Alternative.

1.2.1.1 High Occupancy Vehicle Lane Alternative – Tier I Project

The High Occupancy Vehicle Lane Alternative would widen the existing four-lane highway to a six-lane facility by adding a High Occupancy Vehicle lane next to the median in both the northbound and southbound directions. Along the southern portion of the project, the existing median generally is wide enough to add the new High Occupancy Vehicle lanes within the existing right-of-way. A mandatory standard median width (22 feet) would be used through most of the corridor, north of Freedom Boulevard. Where existing frontage roads would be impacted, non-standard inside shoulder widths of 5 feet are proposed to reduce right-of-way requirements and impacts. Such non-standard design features will require design exceptions when they are part of Tier II project. In some locations, widening would extend outside the existing state right-of-way.

The High Occupancy Vehicle Lane Alternative would modify or reconstruct all nine interchanges within the project limits to improve merging operations and ramp geometrics, lengthen acceleration and deceleration lanes, and improve sight distances. The Bay Avenue/Porter Street and 41st Avenue interchanges would be modified to operate as one interchange with a frontage road connecting the two interchanges. Where feasible, design deficiencies on existing ramps would be corrected to meet current design standards. Ramp metering and High Occupancy Vehicle bypass lanes would be provided on all Route 1 on-ramps. The High Occupancy Vehicle Lane Alternative would include auxiliary lanes between interchange ramps and Transportation Operations System electronic equipment, such as changeable message signs, closed-circuit television, microwave detection systems and vehicle detection systems as also described under the Transportation System Management Alternative – with the exception that an auxiliary lane would not be constructed northbound between State Park Drive and Park Avenue.

Bridge structures and the Capitola Avenue Overcrossing would be modified or replaced to accommodate the new High Occupancy Vehicle lanes. New and widened highway crossing structures would include shoulder and sidewalk facilities to accommodate pedestrians and bicycles. The High Occupancy Vehicle Lane Alternative would include two new pedestrian/bicycle overcrossings of Route 1. The existing Santa Cruz Branch Rail Line structures would be replaced, not relocated or raised, to minimize environmental impacts. The Route 1 bridge over Aptos Creek would be widened on the outside to accommodate the new High Occupancy Vehicle lanes.

Retaining walls would be constructed to minimize right-of-way acquisition and reduce or avoid environmental impacts. At locations where frontage roads are adjacent to Route 1, concrete barriers would be constructed to separate the two facilities and minimize right-of-way acquisition. The project also would include demolition and disposal, excavation, borrow and fill, sound walls, right-of-way acquisition, and temporary easements.

Mainline Improvements with the High Occupancy Vehicle Lane Alternative

- Route 1 would be widened to allow for two standard width (12 feet) mixed-flow lanes, one standard width (12 feet) High Occupancy Vehicle lane and standard outside (10 foot) shoulders.
- The proposed widening would be constructed into the median where the existing median width is over 45 feet. Where the existing median width is less than 45 feet, the required widening would be both into the median and at the outside shoulder, but generally within the existing Route 1 right-of-way.
- Where auxiliary lanes are proposed, widening to the outside would be increased by approximately 12 feet.
- A mandatory standard median width of 22 feet is proposed through most of the corridor.
- The highway centerline would be shifted northward in the vicinity of the Santa Cruz Branch Rail Line crossings to reduce impacts to wetlands. The bridge over Aptos Creek would be widened.
- Route 1 would be lowered to obtain vertical clearance at the Santa Cruz Branch Rail Line crossings in Aptos. A mandatory standard median width of 22 feet is proposed to minimize impacts to the Union Pacific Railroad.
- Median and inside shoulder width would be non-standard to reduce impacts to adjacent streets: McGregor Drive, Cabrillo College Drive, Kennedy Drive and Soquel Avenue. At these four constrained locations, the inside shoulder would be a non-standard 5 feet and the median a non-standard 17 feet.

Auxiliary Lane Improvements with the High Occupancy Vehicle Lane Alternative

Auxiliary lanes are designed to reduce conflicts between traffic entering and exiting the highway by connecting from the on-ramp of one interchange to the off-ramp of the next; they are not designed to serve through traffic. Auxiliary lanes would be added at the following locations:

- Northbound and southbound between Freedom Boulevard and Rio Del Mar Boulevard;
- Northbound and southbound between Rio Del Mar Boulevard and State Park Drive;
- Southbound between State Park Drive and Park Avenue;
- Northbound and southbound from Park Avenue to Bay Avenue/Porter Street; and
- Northbound and southbound from 41st Avenue to Soquel Drive/Soquel Avenue.

Interchange Improvements with the High Occupancy Vehicle Lane Alternative
All interchanges within the project limits would be modified to improve merging operations and ramp geometrics, and to improve accessibility and safety for pedestrians and bicyclists.

Interchange improvements would generally include the following:

- Ramp metering and High Occupancy Vehicle bypass lanes would be provided on all on-ramps.
- Ramps would be widened and their geometrics improved where feasible.
- California Highway Patrol enforcement areas would be provided at all on-ramps except Park Avenue, southbound.
- Intersections of freeway ramps with local roads would be modified to provide less-skewed intersections with crosswalks for pedestrians and bicycles; free right-turns would be eliminated where feasible and traffic signals installed.
- Local roadways would be widened at the interchanges to serve anticipated travel demand.
- Retaining walls would be constructed to minimize impacts to local roadways, development, wetlands, and waterways.
- Drainage facilities would be provided for adequate drainage and treatment of storm water runoff.
- Other specific improvements are identified by interchange area.

Changes at San Andreas/Larkin Valley Roads Interchange

- The existing northbound cloverleaf off-ramp free right-turn onto Larkin Valley Road would be eliminated in favor of a signalized 90 degree intersection.
- A signalized intersection would be provided at the San Andreas Road ramps and the free right-turns eliminated.
- The existing on-ramps would be widened to accommodate High Occupancy Vehicle bypass lanes.
- The southbound Route 1 bridge over San Andreas/Larkin Valley Road would be widened approximately 16.4 feet into the median to accommodate the High Occupancy Vehicle lanes.
- San Andreas/Larkin Valley Roads would be widened within the project limits to add turn lanes.
- New sidewalks would be added along San Andreas/Larkin Valley Roads within the project limits.

Changes at Freedom Boulevard Interchange

- The existing ramp termini at Freedom Boulevard would be modified to provide less-skewed intersections with Freedom Boulevard. These intersections would be signalized, and free right-turns eliminated.
- The southbound off-ramp would be widened to two exit lanes.
- The existing on-ramps would be widened to accommodate High Occupancy Vehicle bypass lanes.
- Freedom Boulevard would be widened within the project limits to add turn lanes.
- The Freedom Boulevard/Bonita Drive intersection would be enlarged to add turn lanes and achieve acceptable level of service.
- The Freedom Boulevard bridge would be replaced with a wider structure that would accommodate a new turn lane on Freedom Boulevard and the new High Occupancy Vehicle lane on Route 1.
- New sidewalks would be added along Freedom Boulevard within the project limits.

Changes at Rio Del Mar Boulevard Interchange

- The northbound on-ramp would be realigned to form the north leg of a four-way intersection with Rio Del Mar Boulevard and the northbound off-ramp. This intersection would be signalized, and free right turns eliminated.
- The northbound off-ramp would be widened to two exit lanes.
- The southbound ramps would be widened, the intersection with Rio Del Mar Boulevard signalized, and free right-turns eliminated.
- The existing on-ramps would be widened to accommodate High Occupancy Vehicle bypass lanes.
- Soquel Drive would be shifted northward to accommodate the roadway widening along the northbound off-ramp.
- Rio Del Mar Boulevard would be widened within the project limits to add turn lanes and a through lane in each direction.
- The Rio Del Mar Boulevard bridge over Route 1 would be replaced with a longer, wider bridge to accommodate a new turn lane and a through lane in each direction on Rio Del Mar and the new High Occupancy Vehicle lane on Route 1.
- Sidewalk would be added along eastbound Rio Del Mar Boulevard within the project limits; sidewalk on westbound Rio Del Mar Boulevard is existing.

Changes at State Park Drive Interchange

- The existing northbound cloverleaf on-ramp free-right would be changed to a signalized right turn.

- The existing northbound off-ramp terminus would be modified to form, together with the realigned northbound on-ramp terminus, the south leg of a signalized intersection with State Park Drive.
- The northbound and southbound off-ramps would be widened to two exit lanes.
- The existing on-ramps would be widened to accommodate High Occupancy Vehicle bypass lanes.
- State Park Drive would be widened within the project limits to add turn lanes and a through lane in each direction.
- The State Park Drive bridge over Route 1 would be replaced with a longer, wider bridge to accommodate a new through lane in each direction on State Park Drive, and the new High Occupancy Vehicle lane on Route 1.
- Sidewalk would be added along eastbound State Park Drive within the project limits; sidewalk along westbound State Park Drive is existing.

Changes at Park Avenue Interchange

- The existing diamond interchange ramp design would be retained and ramps would be widened.
- The northbound and southbound off-ramps would be widened to two exit lanes.
- The existing on-ramps would be widened to accommodate High Occupancy Vehicle bypass lanes.
- Park Avenue would be widened within the project limits to add turn lanes.
- The two Route 1 bridges over Park Avenue would be replaced with one, wider structure to accommodate the new High Occupancy Vehicle lanes on Route 1.
- Sidewalk would be added within the project limits along westbound Park Avenue; sidewalk along eastbound is existing.

Changes at Bay Avenue/Porter Street and 41st Avenue Interchanges

- Improvements at the Bay Avenue/Porter Street and 41st Avenue interchanges are designed so that these two interchanges would work as a single interchange connected by a collector/frontage road running between the interchanges.
- The ramps at Bay Avenue/Porter Street would be reconstructed to form less skewed intersections with Bay Avenue/Porter Street.
- The existing southbound Route 1 off-ramp to Bay Avenue/Porter Street would be eliminated. Southbound traffic bound for Bay Avenue/Porter Street would exit at 41st Avenue two-lane ramp and continue on a new southbound collector/frontage road to Bay Avenue/Porter Street.

- The existing on-ramp from Porter Street to northbound Route 1 on a two-lane ramp would be modified to become a northbound collector/frontage road serving traffic bound for 41st Avenue or northbound Route 1.
- Northbound traffic exiting Route 1 would bear right to access Bay Avenue/Porter Street, or stay left and continue on a new structure over Bay Avenue/Porter Street, join the northbound collector/frontage road, and end at a new signalized intersection at 41st Avenue.
- At 41st Avenue, southbound on- and off-ramps would be eliminated and replaced with a diagonal off-ramp and a collector/frontage road serving traffic bound for Bay Avenue/Porter Street or southbound Route 1. The new ramp and collector/frontage road would form a signalized intersection with 41st Avenue.
- At 41st Avenue, the northbound on-ramps would include a realigned loop and realigned diagonal.
- New on-ramps would include High Occupancy Vehicle bypass lanes.
- 41st Avenue would be widened within the project limits to add turn lanes and eastbound though lanes over Route 1.
- Bay Avenue/Porter Street would be widened to add right-turn lanes at the on-ramps.
- A new bridge over Soquel Creek and Soquel Wharf Road would be constructed for the new southbound collector/frontage road from 41st Avenue to Bay Avenue/Porter Street.
- The 41st Avenue bridge over Route 1 would be replaced with a longer, wider bridge to accommodate the new eastbound through lane and turn lanes on 41st Avenue, and the new High Occupancy Vehicle lanes on Route 1.
- Class I bike paths would be constructed between 41st Avenue and Bay Avenue/Porter Street adjacent to the new collector/frontage roads.

Changes at Soquel Drive/Soquel Avenue Interchange

- The northbound off-ramp would be realigned to a signalized 90 degree intersection with Soquel Drive. The existing access to Commercial Way would be eliminated.
- The westbound Soquel Drive on-ramp to northbound Route 1 would be modified to eliminate the free right-turn access.
- The existing northbound loop on-ramp from eastbound Soquel Avenue would be realigned and its free-right terminus would become a signalized 90 degree intersection.
- A new, wider southbound diagonal off-ramp that adds turn lanes at its terminus and a new loop on-ramp would form the north leg of a signalized intersection at Soquel Avenue.
- The existing southbound hook on-ramp would be widened to add an High Occupancy Vehicle bypass lane and realigned to be made standard.

- The northbound and southbound off-ramps would be widened to two exit lanes.
- New on-ramps would include High Occupancy Vehicle bypass lanes.
- Soquel Avenue within the project limits would be widened to add an eastbound though lane and turn lanes.
- Salisbury Lane would be shifted eastward to form an intersection with the realigned northbound off-ramp and loop on-ramp.
- The Soquel Drive/Soquel Avenue bridge over Route 1 would be replaced with a longer, wider bridge to add an eastbound through lane and a turn lane to Soquel Drive and accommodate the new High Occupancy Vehicle lane on Route 1.
- The culvert at Arana Gulch would be extended underneath the widened Route 1 and new southbound off-ramp.
- Sidewalk would be added along eastbound Soquel Drive/Soquel Avenue within the project limits; sidewalk along westbound Soquel Drive/Soquel Avenue is existing.

Changes at Morrissey Boulevard Interchange

- The southbound exit would be realigned to terminate at a new signalized intersection with Morrissey Boulevard.
- The existing southbound on-ramp would be eliminated and replaced with a new, wider diagonal ramp with a signalized terminus.
- The existing southbound exit and on-ramp at Elk Street would be eliminated.
- The existing northbound loop on-ramp would be eliminated, as would access to Rooney Street from this northbound loop
- The northbound off-ramp would be widened to two exit lanes.
- New on-ramps would include High Occupancy Vehicle bypass lanes.
- Morrissey Boulevard within the project limits would be widened to add an eastbound through lane and turn lanes, and realigned to form a straight line between its intersections with Fairmont Avenue and Rooney Street.
- The Morrissey Boulevard bridge would be replaced with a longer, wider bridge to accommodate a new eastbound through lane and turn lanes on Morrissey Boulevard and new High Occupancy Vehicle lanes on Route 1.
- Sidewalk would be added along eastbound Morrissey Boulevard within the project limits; sidewalk along westbound Morrissey Boulevard is existing.

Transit-Related Facilities

In addition to the mainline High Occupancy Vehicle through-lanes on the highway and High Occupancy Vehicle bypass lanes on the ramps, the High Occupancy Vehicle Lane Alternative could include the following features to facilitate freeway-oriented transit services and operations:

- Both on-ramps and off-ramps at the reconfigured Park Avenue interchange include options for bus pads and bus shelters.
- Ramps and collectors at the Bay Avenue/Porter Street and 41st Avenue interchange include options for bus pads and shelters.
- A future Park and Ride lot is under consideration at the 41st Avenue interchange, to be coordinated with the bus facilities.
- Feasibility for a Park and Ride lot in the Bay Avenue/Porter Street interchange area would be investigated.

These improvements would be considered as part of the detailed Tier II design/ environmental analysis of those respective facilities in the future.

New Bicycle/Pedestrian Overcrossings

The High Occupancy Vehicle Lane Alternative would construct new bicycle/pedestrian overcrossings of Route 1 at the following locations:

- Mar Vista Drive – the crossing would start on the north side of Route 1 and parallel the highway eastward for about 600 feet, doubling back westward as it climbs before crossing the highway at a right angle and then descending by switchbacks to and along Mar Vista Drive for about 550 feet; multiple configurations are under consideration the final design will be determined as part of the Tier II design/environmental analysis of this facility.
- Chanticleer Avenue – the crossing would start at the Chanticleer cul-de-sac on the north side of Route 1 and parallel the highway for about 400 feet to the west before crossing it on a curved alignment, returning to terminate just west of Chanticleer on the south side of the highway.
- Trevethan Avenue – the crossing would start on the north side of Route 1 at Trevethan Avenue and parallel the highway about 600 feet before crossing on an angle and continuing along the banks of the western tributary to Arana Gulch to terminate close to Harbor High School; multiple configurations are possible with the final design to be determined as part of the Tier II design/environmental analysis of this facility.

1.2.1.2 Transportation System Management Alternative – Tier I Project

The Transportation System Management Alternative proposes to add ramp metering and construct High Occupancy Vehicle bypass lanes on existing interchange on-ramps, improve existing nonstandard geometric elements at various ramps, and add auxiliary lanes along the mainline between major interchange pairs within the project limits, as described below and summarized under Common Design Features of the Build Alternatives.

It would not construct High Occupancy Vehicle lanes or any additional through lanes on the mainline.

The common design features of the Build Alternatives section describes other features included in the Transportation System Management Alternative.

Auxiliary Lanes

Auxiliary lanes are designed to reduce conflicts between traffic entering and exiting the highway by connecting from the on-ramp of one interchange to the off-ramp of the next; they are not designed to serve through traffic. Auxiliary lanes to be constructed on Route 1 with the Transportation System Management Alternative consist of the following:

- Northbound and southbound between Freedom Boulevard and Rio Del Mar Boulevard.
- Northbound and southbound between Rio Del Mar Boulevard and State Park Drive.
- Northbound and southbound between State Park Drive and Park Avenue.
- Northbound and southbound between Park Avenue and Bay Avenue/Porter Street.
- Northbound and southbound from 41st Avenue to Soquel Drive/Soquel Avenue.

New Bicycle/Pedestrian Overcrossings

The Transportation System Management Alternative would construct new bicycle/pedestrian overcrossings of Route 1 at Mar Vista Drive, Chanticleer Avenue, and Trevethan Avenue as described under the High Occupancy Vehicle Lane Alternative.

Other Improvements

- At Freedom Boulevard, the southbound off-ramp would be widened to two exit lanes.
- At State Park Drive, the northbound and southbound off-ramps would be widened to two exit lanes.
- At Park Avenue, the northbound and southbound off-ramps would be widened to two exit lanes.

Like the High Occupancy Vehicle Lane alternative, the Transportation System Management alternative would widen the Soquel Avenue northbound and southbound off-ramps to provide two exit lanes, but the southbound ramp would not be realigned and the northbound ramp realignment would not be as significant as in the High Occupancy Vehicle alternative. Also as in the High Occupancy Vehicle alternative, the realigned northbound off-ramp would eliminate access to Commercial Way.

Common Design Features of the Build Alternatives
The High Occupancy Vehicle Lane Alternative shares three primary sets of features with the Transportation System Management Alternative: new auxiliary lanes, new pedestrian/bicycle overcrossings of Route 1, and Transportation Operations System electronic equipment. These common design features are highlighted here, but the auxiliary lanes are discussed in detail within the separate description of each alternative, since specifics vary.

Auxiliary Lanes
Auxiliary lanes would be constructed in the following locations under either the High Occupancy Vehicle Lane or Transportation System Management Alternative:

- Freedom Boulevard and Rio Del Mar Boulevard – northbound and southbound.
- Rio Del Mar Boulevard and State Park Drive – northbound and southbound.
- State Park Drive and Park Avenue – both directions in the Transportation System Management Alternative; southbound only in the High Occupancy Vehicle Alternative.
- Park Avenue and Bay Avenue/Porter Street – northbound and southbound.
- 41st Avenue and Soquel Avenue/Soquel Drive – northbound and southbound.

New Bicycle/Pedestrian Overcrossings
Both build alternatives include construction of new bicycle/pedestrian overcrossings of Route 1 at Mar Vista Drive and Trevethan Avenue, as described under the High Occupancy Vehicle Lane Alternative.

Other Common Features of the Build Alternatives
Both the High Occupancy Vehicle Lane and Transportation System Management alternatives include installation of ramp metering and construction of High Occupancy Vehicle bypass lanes on the Route 1 on-ramps within the project limits. Under the Transportation System Management Alternative, however, no new High Occupancy Vehicle lanes would be incorporated into the freeway mainline. Highway Patrol enforcement areas would be included with the new High Occupancy Vehicle bypass lanes.

Both build alternatives would include reconstruction of the Santa Cruz Branch Rail Line bridges over Route 1 and the State Park Drive, Capitola Avenue, 41st Avenue and Soquel Avenue overcrossings. Also, under both alternatives, the Aptos Creek and Soquel Creek bridges would be widened.

Both the High Occupancy Vehicle Lane and Transportation System Management alternatives also would include Transportation Operations System equipment, described in detail within each alternative description.

1.2.1.3 No-Build Alternative – Tier I Project

The No-Build Alternative offers a basis of comparison with the Transportation System Management and High Occupancy Vehicle Lane Alternatives in the future analysis year of 2035.

It would not address the project purpose and need. It assumes no major construction on Route 1 through the project limits other than currently planned and programmed improvements and continued routine maintenance. Planned and programmed improvements included in the No-Build Alternative are the following improvements contained in the 2010 Regional Transportation Plan:

- Installation of median barrier on Route 1 from Freedom Boulevard to Rio Del Mar Boulevard.
- Construction of auxiliary lanes between the Soquel Avenue-Soquel Drive and Morrissey Boulevard interchanges (EA 05-0F6500, completed May 2013).
- Replacement of the La Fonda Avenue overcrossing of Route 1, included as part of the Soquel-Morrissey Auxiliary Lanes project.

Also included in the No-Build Alternative are a number of locally-sponsored projects for improving the local arterial network and constructing or improving bicycle lanes.

1.2.2 Tier II Project

The Tier II project purpose matches that of the Santa Cruz County Route 1 High Occupancy Vehicle project, that is, reducing congestion and encouraging use of alternative transportation modes as a means to increase system capacity, except that encouraging carpooling is not a part of the Tier II project purpose.

Auxiliary Lanes

It is proposed to widen Route 1 by adding an auxiliary lane to both the northbound and southbound sides between the 41st Avenue and Soquel Drive interchanges. The total roadway widening would be approximately 1.2 miles in length. Southbound, the auxiliary lane would begin at the existing Soquel Drive on-ramp, and end at the existing off-ramp at 41st Avenue. Northbound, the auxiliary lane would begin just south of the 41st Avenue overcrossing, at the existing loop on-ramp to northbound 41st Avenue. West of the overcrossing, the on-ramp from southbound 41st Avenue to northbound Route 1 would merge with the new auxiliary lane, approximately 1,000 feet downstream from its beginning at the bottom of the loop ramp.

As part of the widening in the northbound direction, the project proposes to repair the pavement failure in the outside lane and shoulder by improving the pavement section, installing a retaining wall, and if necessary, replacing the underlying county-owned sanitary sewer.

Pedestrian Features

A new horseshoe-shaped pedestrian overcrossing at Chanticleer Avenue is proposed, and approximately 400 feet of sidewalk would be constructed along the south side of Soquel Avenue, starting at Chanticleer Avenue.

Retaining Walls

Retaining walls would be constructed as part of the roadway widening, with a total of four separate walls: three on the northbound side of the highway and one on the southbound side.

Three of the walls would be located to allow widening for a future lane on the highway, in both directions. The wall proposed along the northbound on-ramp at 41st Avenue would require demolition in the event the highway was widened in the future. Two of the walls would span Rodeo Creek Gulch, where there is an existing 9 foot arch concrete culvert, and one would be constructed within a narrow jurisdictional area on the northbound side of Route 1, adjacent to a 39 inch culvert crossing.

Right-of-Way

Right-of-way would be acquired along Soquel Avenue west of Chanticleer Avenue and at the Chanticleer Avenue cul-de-sac north of the highway, along with temporary construction easements on both sides of Route 1 near the proposed overcrossing.

1.3 Project Need

The need for the project is summarized by these deficiencies on Route 1 within the project limits:

- Several bottlenecks along Route 1 in the southbound and northbound directions cause recurrent congestion during peak hours;
- Travel time delays due to congestion and related accidents are experienced by commuters, commerce, and emergency vehicles;
- "Cut-through" traffic, or traffic on local streets, occurs and is increasing because drivers seek to avoid congestion on the highway;
- Limited opportunities for pedestrians and bicyclists to safely get across Route 1 within the project limits;
- Insufficient support facilities and incentives to increase transit service that operates in the Route 1 corridor because congestion threatens reliability and cost-effective transit service delivery; and
- Inadequate facilities to support carpooler and rideshare vehicles over single-occupancy vehicles; therefore, incentives, such as travel time savings, and reliability are difficult to achieve.

1.3.1 Tier I Project

The purpose of the proposed project is to achieve the following within the Tier I project limits:

- Reduce congestion; and
- Encourage carpooling and use of alternative transportation modes as a means to increase transportation system capacity.

1.3.2 Tier II Project

The Tier II project purpose matches that of the Tier I project, except that encouraging carpooling is not a part of the Tier II project purpose.

1.4 Project History

The population of Santa Cruz County has doubled in the last 30 years to approximately 270,000. During this time, operational improvements have been made to the route within the Project limits, but no capacity enhancements, and this segment of Route 1 has become heavily congested during morning and evening commute times. Heavy congestion is now experienced on weekdays on Route 1 for three and a half hours in the morning from 6:30 a.m. to 10 a.m. and for four and a half hours in the evening from 2 p.m. to 6:30 p.m. Traffic projections for the No-Build scenario in design year 2035 show that from 6:00 a.m. to noon, the corridor would operate at Level of Service (LOS) F in the northbound direction. From 2:00 p.m. to 8:00 p.m., the corridor would operate at LOS F in both directions. The average northbound travel time in the AM peak hour would be as high as 59 minutes, up from 23 minutes under existing conditions. Travel time for the southbound direction during the PM peak hour would average 61 minutes, up from 27 minutes under existing conditions. In the peak commute direction in 2035 for the No-Build scenario, the average travel speed would drop from 44 mph to 18 mph in the AM and from 39 mph to 15 mph in the PM (*State Route 1 HOV Lane Project [From Morrissey Boulevard to San Andreas Road] Traffic Operations Report,* April 2012, Wilbur Smith Associates).

The Santa Cruz County Regional Transportation Commission has identified widening Route 1 between Highway 17 and Aptos as a high priority project since 1986. This is further supported by the 2001 Regional Transportation Plan, in which widening Route 1 was identified as the highest priority project in Santa Cruz County. In the 1990s, the Santa Cruz County Regional Transportation Commission worked with the California Department of Transportation, to secure funding for a project to add merge lanes in the Route 1/Highway 17 interchange area, and the resulting Route 1/Highway 17 Merge Lanes Project was completed in December 2008. The Soquel to Morrissey Auxiliary Lanes Project, funded with CMIA funds, abuts the 1/17 Merge lane project and is currently under construction with completion expected in May 2013. The project adds auxiliary lanes in both directions between the Soquel and Morrissey interchanges, and replaces the La Fonda Avenue overcrossing.

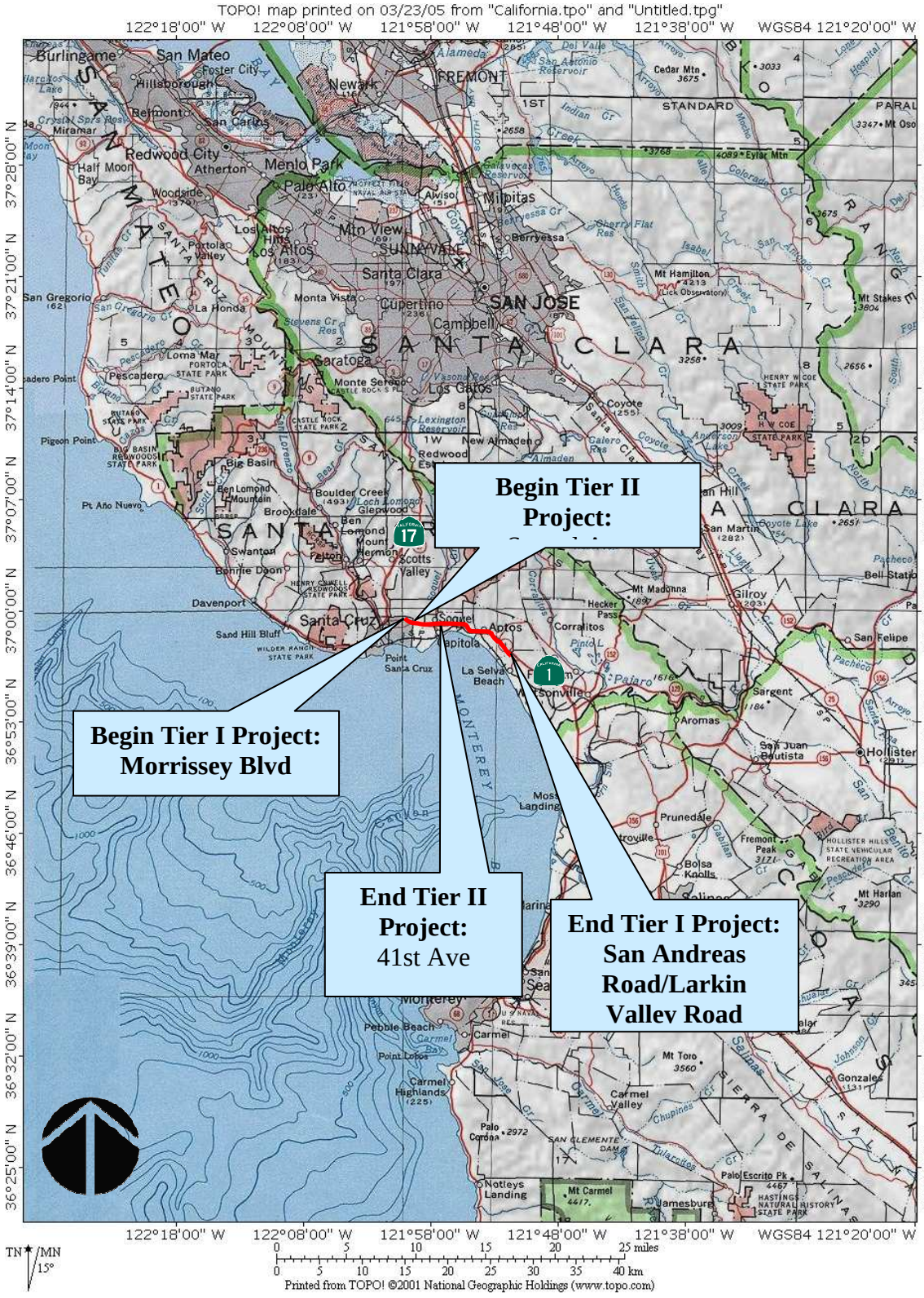

Figure 1. Location Map

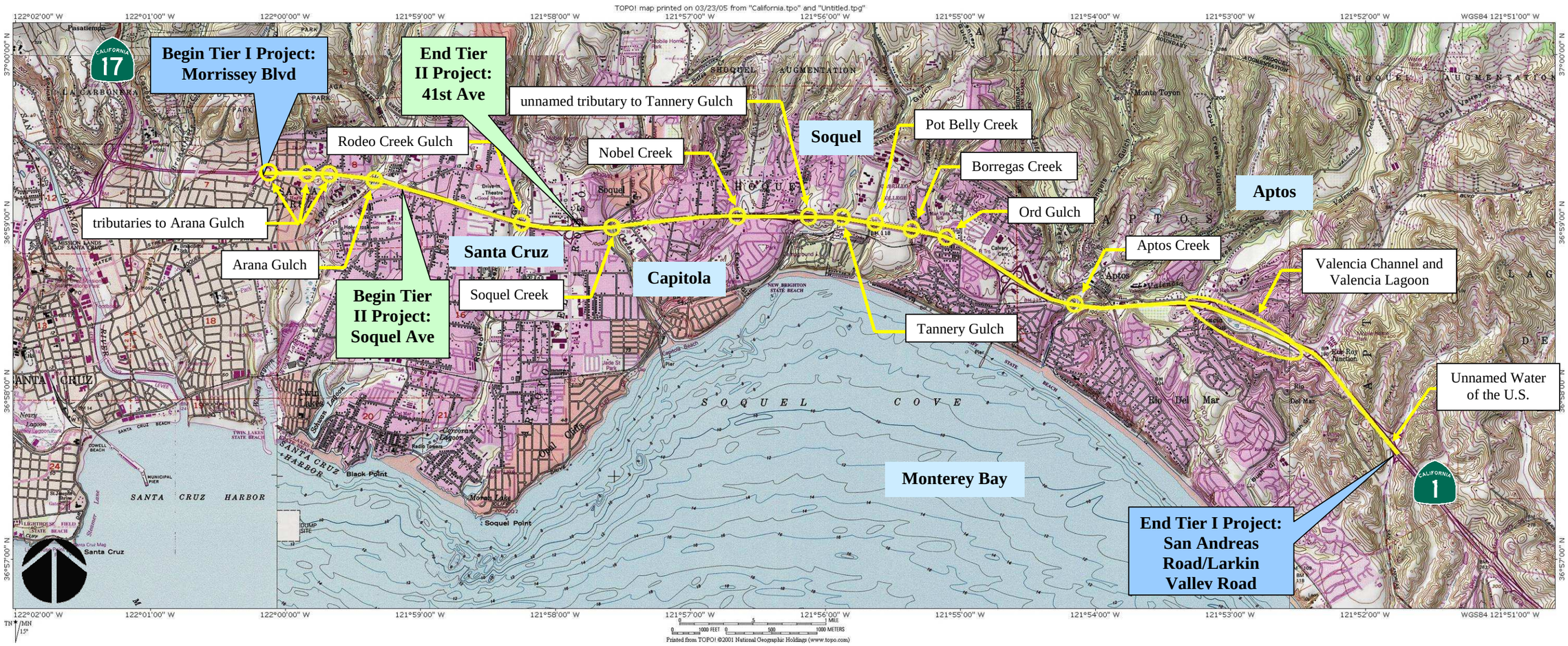

Figure 2. Vicinity Map and Waterway Crossings

Source: United States Geological Survey

2 REGULATORY SECTION

This section summarizes the regulatory context in which issues associated with water quality are mandated at the federal, state, and local levels.

2.1 Federal Requirements

2.1.1 Tier I Project

The primary regulation at the federal level for the quality of surface and groundwater is the Clean Water Act. Details are summarized in the sections below.

Clean Water Act

In 1972 Congress amended the Federal Water Pollution Control Act, making the addition of pollutants to the waters of the United States (U.S.) from any point source unlawful unless the discharge is in compliance with a National Pollution Discharge Elimination System permit. Known today as the Clean Water Act, Congress has amended it several times. In the 1987 amendments, Congress directed dischargers of storm water from municipal and industrial/construction point sources to comply with the National Pollution Discharge Elimination System permit scheme. Important Clean Water Act sections are:

- Sections 303 and 304 require states to promulgate water quality standards, criteria, and guidelines.

- Section 401 requires an applicant for a federal license or permit to conduct any activity, which may result in a discharge to waters of the U.S., to obtain certification from the State that the discharge will comply with other provisions of the act. (Most frequently required in tandem with a Section 404 permit request. See below).

- Section 402 establishes the National Pollution Discharge Elimination System, a permitting system for the discharges (except for dredge or fill material) of any pollutant into waters of the U.S. Regional Water Quality Control Boards administer this permitting program in California. Section 402(p) requires permits for discharges of storm water from industrial/construction and Municipal Separate Storm Sewer Systems (MS4s).

- Section 404 establishes a permit program for the discharge of dredge or fill material into waters of the U.S. This permit program is administered by the U.S. Army Corps of Engineers.

The objective of the Clean Water Act is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."

U.S. Army Corps of Engineers issues two types of 404 permits: Standard and General permits. For General permits there are two types: Regional permits and Nationwide permits. Regional permits are issued for a general category of activities when they are similar in nature and cause

minimal environmental effect. Nationwide permits are issued to authorize a variety of minor project activities with no more than minimal effects.

There are also two types of Standard permits: Individual permits and Letters of Permission. Ordinarily, projects that do not meet the criteria for a Nationwide Permit may be permitted under one of U.S. Army Corps of Engineers' Standard permits. For Standard permits, the U.S. Army Corps of Engineers decision to approve is based on compliance with U.S. Environmental Protection Agency's Section 404 (b)(1) Guidelines (U.S. EPA CFR 40 Part 230), and whether permit approval is in the public interest. The 404(b)(1) Guidelines were developed by the U.S. Environmental Protection Agency in conjunction with U.S. Army Corps of Engineers, and allow the discharge of dredged or fill material into the aquatic system (waters of the U.S.) only if there is no practicable alternative which would have less adverse effects. The Guidelines state that U.S. Army Corps of Engineers may not issue a permit if there is a least environmentally damaging practicable alternative, to the proposed discharge that would have less effects on waters of the U.S., and not have any other significant adverse environmental consequences. Per Guidelines, documentation is needed that a sequence of avoidance, minimization, and compensation measures have been followed, in that order. The Guidelines also restrict permitting activities that violate water quality or toxic effluent standards, jeopardize the continued existence of listed species, violate marine sanctuary protections, or cause "significant degradation" to waters of the U.S. In addition, every permit from the U.S. Army Corps of Engineers, even if not subject to the 404(b)(1) Guidelines, must meet general requirements. See 33 CFR 320.4.

2.1.2 Tier II Project

The primary regulation at the federal level for the quality of surface and groundwater is the Clean Water Act. The Clean Water Act includes the National Pollution Discharge Elimination System permit to regulate municipal and industrial discharges to surface Waters of the United States. Details of the Clean Water Act and the National Pollutant Discharge Elimination System are included in Section 2.1.1.

2.2 State Requirements

Porter-Cologne Water Quality Control Act

California's Porter-Cologne Act, enacted in 1969, provides the legal basis for water quality regulation within California. This Act requires a "Report of Waste Discharge" for any discharge of waste (liquid, solid, or gaseous) to land or surface waters that may impair beneficial uses for surface and/or groundwater of the State. It predates the Clean Water Act and regulates discharges to waters of the State. Waters of the State include more than just waters of the U.S., like groundwater and surface waters not considered waters of the U.S. Additionally, it prohibits discharges of "waste" as defined and this definition is broader than the Clean Water Act definition of "pollutant". Discharges under the Porter-Cologne Act are permitted by Waste Discharge Requirements and may be required even when the discharge is already permitted or exempt under the Clean Water Act.

The State Water Resources Control Board and Regional Water Quality Control Boards are responsible for establishing the water quality standards (objectives and beneficial uses) required by the Clean Water Act, and regulating discharges to ensure compliance with the water quality standards. Details regarding water quality standards in a project area are contained in the applicable Regional Water Quality Control Board Basin Plan. In California, Regional Boards designate beneficial uses for all water body segments in their jurisdictions, and then set criteria necessary to protect these uses. Consequently, the water quality standards developed for particular water segments are based on the designated beneficial use and vary depending on such use. In addition, the State Water Resources Control Board identifies waters failing to meet standards for specific pollutants, which are then state-listed in accordance with Clean Water Act Section 303(d). If a state determines that waters are impaired for one or more constituents and the standards cannot be met through point source or non-source point controls (National Pollution Discharge Elimination System permits or Waste Discharge Requirements), the Clean Water Act requires the establishment of Total Maximum Daily Loads. total maximum daily loads specify allowable pollutant loads from all sources (point, non-point, and natural) for a given watershed.

State Water Resources Control Board and Regional Water Quality Control Boards
The State Water Resources Control Board adjudicates water rights, sets water pollution control policy, issues water board orders on matters of statewide application, and oversees water quality functions throughout the state by approving Basin Plans, TMDLs, and National Pollution Discharge Elimination System permits. RWCQBs are responsible for protecting beneficial uses of water resources within their regional jurisdiction using planning, permitting, and enforcement authorities to meet this responsibility.

- **National Pollution Discharge Elimination System Program**

  Municipal Separate Storm Sewer Systems (MS4)
  Section 402(p) of the Clean Water Act requires the issuance of National Pollution Discharge Elimination System permits for five categories of storm water dischargers, including MS4s. The U.S. Environmental Protection Agency defines an MS4 as "any conveyance or system of conveyances (roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, human-made channels, and storm drains) owned or operated by a state, city, town, county, or other public body having jurisdiction over storm water, that are designed or used for collecting or conveying storm water." The State Water Resources Control Board has identified the Department as an owner/operator of an MS4 pursuant to federal regulations. The Department's MS4 permit covers all Department rights-of-way, properties, facilities, and activities in the state. The State Water Resources Control Board or the Regional Water Quality Control Board issues National Pollution Discharge Elimination System permits for five years, and permit requirements remain active until a new permit has been adopted.

  The Department's MS4 Permit, adopted in September 2012, contains three basic requirements:

1. The Department must comply with the requirements of the Construction General Permit (see below);

2. The Department must implement a year-round program in all parts of the State to effectively control storm water and non-storm water discharges; and

3. The Department storm water discharges must meet water quality standards through implementation of permanent and temporary (construction) Best Management Practices to the Maximum Extent Practicable, and other measures as the State Water Resources Control Board determines to be necessary to meet the water quality standards.

To comply with the permit, the Department developed the Statewide Storm Water Management Plan (SWMP) to address storm water pollution controls related to highway planning, design, construction, and maintenance activities throughout California. The SWMP assigns responsibilities within the Department for implementing storm water management procedures and practices as well as training, public education and participation, monitoring and research, program evaluation, and reporting activities. The SWMP describes the minimum procedures and practices the Department uses to reduce pollutants in storm water and non-storm water discharges. It outlines procedures and responsibilities for protecting water quality, including the selection and implementation of Best Management Practices. The proposed project will be programmed to follow the guidelines and procedures outlined in the latest SWMP to address storm water runoff.

Construction General Permit

Construction General Permit (Order No. 2009-009-DWQ, as amended by 2010-0014-DWG), adopted on November 16, 2010, became effective on February 14, 2011. The permit regulates storm water discharges from construction sites which result in a Disturbed Soil Area of one acre or greater, and/or are smaller sites that are part of a larger common plan of development. For all projects subject to the Construction General Permit, applicants are required to develop and implement an effective Storm Water Pollution Prevention Plan (SWPPP). In accordance with the Department's Standard Specifications, a Water Pollution Control Plan (WPCP) is necessary for projects with Disturbed Soil Area less than one acre.

By law, all storm water discharges associated with construction activity where clearing, grading, and excavation results in soil disturbance of at least one acre must comply with the provisions of the Construction General Permit. Construction activity that results in soil disturbances of less than one acre is subject to this Construction General Permit if there is potential for significant water quality impairment resulting from the activity as determined by the Regional Water Quality Control Board. Operators of regulated construction sites are required to develop storm water pollution prevention plans; to implement sediment, erosion, and pollution prevention control measures; and to obtain coverage under the Construction General Permit.

The Construction General Permit separates projects into Risk Levels 1, 2, or 3. Risk levels are determined during the planning and design phases, and are based on potential erosion and transport to receiving waters. Requirements apply according to the Risk Level determined. For example, a Risk Level 2 and/or 3 (highest risk) project would require compulsory storm water runoff pH and turbidity monitoring. For Risk Level 3 projects larger than 30 acres and with direct discharges to receiving waters, the Construction General Permit requires pre- and post-construction aquatic biological assessments during specified seasonal windows.

Section 401 Permitting
Under Section 401 of the Clean Water Act, any project requiring a federal license or permit that may result in a discharge to a water of the United States must obtain a 401 Certification, which certifies that the project will be in compliance with State water quality standards. The most common federal permit triggering 401 Certification is a Clean Water Act Section 404 permit, issued by U.S. Army Corps of Engineers. The 401 permit certifications are obtained from the appropriate Regional Water Quality Control Board, dependent on the project location, and are required before U.S. Army Corps of Engineers issues a 404 permit.

In some cases the Regional Water Quality Control Board may have specific concerns with discharges associated with a project. As a result, the Regional Water Quality Control Board may issue a set of requirements known as Waste Discharge Requirements under the State Water Code (Porter-Cologne Act) that define activities, such as the inclusion of specific features, effluent limitations, monitoring, and plan submittals that are to be implemented for protecting or benefiting water quality. Waste Discharge Requirements can be issued to address both permanent and temporary discharges of a project.

2.2.1 Tier I Project

Additional laws and regulations that are applicable to the Tier I project are shown below.

2.2.1.1 California Coastal Commission

The California Coastal Commission retains permanent coastal permit jurisdiction over development proposed on the immediate shoreline (i.e., tidelands, submerged lands, and public trust lands). The Commission also hears appeals of certain local governments' coastal permit decisions and must review and approve any amendments to previously certified Local Coastal Programs.

Critical Coastal Areas are areas along California's coast where water is identified, according to the Critical Coastal Areas Program criteria, as being polluted by storm water runoff and associated non-point source pollutants that can potentially harm the aquatic ecosystem. These Critical Coastal Areas include lakes, lagoons, estuaries, rivers, bays, and the ocean.

The proposed Tier I project corridor is located along the California Coast, in the Central Coast Region, which includes areas of the City of Santa Cruz, City of Capitola, and the City of Aptos. The three nearest Critical Coastal Areas identified by the California Coastal Commission are at the San Lorenzo River, Soquel Lagoon, and Aptos Creek. The San Lorenzo River Critical Coastal Area is near the outlet of San Lorenzo Creek, 1.7 mi (2.74 km) to the west of the northern end of the Tier I project site. The Soquel Lagoon Critical Coastal Area was created by building a sandbar at the outlet of Soquel Creek, which is located 0.81 mi (1.3 km) west of the Route 1 corridor at the mid-point of the Tier I project limits. The Tier I project discharges indirectly to the Soquel Lagoon Critical Coastal Area and the Aptos Creek Critical Coastal Area. The Tier I project also is under the California Coastal Commission jurisdiction as it impacts California's Coastal Zone areas. The Aptos Creek Critical Coastal Area is near the outlet of Aptos Creek, an estimated 0.48 mi (0.77 km) to the west of Route 1 near the Southern end of the Tier I project limits. See Figure 3; Critical Coastal Areas are denoted with stars.

Figure 3. Critical Coastal Areas Within the Proposed Tier I Project Corridor
Source: California Coastal Commission

The following information is extracted from the fact sheets available at the California Coastal Commission's Critical Coastal Areas website and describes the condition and environmental setting of the Critical Coastal Areas near the proposed highway project segment.

San Lorenzo River is listed as a Critical Coastal Area because it was identified in 1995 as an impaired coastal watershed that flows into an estuary. San Lorenzo River receives polluted runoff from both failing septic systems and silt from erosion of rural roads within the upper watershed, as well as from urban drainage within the lower valley. The resulting water quality impacts identified in this Critical Coastal Area include impairment of drinking water, fish populations, recreational opportunities, and increased sedimentation of the estuary. This reach of the San Lorenzo River within the coastal zone is surrounded by dense urban development, and it passes through the heart of the City of Santa Cruz. The river is used for public water supply and supports an important anadromous fishery. The associated estuarine waters are a popular public recreation area.

Soquel Lagoon is listed as a Critical Coastal Area because it was identified in 1995 as an impaired water body that flows into an estuary. Water quality impacts upon the lagoon include land disposal, septage disposal, and unspecified nonpoint source and urban runoff from storm sewers. Soquel Lagoon was created by the City of Capitola by building a sandbar at the outlet of Soquel Creek to the ocean. The City's Creek Management Plan dictates how the lagoon may be used, and when to build or remove it.

Aptos Creek is listed as a Critical Coastal Area because it is listed as a 2010 Clean Water Act Section 303(d) List of Water Quality Limited Segments as an impaired water body that flows into a Marine Protected Area (the Monterey Bay National Marine Sanctuary). The Aptos Creek watershed is located in Santa Cruz County and encompasses an estimated 24.5 mi^2 (63.5 km^2). Approximately 60 percent of the watershed is within the Forest of Nisene Marks State Park. The remaining 40 percent of the watershed is primarily privately owned. Land uses in the privately owned portion included timber harvesting and rural residential development. Sedimentation from this development and timber harvesting are affecting the fish habitat and other beneficial uses in the streams.

2.2.1.2 Areas of Special Biological Significance

Areas of Special Biological Significance are defined in the California Ocean Plan as marine areas which require protection of species or biological communities to the extent that alteration of natural water quality is undesirable (State Water Resource Control Board, August 2006). The California Ocean Plan sets bacterial water quality standards for ocean waters to ensure the protection of water contact recreation and shellfish harvesting. In 1974, the California Ocean Plan designated 34 marine-managed locations in Areas of Special Biological Significance. Discharges from point sources were prohibited and discharges from non-point sources were to be controlled to the maximum extent practicable. In 1978, the California Ocean Plan was amended to state that non-point sources of waste discharges were subject to contaminant concentration thresholds. In 1983, the California Ocean Plan was revised once more to prohibit all waste discharges to Areas of Special Biological Significance locations.

There are six designated Areas of Special Biological Significance within the Central Coast Regional Water Quality Control Board's jurisdiction. The Areas of Special Biological Significance locations are: Año Nuevo Point and Island, located south of the San Mateo-Santa Cruz County line (Areas of Special Biological Significance No. 15); Point Lobos Ecological Reserve in Monterey County (Areas of Special Biological Significance No. 16); the waters surrounding the islands of San Miguel, Santa Rosa, and Santa Cruz (Areas of Special Biological Significance No. 17); the Julia Pfeiffer Burns Underwater Park in Monterey County (Areas of Special Biological Significance No. 18); the Pacific Grove Marine Gardens Fish Refuge and Hopkins Marine Life Refuge in Monterey County (Areas of Special Biological Significance No. 19); the Ocean Area Surrounding the Mouth of Salmon Creek in Monterey County (Areas of Special Biological Significance No. 20); and Carmel Bay in Monterey County (Areas of Special Biological Significance No. 34).

The locations of the designated Areas of Special Biological Significance are shown in Figure 4, which indicates that the designated Areas of Special Biological Significance do not fall within the proposed State Route 1 High Occupancy Vehicle Lane Widening Project limits. In addition, the Regional Water Quality Control Board granted an individual exception allowing associated storm water related discharges to Monterey Bay. The State Water Resources Control Board and the Regional Water Quality Control Board have the sole authority to grant exceptions and process applications.

Figure 4. Areas of Special Biological Significance in the Project Area

Source: SWRCB—Central Coast (Region 3)

2.2.2 Tier II Project

As mandated by the Porter Cologne Water Quality Act, the State Water Resources Control Board and the Regional Water Quality Control Boards regulate water quality. The California Coastal Commission has permit jurisdiction over development proposed on the immediate shoreline, including areas identified as Critical Coastal Areas. Similar to the Tier I project, the Tier II project discharges indirectly to the Soquel Lagoon Critical Coastal Area, but it is a smaller project and would have fewer impacts than the Tier I project. History and additional details of state level regulation is discussed in Section 2.2.1.

2.3 Regional and Local Requirements

2.3.1 Tier I Project

The Soquel Creek Water District is a local government agency that provides water resource management in a service area, within the Tier I project limits, as shown in Figure 5. Soquel Creek Water District Water Service Area. The City of Santa Cruz Water Department is another local government agency with water resources management and water supply jurisdiction within the Tier I project area.

The Soquel Creek Water District and the Santa Cruz Water Department carry out water quality enforcement by adhering to regulations and standards established by the U.S. Environmental Protection Agency and the California Department of Public Health. These local government agencies also develop monitoring and testing programs to enforce public health goals for drinking water, which intend to keep contaminants in drinking water at a level below which there is no known or expected risk to health. The Soquel Creek Water District gets its water supply from the Soquel Creek and Aptos Creek watersheds, and the Santa Cruz Water Department gets its water supply from four local source areas: the North Coast, the San Lorenzo River, Loch Lomond Reservoir, and the Live Oak Wells. Three of the four sources of water supply for the Santa Cruz Water Department are from surface waters that depend on rainfall and runoff. The fourth is from groundwater near Pleasant Point pumped out of the Live Oak Wells.

The Project is located in the two Municipal Separate Storm Sewer Systems (MS4s). Those areas within the City of Santa Cruz are located within the City of Santa Cruz MS4 and all other areas are within the combined Santa Cruz County and City of Capitola MS4. The City of Santa Cruz has developed a Storm Water Management Plan, and Santa Cruz County and the City of Capitola have developed a joint Storm Water Management Program in order to fulfill the requirements for the Phase II National Pollution Discharge Elimination System General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems. These are comprehensive programs focused on reducing the discharge of pollutants to the storm drain system, which flows into local creeks and Monterey Bay.

There are no specific requirements from local agencies known at this phase. Both MS4s within the Project have *Storm Water Management Programs* with temporary and permanent stormwater requirements and standards. While all work is anticipated to be within Caltrans R/W, these local requirements would be considered for any potential impacts to areas outside of Caltrans R/W. These requirements include implementation of construction site stormwater Best Management Practices and installation of permanent stormwater treatment Best Management Practices and potential hydromodification design elements.

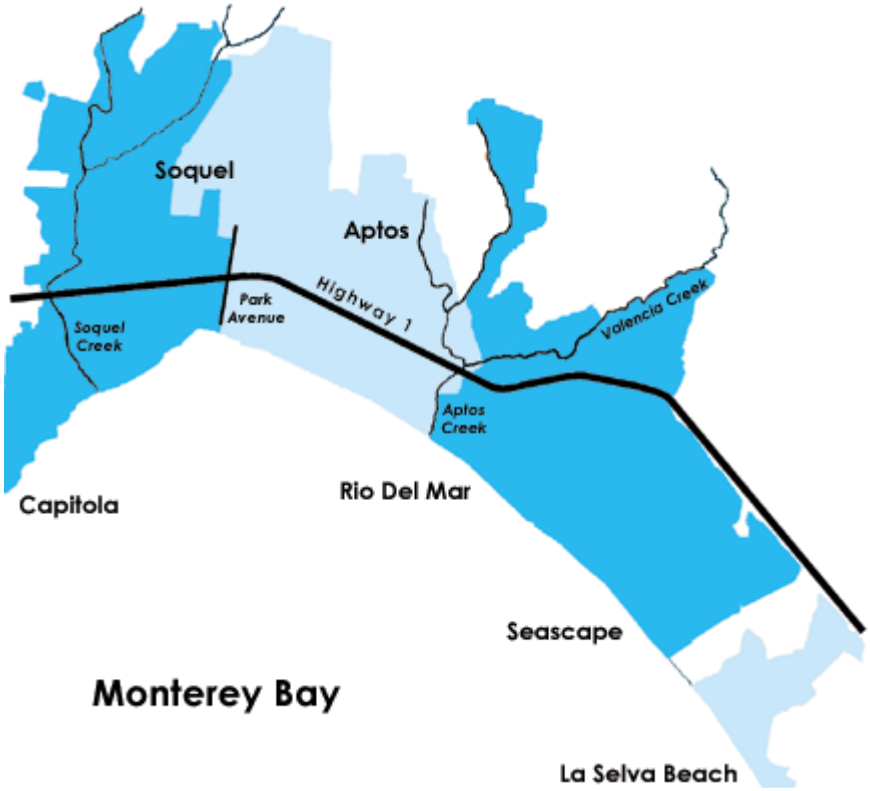

Figure 5. Soquel Creek Water District Water Service Area
Source: Soquel Creek Water District

2.3.2 Tier II Project

At the local level, the Soquel Creek Water District and the City of Santa Cruz Water Department provide water resources management and water quality enforcement. Details of regional and local requirements are provided in Section 2.3.1.

3 AFFECTED ENVIRONMENT/EXISTING CONDITIONS

3.1 Tier I Project

3.1.1 Study Area

The Tier I project limits are bounded to the south by the Larkin Valley Road/San Andreas Road interchange and to the north by the Morrissey Boulevard interchange. The limits of the Tier I project are between Post Miles R7.24 and 16.13 (Kilometers Post 11.64 and 25.96). The Hydrologic Units covered within this reach are the Pajaro River Hydrologic Unit (305) and the Big Basin Hydrologic Unit (304). The Hydrologic Sub-Areas covered within this reach are an undefined Hydrologic Sub-Area in Watsonville (305.10) and the Aptos-Soquel (304.13) and San Lorenzo (304.12) Hydrologic Sub-Areas in Santa Cruz.

3.1.2 Study Methods and Procedures

The methods and procedures considered for the development of this report are the federal, state, and local water quality laws and regulations relevant to the Tier I project study area. These laws and regulations are the Clean Water Act, California's Porter-Cologne Water Quality Control Act, and Santa Cruz County regulations.

Water quality related permits at the statewide level for the State Route 1 High Occupancy Vehicle Lane Widening Project were also studied and addressed in this report, e.g. the California Department of Transportation National Pollution Discharge Elimination System statewide permit and Construction General Permit for construction and dewatering. The water quality requirements of the Regional Water Quality Control Board were also addressed, such as those pertaining to water resources designated as beneficial uses and those pertaining to water quality objectives. The Central Coast Regional Water Quality Control Board established a General Basin Plan with goals and policies that apply to the county's water resources regarding beneficial uses and water quality objectives.

As part of this Water Quality Study, the project team reviewed existing topographic data from the United States Geological Survey, erosion and climate data from the United States Department of Agriculture Natural Resources Conservation Service Web Soil Survey, and hydrology and surface streams information from the Flood Insurance Study Report from the Federal Emergency Management Agency. General information regarding channel geomorphology, existing groundwater, and biotic and aquatic groups specific to the study area was considered in order to evaluate the impacts that would result from the construction of the State Route 1 High Occupancy Vehicle Lane Widening Project and the operation and maintenance of this highway. However, detailed studies were not performed.

3.1.3 General Water Resources Setting

The southern and northern Tier I project limits are, respectively, the Larkin Valley Road/San Andreas Road interchange and the Morrissey Boulevard interchange. The 8.9-mi (14.3-km) long area is dominated by typical freeway landscaping and ruderal habitat, surrounded by residential

and commercial buildings and landscaping. The Tier I project corridor crosses ten named creek channels, and five small, unnamed tributary drainages, and it runs parallel to Valencia Creek, Valencia Lagoon, and the Valencia Channel. Creeks along the route pass under the freeway by means of existing bridges and culverts (Wetland Assessment, 2004). These creeks include some riparian habitat.

3.1.3.1 Topography

The Tier I project area between San Andreas Road and Rio Del Mar Boulevard ranges in elevation from 20 to 400 ft (6.1 to 121.9 m). The part of the Tier I project area within the City of Aptos ranges in elevation from 100 to 800 ft (30.5 to 243.8 m), and the area between the City of Aptos and the northern end of the Tier I project ranges in elevation from 20 to 900 ft (6.1 to 274.3 m). The segment of Route 1 near the northern end of the Tier I project limits is close to coastal terraces, with some parts of the Tier I project on the lower slopes of the Santa Cruz Mountains.

3.1.3.2 Soils and Geology

General soil information for the State Route 1 High Occupancy Vehicle Lane Widening Project was researched and reviewed using the United States Department of Agriculture, Natural Resources Conservation Service Web Soil Survey. Table 1 summarizes the underlying native soil units and their impact from drainage and permeability.

The soils for the segment of the Tier I project area between San Andreas Road and Rio Del Mar Boulevard consist mainly of Baywood Loamy Sand, Ben Lomond Sandy Loam, Danville Loam, Elkhorn Sandy Loam, Elkhorn-Pfeiffer complex, Fluvaquentic Haploxerolls-Aquic Xerofluvents complex, and Tierra-Watsonville complex (most of which have moderate to high infiltration when wet).

The soils for the segment of the Tier I project area from Rio Del Mar Boulevard north to Mar Vista Drive are predominately Elkhorn Sandy Loam, Tierra-Watsonville Loam, Watsonville Loam, and Lompico-Felton complex. The Tierra-Watsonville and Watsonville Loam in this area have slow infiltration rates, which make for high runoff potential; the other dominant soils have moderate infiltration rates.

Soils for the segment of the Tier I project area from Mar Vista Drive north to the 41st Avenue interchange consist mainly of Watsonville Loam, Tierra-Watsonville complex, Soquel Loam, Elkhorn Pfeiffer complex, Elkhorn Sandy Loam and Danville Loam. The Tierra-Watsonville Complex and Watsonville Loam in this area have slow infiltration rates, which correspond to high runoff potential while the others have moderate infiltration rates.

The soils for the segment of the Tier I project area from 41st Avenue north to Morrissey Boulevard are predominately Danville Loam, Elkhorn Sandy Loam, Lompico-Felton complex, Pinto Loam, Soquel Loam, and Watsonville Loam (United States Department of Agriculture, Natural Resources Conservation Service, 2008).

Geologic stability at the Tier I project area can be inferred from the geotechnical study conducted at various roadway or waterway crossings along Route 1. The study indicates that liquefaction potential is low at most of the study locations except for a number of those that require further verification and investigation; these locations are at the Soquel Drive overcrossing, the North Aptos underpass, the Aptos Creek bridge, and the South Aptos underpass. The existence of the San Andreas Fault Zone, which borders the head of the Pajaro Valley, is a major source of the faulting activities that cause earthquakes near the southern Tier I project limits, near the City of Watsonville. Damage to stream flow patterns and lake geomorphology was documented in the Santa Cruz Flood Insurance Study (Federal Emergency Management Agency, 2006).

The percolation rates of the native soils can be assumed based on the hydrologic soil group; Table 1 shows the hydrologic soil group and assumed minimum percolation rate for the native soils. Actual soil percolation rates require further detailed geotechnical borings throughout the Tier I Project; these borings would be done during the design phase in coordination with the roadway drainage and storm water treatment design.

3.1.3.3 Erosion Potential

The Natural Resources Conservation Service provides information in their soil surveys regarding soil erodibility by providing a set of numerical indices for each soil type. Soil erodibility factor (K) is a measure of the susceptibility of a given soil type to erosion by water; it varies from 0.10 to 0.60, with soils having the highest K values as the most erodible. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, soil management practices, and climate. "Soil-loss tolerance factor" (T) is the maximum rate of erosion for a given soil, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

The California Department of Transportation "Construction General Permit Info" GIS mapping system identifies a K factor of 0.15 between San Andreas/Larkin Valley Road and Rio Del mar Boulevard and a K factor of 0.32 from Rio Del mar Boulevard to Morrissey Boulevard; these values are used for the risk level determination associated with the Construction General Permit. The wind erodibility index ranges from 56 to 134.

The Geologic and Seismic Section (2008) report evaluated the soils within the Tier I project limits based on the Soil Survey Map and the permeability, percent slope, drainage, runoff potential, erosion hazard levels and hydrologic soil group; the results are summarized in Table 1.

Table 1. Soil Units, Permeability, Drainage, Runoff, Erosion Hazard, and Hydrologic Soil Groups (HSGs)

Soil Unit	Map Unit Name	Surface texture	Permeability	Slope (%)	Drainage	Runoff	Erosion Hazard	HSG	Percolation Rate (inch/hour)
105 106	Baywood loamy sand	Loamy sand	High	2-15 15–30	Excessively drained	High	High	A	1
114	Ben Lomond - Felton	Sandy loam	High	30-50	Well drained	Moderately slow	Moderately low	B	0.25
116	Bonny Doon loam	Loam	Moderately high	5–30	Excessively drained	Slow	Low	Not Found	
124	Danville loam	Loam	High	0-2	Well drained	Slow	Low	Not Found	
129 130	Elder sandy loam	Sandy loam	Moderately high	0-2 2-9	Well drained	Moderately slow	Moderately low	Not Found	
133 134 135 136	Elkhorn sandy loam	Sandy loam	High	2-9 9-15 15-30 30-50	Well drained	Moderately slow	Moderately low	B	0.25
143	Lompico-Felton complex	Loam	High	30-50	Well drained	Moderately slow	Moderately low	B	0.25
161 162	Pinto loam	Loam	Moderately high	0-2 2-9	Moderately well drained	Slow	Low	C	0.15
170 171	Soquel loam	Loam	Moderately high	0-2 2-9	Moderately well drained	Moderately slow	Moderately low	B	0.25
174	Tierra Watsonville Complex	Sandy loam	Moderately high	15-30	Moderately well drained	Very slow	Moderately low	Not Found	
176 177 178 179	Watsonville loam	Loam	Moderately high	2-9 9-15 15-30 30-50	Poorly drained	Very slow	Moderately low	Not Found	
182	Zayante coarse sand	Coarse sand	High	9-15	Excessively drained	High	Low	A	1

Source: Geologic and Seismic Section, 2008

3.1.3.4 Climate and Precipitation

Climate and precipitation data for the Tier I project area were obtained from the Western Regional Climate Center's historic climate database. All information was recorded at the Santa Cruz station and the Watsonville Waterworks station (see Table 2, Table 3, and Table 4).

Santa Cruz County has a Mediterranean climate with low humidity and sunshine around 300 days a year. The general climate pattern at the Tier I project area is characterized by relatively stable temperatures year round. The average temperature is between 50ºF to 65ºF (10ºC and 18ºC). Precipitation occurs mostly between the months of October and March.

In the southern part of the Tier I project area and in the segment of Route 1 near the northern end, the mean annual precipitation is between 25 to 28 inches (64 centimeters and 71 centimeters). The Tier I project area near Aptos has a mean annual precipitation of 29 inches (74 centimeters).

The mean annual air temperature is 58°F (14°C), and the frost-free season ranges between 245 and 275 days for those areas within the Tier I project limits (United States Department of Agriculture, Natural Resources Conservation Service, 1976).

Table 2. 1971-2000 Monthly Climate Summary: Santa Cruz Station (No. 047916)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. Max. (ºF)	60.8	62.6	64.5	68.0	70.7	73.7	74.5	75.1	75.3	72.2	62.9	60.7
Avg. Min. (ºF)	40.1	42.0	43.2	44.4	47.2	50.3	52.5	53.0	51.9	48.1	41.9	39.5

Source: United States Department of Agriculture, Natural Resources Conservation Service, 1976

Table 3. Monthly Total Precipitation (in inches): Santa Cruz Station (No. 047916)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2003	1.85	1.86	1.47	3.50	0.90	0.07	0.00	0.01	0.00	0.31	3.38	9.93
2004	3.27	5.64	1.34	0.43	0.09	0.01	0.06	0.00	0.02	5.80	2.20	10.28
2005	5.98	6.26	7.65	3.03	1.34	1.05	0.01	0.02	0.01	0.12	1.86	12.62
2006	6.37	2.76	10.99	7.00	0.78	---	---	---	---	---	---	---

Source: United States Department of Agriculture, Natural Resources Conservation Service, 1976

Table 4. Monthly Total Precipitation (in inches): Watsonville Waterworks Station (No. 049473)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2003	1.27	1.71	1.22	2.52	1.16	0.02	0.00	0.02	0.01	0.41	2.31	7.80
2004	2.49	5.74	0.77	0.40	0.11	0.00	0.00	0.00	0.01	3.51	1.75	4.87
2005	4.22	4.63	5.33	1.59	0.83	0.82	0.03	0.00	0.00	0.17	0.90	8.77
2006	5.51	1.76	8.61	5.81	0.83	---	---	---	---	---	---	---

Source: United States Department of Agriculture, Natural Resources Conservation Service, 1976

3.1.3.5 Regional Hydrology

The proposed Tier I project is within the Central Coast Hydrologic Unit, which is under the jurisdiction of the Central Coast Regional Water Quality Control Board. The Tier I project corridor runs along the coastline of Monterey Bay. The City of Santa Cruz is situated in the Monterey Bay's north shore area.

The hydrology along Route 1 is controlled by existing creeks and drainages, with extensive runoff contribution from urban and residential development, roadways, and parking areas. Route 1 crosses several large watersheds, and most of the creeks and drainages it crosses flow directly into the Pacific Ocean downstream of the proposed Tier I project area. No tidally influenced or brackish areas are present within the Tier I project area (Wetland Assessment, 2004).

In Santa Cruz County, riparian forests exist along the majority of the Aptos Creek watershed. Most of the vegetation is located along the side of the stream and beyond the bank flow line. Riparian trees are trees growing near the stream bank and consuming the groundwater. The stream channels show evidence of scour and/or deposition (Riparian Vegetation Technical Report, 2003).

3.1.3.6 Local Hydrology

The mean annual precipitation at or near the Tier I project area is between 25 inches and 29 inches (64 centimeters and 74 centimeters) (United States Department of Agriculture, Natural Resources Conservation Service, 1976). The major drainage basins in the Tier I project area are the San Lorenzo River, Soquel Creek, Aptos Creek, and Pajaro Valley basins. The drainage basins in Santa Cruz County are short and steep with short flow durations. Mountains and hills bordering the eastern boundaries of Santa Cruz County squeeze moisture out of arriving Pacific weather systems and provide watershed areas to funnel precipitation into runoff tributaries.

The Soquel Creek watershed, which is located in the northern end of the Tier I project limits, drains an area of 42 square miles (108.8 square kilometers) with a steep elevation drop of nearly 3,000 feet (914.4 meters). Soquel Creek collects the flow from many tributaries, including Rodeo Creek Gulch, Nobel Creek, Tannery Gulch, and Borregas Creek (Santa Cruz County, 2002). The Aptos Creek watershed drains an area of 25 square miles (64.8 square kilometers) with an elevation drop of 2,000 feet (609.6 meters). Like the Soquel Creek watershed, inundation in the Aptos Creek watershed occurs with heavy rain. The steep elevation drops and narrow canyons contribute to the increase in rapid runoff volume. Physical barriers in the watershed cause backwater flooding (Santa Cruz County, 2002).

The following descriptions of creek crossings and channels are provided by a Wetland Assessment Study performed for the Tier I project in October 2004.

The Valencia Channel is a 2,500-foot (762-meter) long drainage channel within the Tier I project limits with a channel width ranging from 20 to 40 feet (6.1 to 12.2 meters). There is dense vegetation in the channel and the surrounding low-lying areas, including Arroyo Willow, Cattail, Bulrush, California Blackberry, and Poison Oak. The Valencia Channel is hydrologically connected to the Valencia Lagoon, and both areas are known to provide habitat for the federal- and state-listed endangered Tiger Salamander.

The portion of Valencia Creek assessed consists of a broad, deeply to slightly incised channel in a residential setting dominated by California Bay, Big Leaf Maple, California Redwood, California Blackberry, Poison Oak, Stinging Nettle, English Ivy, and Arroyo Willow. The channel has a clay and sand bottom averaging 20 to 50 feet (6 to 15 meters) wide at the Ordinary High Water Mark, which is 4.5 feet (1.4 meters) above the thalweg.

The portion of Aptos Creek assessed consists of a broad, slightly incised channel in a residential setting dominated by California Bay, Big Leaf Maple, Sycamore, California Blackberry, Poison Oak, Stinging Nettle, Horsetail, and Arroyo Willow. The channel has a clay, sand, and cobble bottom averaging 40 to 50 feet (12 to 15 meters) wide at the Ordinary High Water Mark, which

is 5 feet (1.5 meters) above the thalweg. Several sections of the creek bank consist of riprap or poured concrete intended to prevent erosion of adjacent residential properties within the floodplain.

The portion of Ord Gulch assessed consists of a small, narrow incised channel in a residential/commercial setting dominated by Coast Live Oak, Poison Oak, English Ivy, Vinca, and a few Arroyo Willows. The channel has a clay and sand bottom averaging 8 to 12 feet (2.4 to 3.7 meters) wide at the Ordinary High Water Mark, which is 1.5 feet (0.46 meters) above the thalweg. Riprap bank protection is present on both banks south of Route 1. Ord Gulch is a tributary to Borregas Creek. A small roadside drainage channel, 2 to 3 feet (0.6 to 0.9 meters) wide, parallels the north side of Route 1 within the Tier I project limits and crosses under the Mar Vista Drive.

The portion of Borregas Creek assessed consists of a narrow, deeply incised channel in a residential setting dominated by Coast Live Oak, Poison Oak, Acacia, Arroyo Willow, and Kikuyu Grass. The natural channel areas have a gravel bottom channel averaging 2 to 3 feet (0.6 to 0.9 meters) wide at the Ordinary High Water Mark, which is an estimated 16 inches (40.6 centimeters) above the thalweg.

The portion of Pot Belly Creek assessed consists of a small drainage channel that originates along Cabrillo College Drive north of Route 1 and continues south of the highway along New Brighton Road to Pot Belly Beach. Within the Tier I project limits, a 3 to 6 feet (0.9 to 1.8 meters) wide roadside drainage swale parallels the north side of Route 1 enters Pot Belly Creek 30 feet (9.1 meters) north of the culvert inlet.

The portion of Tannery Gulch assessed consists of a narrow, moderately incised channel in a rural residential setting dominated by Blue Gum Eucalyptus, Poison Oak, Dogwood, and Arroyo Willow. The natural channel areas have a sand or clay bottom averaging 3 feet (0.9 meters) wide at the Ordinary High Water Mark, which is 18 inches (45.7 centimeters) above the thalweg. Urban runoff feeds a small, moderately incised channel 2 to 4 feet (0.6 to 0.9 meters) wide, which is tributary to Tannery Gulch south of the Tier I project limits.

The portion of Nobel Creek assessed consists of a narrow, moderately incised channel in an urban setting dominated by Eucalyptus, Coast Live Oak, Poison Oak, Horsetail, and Arroyo Willow. The natural channel areas have a clay bottom averaging 2 to 3 feet (0.6 to 0.9 meters) wide above the Ordinary High Water Mark, which is 24 inches (60.9 centimeters) above the thalweg.

The portion of Soquel Creek assessed consists of a broad, moderately incised channel in an urban setting dominated by Alder, Black Cottonwood, Redwood, Coast Live Oak, Poison Oak, California Blackberry, Bulrush, and Arroyo Willow. The natural channel areas exhibit a clay, sand, and cobble bottom averaging 60 to 75 feet (18.3 to 22.9 meters) wide at the Ordinary High Water Mark, which is 5.5 feet (1.7 meters) above the thalweg. This large creek receives runoff from a large urban watershed area.

The portion of Rodeo Creek Gulch assessed consists of a broad, slightly incised channel in an urban setting dominated by California Bay, Coast Live Oak, California Blackberry, Poison Oak, Stinging Nettle, and Arroyo Willow. The broad, flat natural channel area south of Route 1 has a central flat, sandy low flow channel, surrounded by low-lying, regularly inundated floodplain areas. This creek receives runoff from a medium sized urban watershed area.

The portion of Arana Gulch assessed consists of a broad, slightly incised channel in an urban setting dominated by California Bay, Eucalyptus, Redwood, Coast Live Oak, California Blackberry, Poison Oak, Stinging Nettle, Box Elder, and Arroyo Willow. Natural channel areas have a clay or sand bottom averaging 10 to 20 feet (3 to 6.1 meters) wide at the Ordinary High Water Mark, which is 2.5 feet (0.7 meters) above the thalweg. This creek receives runoff from a large urban watershed area, including several tributary channels. Tributary channels to Arana Gulch are fed by residential runoff and highway drop inlets from the south of the Tier I project area.

3.1.3.7 Population and Land Use

The population estimated for Santa Cruz County (Tier I project area) in 2008 was 253,137. There are four incorporated cities within Santa Cruz County. The largest of these is the City of Santa Cruz, with a population of 56,124, followed by Watsonville with a population of 50,442 and Capitola with a population of 9,612.

Santa Cruz County has a land area of an estimated 445 square miles (1,153 square kilometers). Land use consists mostly of residential and vacant land, with minor commercial and industrial developments east and west of the Tier I project limits.

3.1.4 Existing Surface Water Resources Environment

Surface water resources near and along the Tier I project limits include rivers, lakes and lagoons, Monterey Bay, and the Pacific Ocean.

3.1.4.1 Surface Streams

Sixteen waterways and two lagoons cross or run parallel to Route 1 along this reach: Valencia Channel, Valencia Lagoon, Valencia Creek, Aptos Creek, Ord Gulch, Borregas Creek, Pot Belly Creek, Tannery Gulch, an unnamed tributary to Tannery Gulch, Nobel Creek, Soquel Creek, Soquel Lagoon, Rodeo Creek Gulch, Arana Gulch, the three tributaries to Arana Gulch, and an unnamed Water of the U.S. at Station 49+65. The existing drainage facilities at the crossings of the creeks and Route 1 are shown in Table 5. Thirteen of the major crossings are cross culverts, and the other two are bridges with assigned bridge numbers; Valencia Creek runs parallel to, but does not cross, Route 1.

The two bridges are the Aptos Creek bridge and the Soquel Creek bridge, with assigned bridge numbers 36-0011 and 36-0013, respectively. Most of these streams drain small watershed areas, and thus have low 100-year peak discharges. Aptos Creek and Soquel Creek are the two largest creeks that cross Route 1. Aptos Creek has a watershed area of 24 square miles (62.2 square kilometers) and drains a peak discharge of 8,264 cubic feet per second (234 cubic meters per

second) during the 100-year storm event. Soquel Creek has a watershed area of 43 square miles and drains a peak discharge of 12,078 cubic feet per second (342 cubic meters per second) during the 100-year storm event.

Table 5. Drainage Facilities at Major Crossings of Route 1

Waterway	Station at Route 1 Crossing	Drainage Facility	
		English	Metric
Unnamed Waters of the U.S.	49+65	84 in. corrugated steel pipe	2100 mm corrugated steel pipe
Valencia Channel	75+30	culvert size unknown	culvert size unknown
Aptos Creek	90+00	concrete bridge	concrete bridge
Ord Gulch	107+85	48 in. concrete culvert	1200 mm concrete culvert
Borregas Creek	110+69	48 in. concrete culvert	1200 mm concrete culvert
Pot Belly Creek	114+90	30 in. reinforced concrete pipe culvert	750 mm reinforced concrete pipe culvert
Tannery Gulch	118+64	6 ft x 6 ft reinforced concrete box culvert	1800 mm x 1800 mm reinforced concrete box culvert
unnamed tributary to Tannery Gulch	122+66	48 in. reinforced concrete pipe culvert	1200 mm reinforced concrete pipe culvert
Nobel Creek	130+08	6 ft x 6 ft reinforced concrete box culvert	1800 mm x 1800 mm reinforced concrete box culvert
Soquel Creek	143+60	98 ft wide, 323 ft span concrete arch span bridge	29.9 m wide, 98.5 m span concrete arch span bridge
Rodeo Creek Gulch	154+24	9 ft concrete arch culvert	2700 mm concrete arch culvert
Arana Gulch	171+03	72 in. (height) concrete arch culvert	1800 mm (height) concrete arch culvert
tributary to Arana Gulch	175+98	36 in. reinforced concrete pipe culvert	900 mm reinforced concrete pipe culvert
tributary to Arana Gulch	177+92	4 ft x 4 ft reinforced concrete box culvert	1200 mm x 1200 mm reinforced concrete box culvert
tributary to Arana Gulch	183+01	30 in. reinforced concrete pipe culvert	750 mm reinforced concrete pipe culvert

3.1.4.2 Beneficial Uses of Receiving Water Bodies

Beneficial uses are critical to water quality management in California. According to state law, the beneficial uses of California's waters that may be protected against quality degradation include, but are not limited to, "...domestic; municipal; agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves" (Water Code Section 13050). Beneficial uses for surface and ground waters are divided into the 20 standard categories with definitions listed in Appendix B. Protection and enhancement of existing and potential beneficial uses are the primary goals of water quality planning. The receiving water bodies with designated beneficial uses listed in the Central Coast Regional Water Quality Control Board Basin Plan are: Valencia Lagoon, Valencia Creek, Aptos Creek, Soquel Creek, Soquel Lagoon, Rodeo Creek Gulch and Arana Gulch (see Table **6**). All other Tier I project receiving water bodies do not have designated beneficial uses; however, the *Basin Plan* states that, "Surface water bodies within the Region that do not have beneficial uses designated for them in Table 2-1 [of the *Basin*

Plan] are assigned the following designations: municipal and domestic water supply [and] protection of both recreation and aquatic life."

3.1.4.3 Water Quality Objectives

The 1972 Amendments to the federal Water Pollution Control Act declared that elimination of discharge of pollutants into navigable waters (State Water Resource Control Board, 1972) is a national goal. The establishment of a base or reference point is a prerequisite to water quality control. The Regional Water Quality Control Board needs to utilize current technical guidelines, available historical data, and enforcement feasibility when formulating water quality objectives.

The general water quality objectives established for all inland surface waters, enclosed bays, and estuaries within the Central Coast Region's Hydrologic Basin are color, tastes and odor, floating material, suspended material, settleable material, oil and grease, biostimulatory substances, sediment, turbidity, pH, dissolved oxygen, temperature, toxicity, pesticides, chemical constituents, organic substances, and radioactive substances. The receiving water bodies for this Tier I project are not listed as having specific water quality objectives. See Appendix A.1 for more information regarding the general objectives for all inland surface waters, enclosed bays, and estuaries.

Per the Central Coast Regional Water Quality Control Board's Basin Plan, the general water quality objectives for all groundwater in the Central Coast area include tastes, odors, and radioactivity. Groundwater shall not contain taste or odor producing substances in concentrations that adversely affect beneficial uses. In addition, radionuclides shall not be present in concentrations deleterious to humans, plants, animals, or aquatic life. Appendix A.2 summarizes ground water quality objectives based on beneficial uses established by the Central Coast Regional Water Quality Control Board.

Table 6. Beneficial Uses of Water in the Tier I Project Area (Big Basin Hydrologic Unit)

Water Body Names	Beneficial Uses																					
	MUN	AGR	PRO	IND	GWR	REC1	REC2	WILD	COLD	WARM	MIGR	SPWN	BIOL	RARE	EST	FRESH	NAV	POW	COMM	AQUA	SAL	SHELL
BIG BASIN HYDROLOGIC UNIT																						
Arana Gulch	x				x	x	x	x	x		x	x		x		x			x			
Rodeo Creek Gulch (Doyle Gulch)	x	x		x	x	x	x	x	x			x				x			x			
Soquel Lagoon						x	x	x	x		x	x		x	x				x			x
Soquel Creek	x	x		x	x	x	x	x	x		x	x	x			x			x			
Bates Creek	x					x	x	x	x		x	x	x						x			
Grover Gulch	x				x	x	x	x	x		x	x							x			
Soquel Creek, east branch	x			x	x	x	x	x	x		x	x							x			
Hinckley Creek	x	x		x	x	x	x	x	x		x	x	x						x			
Amaya Creek	x				x	x	x	x	x		x	x							x			
Soquel Creek, west branch	x				x	x	x	x	x		x	x							x			
Hester Creek	x				x	x	x	x	x		x	x							x			
Laural Creek	x				x	x	x	x	x		x	x							x			
Burns Creek	x				x	x	x	x	x		x	x							x			
Moores Gulch	x				x	x	x	x	x		x	x							x			
Miners Creek	x				x	x	x	x	x		x	x							x			
Aptos Creek	x	x		x	x	x	x	x	x		x	x	x		x	x			x			
Valencia Creek	x				x	x	x	x	x		x	x							x			
Trout Gulch	x				x	x	x	x	x										x			
Bridge Creek	x	x				x	x	x	x		x	x	x						x			
Valencia Lagoon						x	x	x		x		x		x					x			

Source: Central Coast Regional Water Quality Control Board Basin Plan

Notes:
AGR—Agricultural Supply
AQUA—Aquaculture
ASBS—Areas of Special Biological Significance
BIOL—Preservation of Biological Habitats of Special Significance
COLD—Cold Freshwater Habitat
COMM—Commercial and Sport Fishing
EST—Estuarine Habitat
FRSH—Freshwater Replenishment
GWR—Ground water Recharge
IND—Industrial Service Supply
MAR—Marine Habitat
MIGR—Migration of Aquatic Organisms
MUN—Municipal and Domestic Supply
NAV—Navigation
POW—Hydropower Generation
PROC—Industrial Process Supply
RARE—Rare, Threatened, or Endangered Species
REC-1—Water Contact Recreation
REC-2—Non-contact Water Recreation
SAL—Inland Saline Water Habitat
SHELL—Shellfish Harvesting
SPWN—Spawning, Reproduction, and/or Early Development
WARM—Warm Freshwater Habitat
WILD—Wildlife Habitat

3.1.4.4 Possible Pollutants Affecting Water Quality

California Department of Transportation has performed many studies to monitor and characterize highway storm water runoff throughout the State. Commonly found pollutants are Total Suspended Solids (TSS), nitrate nitrogen, Total Kjeldahl Nitrogen (TKN), phosphorous, Ortho-phosphate, Copper, Lead and Zinc. Some sources of these pollutants are natural erosion, phosphorus from tree leaves, combustion products from fossil fuels, and the wearing of brake pads and tires (California Department of Transportation, November 2003).

Five of the direct receiving water bodies, which are existing waterways within the Tier I project limits, are included on the 2010 Clean Water Act Section 303(d) List. Aptos Creek, Valencia Creek, Soquel Creek, Soquel Lagoon, and Rodeo Creek Gulch do not meet water quality objectives. These water quality limited segments are located immediately upstream or downstream of the traversing Route 1 right-of-way. Table 8 lists the water bodies with impaired water quality, including the pollutants affecting them.

A combined total maximum daily load for pathogens has been established for Aptos and Valencia creeks and a separate total maximum daily load for pathogens has been established for Soquel Creek. Table 7 lists the approval dates for these total daily maximum loads.

Table 7. Pathogen Total Maximum Daily Load Approval Dates

Water Body	Regional Water Quality Control Board Approval Date	State Water Resources Control Board Approval Date	California Office of Administrative Law Approval Date	US EPA Approval Date
Aptos/Valencia creeks	May 8, 2009	August 3, 2010	October 29, 2010	January 20, 2011
Soquel Lagoon	May 8, 2009	July 6, 2010	September 15, 2010	November 17, 2010

Source: SWRCB, 2010

The 303(d) List shows a proposed total maximum daily load completion date for sedimentation/siltation for Aptos Creek, Valencia Creek, and Soquel Lagoon of 2021, a proposed total maximum daily load completion date for turbidity for Soquel Creek and Rodeo Creek Gulch of 2021, and a proposed total maximum daily load completion date for pH for Rodeo Creek Gulch of 2021. Currently, no information is available on the Regional Water Quality Control Board website for the status of these total maximum daily loads.

Table 8. Limited Water Quality Segments Within the Tier I Project Limits

Region	Type	Name	California Water Watershed	Pollutant/ Stressor	Potential Sources	Estimated Size Affected	Proposed Total Maximum Daily Load Project Completion
3	River	Aptos Creek	30413023	Pathogens	Collection System Failure, Natural Sources, Onsite Wastewater Systems (Septic Tanks), Pasture Grazing-Riparian and/or Upland, Urban Runoff/Storm Sewers	8.4 mi	2011
				Sedimentation/ Siltation	Disturbed Sites (Land Development)/ Channel Erosion	8.4 mi	2021
3	Estuary	Soquel Lagoon	30413014	Pathogens	Urban Runoff/Storm Sewers, Collection System Failure, Transient Encampments, Onsite Wastewater Systems (Septic Tanks), Pasture Grazing-Riparian and/or Upland,	1.2 ac	2011
				Sedimentation/ Siltation	Construction/ Land Development	1.2 ac	2021
3	River	Valencia Creek	30413023	Pathogens	Source Unknown	6.2 mi	2011
				Sedimentation/ Siltation	Agriculture/ Construction/ Land Development	6.2 mi	2021
3	River	Soquel Creek	30413011	Enterococcus	Collection System Failure, Natural Sources, Transient encampments, Urban Runoff/Storm Sewers	17.9 mi	2011
				Escherichia coli (E. coli)	Collection System Failure, Natural Sources, Onsite Wastewater Systems (Septic Tanks), Transient encampments, Urban Runoff/Storm Sewers	17.9 mi	2011
				Fecal Coliform	Collection System Failure, Natural Sources, Onsite Wastewater Systems (Septic Tanks), Transient encampments, Urban Runoff/Storm Sewers	17.9 mi	2011
				Turbidity	Source Unknown	17.9 mi	2021
3	River	Rodeo Creek Gulch	30413014	Turbidity	Source Unknown	6.0 mi	2021
				pH	Source Unknown	6.0 mi	2021

Source: SWRCB, 2010

3.1.4.5 Flooding Sources

Floodplains are associated with individual creek crossings underneath Route 1. Federal Emergency Management Agency Flood Insurance Rate Maps indicate that floodplains exist at the Aptos Creek crossing of Route 1; at the Porter Street/Bay Avenue interchange near the Soquel Creek crossing of Route 1; at the Rodeo Creek Gulch crossing of Route 1; and at the Arana Gulch crossing of Route 1.

The rainy season for Soquel Creek generally extends from October through May, but most flooding occurs from December through March. Flood stage can swell to flood peaks in a few hours with high velocities in the main channel. The Soquel Creek basin experienced major flooding in December 1955 and January 1982. Obstacles and major log jams near the Soquel Avenue bridge downstream of the Route 1 crossing caused severe backwater. The estimated peak flow at the Soquel gage station was 15,800 cfs (447 m^3/s) (which corresponds to a 70-year storm) for the December 1955 storm and 9,700 cfs (275 m^3/s) (which corresponds to a 15-year storm) for the January 1982 storm. The Aptos Creek basin experienced similar flooding with an estimated peak discharge of 3,500 cfs (99 m^3/s) for the December 1955 storm and 3,950 cfs (112 m^3/s) for the January 1982 storm (Federal Emergency Management Agency, 2006).

Flooding along the Pacific Coast of Santa Cruz County is typically associated with the simultaneous occurrence of very high tides, large waves, and storm swells during the winter. Flood hazards along the coast are generated by swell waves from offshore storms, by wind waves from land-falling storms, and by tsunamis. Other hazards, which present potential damage to structures, exposure to erosion, and impacts to channels, are landslides, earthquakes, and wildland fires. Areas in Santa Cruz County would be significantly impacted from a tsunami created by an earthquake on the San Gregorio fault, which is located offshore in Monterey Bay and roughly parallels the coastline. A tsunami created by such an earthquake would arrive without warning, minutes after the initial shock (Federal Emergency Management Agency, 2006).

These flooding sources have had significant impacts on ocean-front development. Severe storms in January 1978 accelerated erosion and weakened foundations of existing beachfront homes. Seawalls and temporary barriers, intended to protect the beach shoreline, were either damaged or destroyed. In addition, storm centers from the southwest produce storm flow patterns toward the coast that have caused the majority of the serious coastal floods; strong winds and high tides create storm surges that back up river flows, and this leads to flooding at the river mouths (Federal Emergency Management Agency, 2006).

3.1.4.6 Geomorphology

General geomorphology of the study area was researched; several other studies were available that discuss geomorphology for the watersheds that are within the State Route 1 High Occupancy Vehicle Lane Widening Project limits, but they are not specific to this project.

In general, geomorphology of surface water resources, such as streams, channels, or lakes, is a component of the composition of the soil that formed the channel banks and the pattern and intensity of water flow in the channels or over the surrounding ground surfaces. Primary impacts to channel geomorphology from highway projects include changes in the hydrograph, construction or removal of rigid features along the waterway (i.e., culverts, concrete, tree roots, large boulders, etc.), sediment transport characteristics (i.e., alterations of the water's energy), and others (watershed dependent). These surface water resources would not be subject to major changes as the result of the Tier I project because the Tier I project would minimize impacts to streams and channels. Best Management Practices would be implemented to minimize impacts from additional runoff from widened roadways, and by maintaining existing flow patterns of watercourses as well as surrounding soil composition. Water resources geomorphology and natural land forms throughout the Route 1 project corridor can be changed by fault line activities, such as the San Andreas/North Fault, located 7.8 miles (12.6 kilometers) from the Capitola Avenue overcrossing.

The geomorphologic character of the proposed Tier I project area is within the Watsonville and Santa Cruz Mountain subsections of the United States Forest Service's ecological subregion. The Tier I project area is generally characterized by northwest trending mountains with rounded ridges, steep sides, and narrow canyons; it is on alluvial plains consisting of mostly gently sloping to nearly level floodplain, stream terraces, and alluvial fans. The Tier I project area is near the northeast edge of the mountain range and parallels the San Andreas Fault, which is along the northeast side of the Santa Cruz Mountains. Most of the streams crossing Route 1 originate from the Santa Cruz Mountains to the east and northeast of Route 1, and they drain toward the southwest. There are recent dunes along the west side of Monterey Bay and stabilized dunes on the southeast side of Monterey Bay. Mass wasting and fluvial erosion and deposition are the main geomorphic processes, and wind is an active geomorphic agent along the west side of Monterey Bay.

The proposed Tier I project is adding impervious surface area, extending or upsizing existing culverts (adding a parallel culvert next to an existing one), widening bridges, removing riparian vegetation, and altering wetlands. Such activities all may have an influence on channel geomorphology.

The *Soquel Creek Watershed Assessment and Enhancement Project Plan* (November 2003) was prepared for the Santa Cruz County Resource Conservation District by Strelow & Associates. It states that most of the Soquel Creek and its main tributaries flow to the valley floors of alluvium. Alluvium is referred to in the aforementioned report as sediment deposited by streams that are from the valley-bottom soils supporting riparian vegetation. In general, the Soquel Creek channel receives material from tectonic and landslide events and is ultimately distributed downstream by fluvial processes. The material is deposited on the bed, high-flow bars, or floodplains, and flushed through the system to the Monterey Bay. Large pieces of wood are jammed behind bridges or other natural restraints and ultimately washed away from the alluvium process. In general, the *Soquel Creek Watershed Assessment and Enhancement Project Plan* attributes tectonic uplift, mass movement of slope materials, and fluvial processes as the primary geomorphic processes determining the existing channels (November 2003).

Fluvial geomorphology is the study of rivers and streams and the processes that form them. More specific to the project, fluvial geomorphology is the study of the effects that the State Route 1 High Occupancy Vehicle Lane Widening Project would have on the existing waterways. Because the Tier I project has two alternatives, the Transportation Systems Management and High Occupancy Vehicle Lanes Alternative, the upsizing or extension of the existing Tier I project's cross culverts was evaluated for each alternative. For the Transportation Systems Management Alternative, the cross culvert at station 158+45 is proposed to be extended on the northbound side of Route 1. The other cross culvert at station 122+66 is proposed to be upsized by placing a parallel culvert. For the High Occupancy Vehicle Lanes Alternative, the cross culvert at station 158+45 is proposed to be extended upstream only, and the cross culvert at station 122+66 is also proposed to be upsized by placing a parallel culvert. The cross culvert at station 85+47 is proposed to be extended on both sides of Route 1.

The Tier I project design goal is to maintain pre-construction storm water discharge flows by metering or detaining flows to pre-construction rates prior to discharge to a receiving water body or a Municipal Separate Storm Sewer System; therefore, the hydrograph of the Tier I project would not be changed. For areas where riparian vegetation would be removed and where wetlands would be altered within the proposed Tier I project limits, more detailed biological studies would be conducted to determine what mitigation measures the Tier I project should propose.

An increase in impervious surface area can be evaluated using computer modeling, such as Bay Area Hydrology Model, and by evaluating a watershed for cumulative effects from impervious surface and pollutant runoff. This computer modeling is not possible for this phase of the Tier I project. However, as survey information becomes available, this task will be performed.

Roadway and drainage improvements proposed for the Tier I project and its downstream effects can be evaluated using computer software, such as HY-8 or Hydraflow. Watersheds can be evaluated for cumulative effects from impervious surfaces. This computer modeling is not possible for this phase of the Tier I project; however, as survey information becomes available, this task will be performed.

3.1.4.7 Existing Surface Water Quality and Sensitivity

Surface water quality information in the Tier I project area was obtained from the State Water Resources Control Board's Surface Water Ambient Monitoring Program. The primary factors contributing to water quality issues in this region are related to nonpoint source pollution associated with row crop agriculture, vineyards, rangeland, and timber harvest. Furthermore, urban runoff problems are increasing in some parts of the region. Nutrients, sedimentation, pesticides, and pathogens are the primary causes some of the creeks are included on the 2010 Clean Water Act Section 303(d) Lists.

3.1.5 Existing Groundwater Resources Environment

The following sections present information about existing groundwater within the Tier I project limits. Figure 6 is an excerpted groundwater map of the Central Coast Hydrologic Unit. The

Basin/Subbasin numbers listed in Table 9 correspond to the Basin/Subbasin names shown in Figure 6.

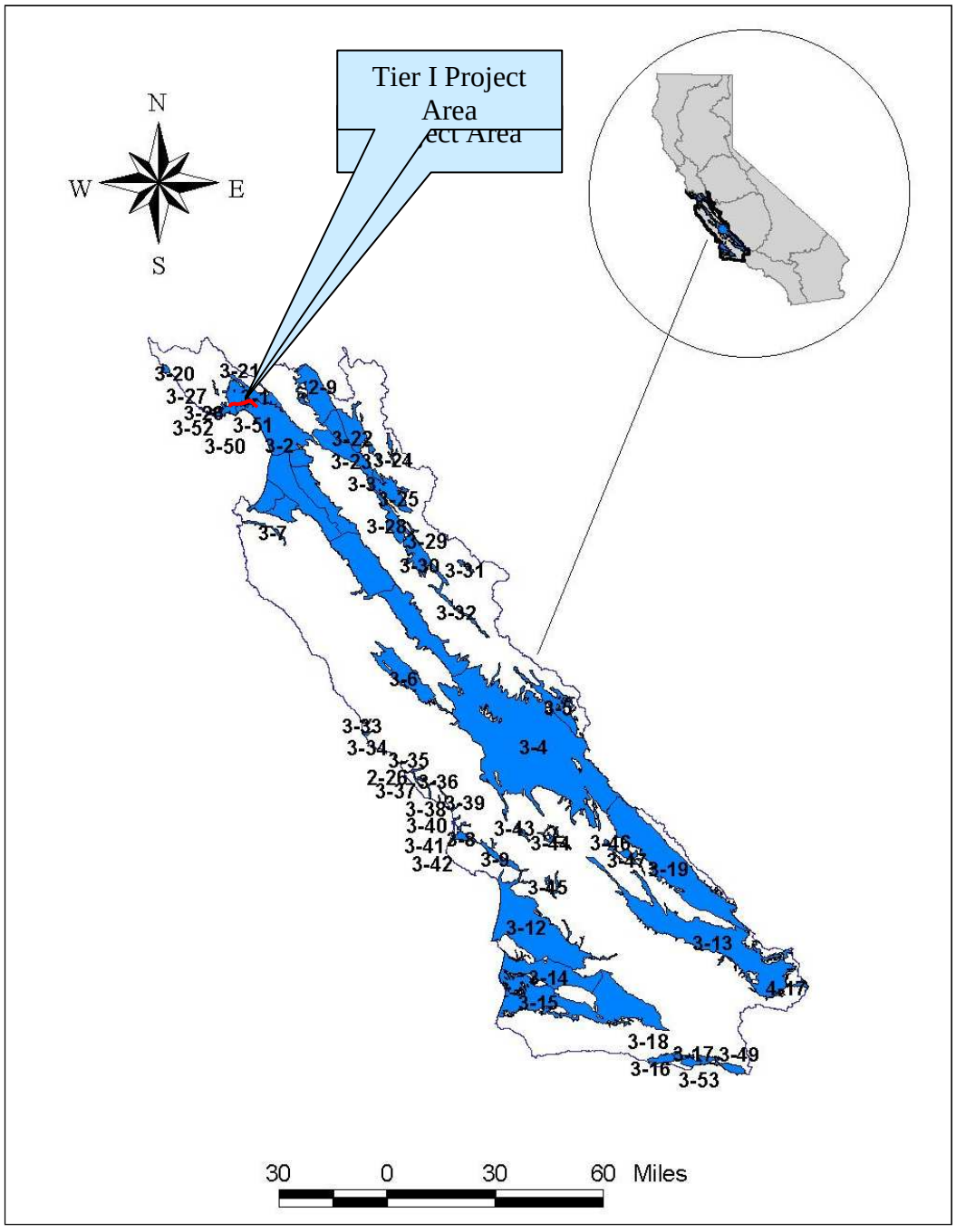

Figure 6. Groundwater Resources in the Central Coast Hydrologic Unit

Source: Department of Water Resources, 2003

Table 9. Basins and Subbasins of Central Coast Hydrologic Region

Basin / Subbasin	Basin Name	Basin / Subbasin	Basin Name
3-1	Soquel Valley	3-24	Quien Sabe Valley
3-2	Pajaro Valley	3-25	Tres Pinos Valley
3-3	Gilroy-Hollister Valley	3-26	West Santa Cruz Terrace
3-3.01	Llagas Area	3-27	Scotts Valley
3-3.02	Bolsa Area	3-28	San Benito River Valley
3-3.03	Hollister Area	3-29	Dry Lake Valley
3-3.04	San Juan Bautista Area	3-30	Bitter Water Valley
3-4	Salinas Valley	3-31	Hernandez Valley
3-4.01	180/400 Foot Aquifer	3-32	Peach Tree Valley
3-4.02	East Side Aquifer	3-33	San Carpoforo Valley
3-4.04	Forebay Aquifer	3-34	Arroyo de la Cruz Valley
3-4.05	Upper Valley Aquifer	3-35	San Simeon Valley
3-4.06	Paso Robles Area	3-36	Santa Rosa Valley
3-4.08	Seaside Area	3-37	Villa Valley
3-4.09	Langley Area	3-38	Cayucos Valley
3-4.10	Corral de Tierra Area	3-39	Old Valley
3-5	Cholame Valley	3-40	Toro Valley
3-6	Lockwood Valley	3-41	Morro Valley
3-7	Carmel Valley	3-42	Chorro Valley
3-8	Los Osos Valley	3-43	Rinconada Valley
3-9	San Luis Obispo Valley	3-44	Pozo Valley
3-12	Santa Maria River Valley	3-45	Huasna Valley
3-13	Cuyama Valley	3-46	Rafael Valley
3-14	San Antonio Creek Valley	3-47	Big Spring Area
3-15	Santa Ynez River Valley	3-49	Montecito
3-16	Goleta	3-50	Felton Area
3-17	Santa Barbara	3-51	Majors Creek
3-18	Carpinteria	3-52	Needle Rock Point
3-19	Carrizo Plain	3-53	Foothill
3-20	Ano Nuevo Area		
3-21	Santa Cruz Purisima Formation		
3-22	Santa Ana Valley		
3-23	Upper Santa Ana Valley		

Source: Department of Water Resources, 2003

3.1.5.1 Study Area and Recharge Areas

The Tier I project is within the Central Coast Hydrologic Region. This Hydrologic Region has 50 delineated groundwater basins. The Tier I project is within the Soquel Valley (3-1), Pajaro Valley (3-2), and the West Santa Cruz Terrace (3-26) groundwater basins. Soquel Valley Basin covers an area of 2,500 acres (1,012 hectares); the Pajaro Valley covers an area of 76,800 acres

(31,081 hectares); and the West Santa Cruz Terrace covers an area of 7,870 acres (3,185 hectares). Groundwater is an extremely important source of the water supply, and within this region, groundwater accounted for 83 percent of the annual supply used for agriculture and urban purposes in 1995 (Department of Water Resources, 2003).

A geotechnical study was performed to provide additional information on groundwater resources. They conducted a groundwater study within the proposed Route 1 improvement segment based on historic boring data, as-built information, and current topography and geologic information. Table 10 indicates the locations and groundwater elevations and provides brief descriptions of sub-soil characteristics and compositions (Geologic and Seismic Section Report March 2008).

Table 10. Project Area Groundwater Conditions

Bridge / Structure	Subsoil Condition	Groundwater Depth below existing ground surface	
		(feet)	(meters)
San Andreas Rd / Larkin Valley Rd UC	10 to 30 ft (3 to 9 m) thick surficial deposits, overlying with very dense clayey/silty sand	Not encountered	Not encountered
Freedom Blvd / Rob Roy Junction OC	20 ft (6 m) of loose to dense silty/clayey sand overlying with dense gravelly sand	3 to 20 ft	0.9 to 6.1 m
Rio Del Mar Blvd OC	27 ft (8 m) of dense to very dense silty sand overlying with dense gravelly sand	Not encountered	Not encountered
State Park Dr. OC	25 to 40 ft (8 to 12 m) of loose to dense silty/clayey sand	Not encountered	Not encountered
Park Avenue UC	50 ft (15 m) of dense to very dense clayey sand overlying with very dense silty sand with cemented layer	41 to 54 ft	12.5 to 16.5 m
Bay Avenue UC	15 ft (5 m) of stiff to very stiff silty/sandy clay overlying with loose to very dense silty/clayey/gravelly sand	23 to 26 ft	7.0 to 7.9 m
Soquel Creek Bridge	Stiff to very stiff sandy/silty clay imbedded with dense to very dense silty/gravelly sand	19 to 40 ft	5.8 to 12 m
41st Avenue OC	25 ft (8 m) of medium dense to dense silty sand overlying with very dense sand	29 to 31 ft	8.8 to 9.4 m
Morrissey Avenue OC	Dense to very dense silty sand	1 ft	0.3 m

Note: The as-built LOTBs for North Aptos undercrossing, Aptos Creek bridge, Capitola Avenue overcrossing, Soquel Drive overcrossing, and La Fonda Avenue overcrossing were not available.

Source: Geologic and Seismic Section Report (March 2008)

Based on the groundwater findings, there are two locations within the study limits that are characterized by groundwater depths that would make media filters and infiltration devices infeasible treatment options: the Freedom Boulevard/Rob Roy Junction overcrossing and the Morrissey Avenue overcrossing. Media filters and infiltration devices both require at least a 10-foot (3.05-meter) clearance between the groundwater elevation and the bottom of the treatment device. Further borings would be performed during the design phase to evaluate groundwater depths beyond these areas.

3.1.5.2 Local Area Springs and/or Wells

Figure 7 is a map obtained from the Department of Water Resources' groundwater level monitoring program database, which indicates the approximate locations and positions of groundwater wells within the proposed highway improvement corridor. The list of creeks that are potential recharge sources for the groundwater aquifers that cross the Tier I project limits is included in Table 5 of this report.

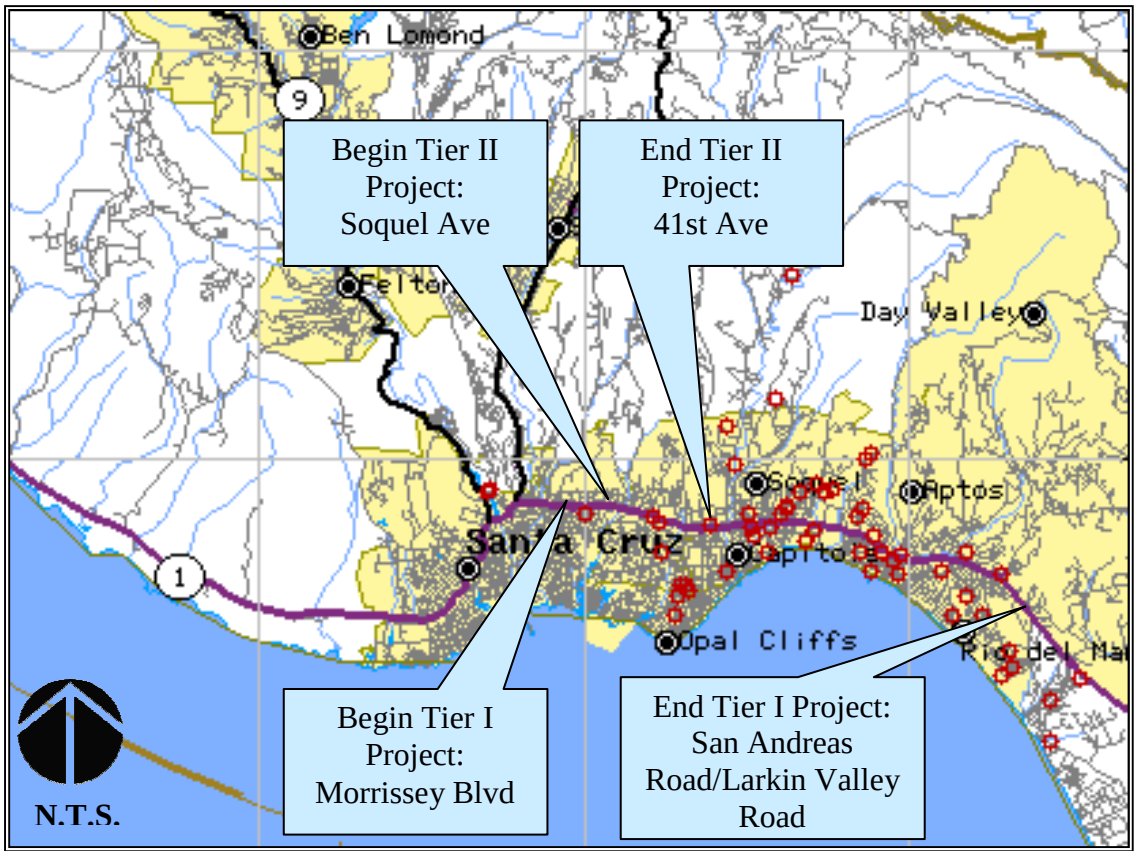

Figure 7. Project Area Groundwater Wells

Source: Department of Water Resources, 2003

3.1.5.3 Objectives for Groundwater Quality and Local Groundwater Constituents

According to the Basin Plan, established for the Central Coast Regional Water Quality Control Board, objectives for groundwater quality include monitoring and controlling the tastes, odor and radioactivity, which applies to all groundwater in the basin. Specific objectives were established for groundwater used for municipal and domestic supply and groundwater for agricultural supply. Table 11 lists contaminant groups frequently found to exist in the groundwater resources in the Central Coast Hydrologic Region.

3.1.6 Other Existing Water Quality Considerations

Areas adjacent to existing creek crossings and along the coastline are under the jurisdiction of the California Department of Fish and Wildlife, the United States Army Corps of Engineers, or

the California Coastal Commission. These crossings make up a part of the surface water resources environment that serves different functions within the Tier I project limits.

Table 11. Most Frequently Occurring Contaminant Groups in the Central Coast Hydrologic Region

Contaminant Group	Contaminant – # of wells	Contaminant – # of wells	Contaminant – # of wells
Inorganics – Primary	Antimony – 6	Aluminum – 4	Chromium (Total) – 4
Inorganics – Secondary	Iron – 145	Manganese – 135	TDS[4] – 11
Radiological	Gross Alpha – 15	Radium 226 – 3	Uranium – 3
Nitrates	Nitrate (as NO3) – 69	Nitrate + Nitrite – 24	
Pesticides	Heptachlor – 4	Di (2-Ethylhexyl) phthalate – 2	
VOCs[1] /SVOCs[2]	TCE[3] – 3	3 are tied at 2 exceedances	

Source: Department of Water Resources, 2003

[1]VOC=Volatile Organic Compound
[2]SVOC=Semivolatile Organic Compound
[3]TCE= Trichloroethylene
[4]TDS= Total Dissolved Solids

3.1.6.1 Biotic/Aquatic Considerations

Areas within the Tier I project limits that potentially contain biotic and aquatic species of significance are characterized by whether they are under the jurisdiction of the United States Army Corps of Engineers (ACOE), the California Coastal Commission (CCC), or the California Department of Fish and Wildlife (CDFW).

The United States Army Corps of Engineers biotic/aquatic areas were identified and mapped within the Ordinary High Water Mark in adjacent areas of the creeks or drainages within the Tier I project limits (Wetland Assessment, 2004). The California Coastal Commission biotic/aquatic areas are identified and mapped within the banks or riparian canopy of each creek and drainage within the Coastal Zone areas of the Tier I project limits (Wetland Assessment, 2004). The California Department of Fish and Wildlife biotic/aquatic areas are identified and mapped within the banks or riparian canopy of each creek and drainage not located within the Coastal Zone areas of the Tier I project limits (Wetland Assessment, 2004).

As listed in Table 14, an estimated 1.00 acre (4,506 square meters) of United States Army Corps of Engineers' United States wetlands and 0.26 acres (1,052 square meters) other waters jurisdictional areas were listed for the High Occupancy Vehicle Lane Alternative. Also, listed in Table 14, an estimated 10.40 acres (42,072 square meters) of California Department of Fish and Wildlife Jurisdiction and 3.69 acres (14,921 square meters) of California Coastal Commission Jurisdiction areas are present within the Tier I project limits for the High Occupancy Vehicle Lane Alternative (Jurisdictional Areas within the Biological Study Area, 2010).

As listed in Table 15, an estimated 0.28 acres (1,114 square meters) of United States Army Corps of Engineers' United States wetlands and 0.13 acres (507 square meters) of other waters jurisdictional areas were listed for the Transportation Systems Management Alternative. Also listed in Table 15, an estimated 4.53 acres (18,342 square meters) of California Department of Game Jurisdiction and 2.53 acres (10,233 square meters) of California Coastal Commission jurisdictional areas are present within the Tier I project limits for the Transportation Systems Management Alternative (Jurisdictional Areas within the Biological Study Area, 2010).

Table 12 lists the functions and values of the identified jurisdictional areas within the Tier I project limits. Based on the rating criteria used in the study, the identified biotic/aquatic (wetland) areas rank moderate to high in function and value, due to the presence of standing water and saturated soils during summer months, dense riparian and emergent vegetation, and discharge, recharge, and water quality benefits, as shown in Table 13 (Wetland Assessment, 2004).

Widening was avoided adjacent to Valencia Creek to prevent direct impacts to the creek as well as to Valencia Lagoon. There is proposed widening in the median just upstream of Valencia Channel and along the Rio Del Mar northbound on-ramp that may cause slight increases of flow; the flow increase, however, would be so small that the indirect impacts to Valencia Channel and Valencia Lagoon would be minimal.

Table 12. Value Assessment of Biotic/Aquatic Areas within Tier I Project Limits

Function/Value	Rating		
	Low	Moderate	High
Water Quality Improvement	<5 acres in size; <50% vegetation density; no proximity to pollutants.	5-10 acres in size; 50-80% vegetation density; adjacent to non-point pollutants.	>10 acres in size; >80% vegetation density; downstream from point discharges.
Storm and Floodwater Storage	<5 acres in size; <10% woody cover; permanently flooded; unconstrained outlet.	5-10 acres in size; 10-30% woody cover.	>10 acres in size; urban and developable areas; >30% woody cover; seasonal hydroperiod; constrained outlet.
Groundwater Discharge	Isolated depression; temporarily saturated or inundated.	Open drainage system; seasonally flooded.	Open tidal systems; permanent saturation or inundation.
Groundwater Recharge	<5 acres in size; isolated depression; temporarily saturated or inundated; impermeable substrate.	5-10 acres in size; seasonally flooded.	>10 acres in size; permanent inundation; several feet deep; permeable substrate.
Natural Biological Support	Small size; low species diversity; one vegetation layer; no sensitive or water-dependent species.	Medium size; moderate species diversity; several vegetation layers; water-dependent species; no sensitive species.	Large size; high species diversity; water-dependent and sensitive species; many vegetation layers.

Source: Wetland Assessment, 2004

Table 13. Function and Value Ratings of Identified Biotic/Aquatic (Wetland) Areas

Resource	Size	Water Quality	Storage	Discharge	Recharge	Biological Support
ACOE/CDFW/CCC Wetlands	9.14 acres/37,000 square meters	Moderate	Moderate	High	High	High
CCC/CDFW Wetlands	27.57 acres/111,580 square meters	High	Moderate	High	High	High

Source: Wetland Assessment, 2004

Table 14. Jurisdictional Waters/Wetlands within the Biological Study Area- High Occupancy Vehicle Lane Alternative under Tier I Project

Site No.	Jurisdictional Area (WITHIN COASTAL ZONE)		ACOE Jurisdiction				Impacts to CCC/CDFG Jurisdiction[1]	
			Impacts to Wetlands		Impacts to Other Waters			
			Acre	Sq. Meter	Acre	Sq. Meter	Acre	Sq. Meter
1a, 1b	Valencia Channel and Lagoon	Permanent	0	0			0	0
		Temporary	0	0			0	0
2a	Valencia Creek roadside ditches	Permanent			0.03	128	0.03	128
		Temporary			0.00	0	0.00	0
2b	Valencia Creek/ Aptos Creek	Permanent	0.15	592			1.38	5,592
		Temporary	0.02	67			0.26	1,048
3	Ord Gulch	Permanent	0.09	378	0.01	50	1.50	6,058
		Temporary	0	0	0	0	0.06	246
4	Borregas Creek	Permanent	0	0			0.03	127
		Temporary	0	0			0.04	166
5	Potbelly Creek	Permanent	0	0			0.04	175
		Temporary	0	0			0.01	30
6	Tannery Gulch	Permanent	0	0			0	0
		Temporary	0	0			0	0
7	Tannery Gulch Tributary	Permanent						
		Temporary						
8	Monterey Avenue /Nobel Creek	Permanent	0.00	5	0	0	0.24	983
		Temporary	0.01	56	0	0	0.09	368
SUBTOTAL			*0.27*	*1,098*	*0.04*	*178*	*3.69*	*14,921*

Site No.	Jurisdictional Area (OUTSIDE COASTAL ZONE)		ACOE Jurisdiction				Impacts to CDFG Jurisdiction[2]	
			Impacts to Wetlands		Impacts to Other Waters			
			Acre	Sq. Meter	Acre	Sq. Meter	Acre	Sq. Meter
6	Tannery Gulch	Permanent	0	0			0	0
		Temporary	0	0			0	0
8	Monterey Avenue /Nobel Creek	Permanent			0	0	0	0
		Temporary			0	0	0	0
9	Soquel Creek	Permanent	0.30	1,228			1.01	4,086
		Temporary	0.07	301			0.21	831
10a	Rodeo Gulch	Permanent	0	0			0.15	596
		Temporary	0	0			0.08	308
10b	Soquel Drive-Inn roadside ditch	Permanent			0.04	179	0.04	179
		Temporary			0.04	166	0.04	166
11	Arana Gulch	Permanent	0.20	797			3.34	13,517
		Temporary	0.12	469			0.36	1,473
12	La Fonda Road Shoulder	Permanent	0.04	163				
		Temporary	0.00	0				
13	Arana Gulch Tributary	Permanent			0.07	288	1.22	4,938
		Temporary			0.06	241	0.26	1,057
SUBTOTAL			*0.73*	*2,958*	*0.22*	*874*	*6.71*	*27,151*

ACOE Jurisdiction – Impact Totals		1.00	4,056	0.26	1,052		
CDFG Jurisdiction – Impact Total						10.40	42,072
CCC Jurisdiction – Impact Total						3.69	14,921

[1] *CDFG/CCC jurisdiction includes ACOE areas.*

[2] *CDFG jurisdiction includes ACOE areas.*

Source: Jurisdictional Areas within the Biological Study Area, 2010

Table 15. Jurisdictional Waters/Wetlands within the Biological Study Area-Transportation Systems Management Alternative under Tier I Project

Site No.	Jurisdictional Area (WITHIN COASTAL ZONE)		ACOE Jurisdiction				Impacts to CCC/CDFG Jurisdiction[1]	
			Impacts to Wetlands		Impacts to Other Waters			
			Acre	Sq. Meter	Acre	Sq. Meter	Acre	Sq. Meter
1a, 1b	Valencia Channel and Lagoon	Permanent	0	0			0	0
		Temporary	0.00	14			0.00	14
2a	Valencia Creek roadside ditches	Permanent			0.02	65	0.02	65
		Temporary			0.00	1	0.00	1
2b	Valencia Creek/ Aptos Creek	Permanent	0.05	190			0.31	1,257
		Temporary	0.02	92			0.22	904
3	Ord Gulch	Permanent	0.09	378	0.06	251	1.56	6,296
		Temporary	0.00	0	0.00	0	0.06	236
4	Borregas Creek	Permanent	0	0			0.06	241
		Temporary	0	0			0.01	56
5	Potbelly Creek	Permanent	0	0			0.07	274
		Temporary	0	0			0.04	165
6	Tannery Gulch	Permanent	0	0			0	0
		Temporary	0	0			0	0
7	Tannery Gulch Tributary	Permanent						
		Temporary						
8	Monterey Avenue /Nobel Creek	Permanent	0	0	0	0	0.18	712
		Temporary	0.00	0	0	0	0.00	12
SUBTOTAL			*0.17*	*674*	*0.08*	*317*	*2.53*	*10,233*

Site No.	Jurisdictional Area (OUTSIDE COASTAL ZONE)		ACOE Jurisdiction				Impacts to CDFG Jurisdiction[2]	
			Impacts to Wetlands		Impacts to Other Waters			
			Acre	Sq. Meter	Acre	Sq. Meter	Acre	Sq. Meter
6	Tannery Gulch	Permanent	0	0			0	0
		Temporary	0	0			0	0
8	Monterey Avenue /Nobel Creek	Permanent			0	0	0.01	21
		Temporary			0	0	0	0
9	Soquel Creek	Permanent	0.06	242			0.27	1,091
		Temporary	0.01	39			0.03	113
10a	Rodeo Gulch	Permanent	0	0			0.11	443
		Temporary	0	0			0.00	0
10b	Soquel Drive-Inn roadside ditch	Permanent			0.01	56	0.01	56
		Temporary			0.02	95	0.02	95
11	Arana Gulch	Permanent	0.00	6			0.47	1,883
		Temporary	0.00	20			0.33	1,351
12	La fonda Road Shoulder	Permanent	0.03	133				
		Temporary	0.00	0				
13	Arana Gulch Tributary	Permanent			0.01	32	0.51	2,070
		Temporary			0.00	7	0.24	986
SUBTOTAL			*0.11*	*440*	*0.05*	*190*	*2.00*	*8,109*

ACOE Jurisdiction – Impact Totals		0.28	1,114	0.13	507		
CDFG Jurisdiction – Impact Total						4.53	18,342
CCC Jurisdiction – Impact Total						2.53	10,233

[1] *CDFG/CCC jurisdiction includes ACOE areas.*

[2] *CDFG jurisdiction includes ACOE areas.*

Source: Jurisdictional Areas within the Biological Study Area, 2010

3.2 Tier II Project

Section 3.1 describes the affected environment and existing conditions present at the Tier I project location. Because the Tier II project area is within the larger Tier I project area, the information presented in Section 3.1 is also applicable to the Tier II project, unless otherwise stated below. However, because the Tier II project covers a smaller portion of Route 1, generally only the discussions within the area between the 41st Avenue interchange and the Soquel Avenue interchange, or the creeks (i.e., Soquel Creek, Rodeo Creek Gulch, or Arana Gulch) are pertinent to the Tier II project.

3.2.1 Study Area

The Tier II project is located on Route 1 between 41st Avenue and Soquel Avenue, between post miles 13.5 and 14.9 in Santa Cruz County. The hydrologic unit covered in this reach is the Big Basin Hydrologic Unit (304). This reach includes the Aptos-Soquel (304.13) and San Lorenzo (304.12) hydrologic sub-areas in Santa Cruz.

3.2.2 Study Methods and Procedures

Refer to Section 3.1.2 for the methods and procedures considered for the development relevant to the Tier II project study area.

3.2.3 General Water Resources Setting

As with the Tier I project, most of the runoff within the Tier II project limits flows south to Monterey Bay and eventually to the Pacific Ocean. All of the cross drainages directly convey flow southward to Monterey Bay.

Large off-site watersheds cross Route 1 within the Tier II project limits. The Tier II project would add impervious areas that would affect three streams: Soquel Creek, Rodeo Creek Gulch, and Arana Gulch. Within the Tier II project limits, there is only one major waterway crossing, the Rodeo Creek Gulch crossing. Although they are outside of the project limits, Soquel Creek and Arana Gulch would also receive runoff from the Tier II project because of the existing topography.

3.2.3.1 Topography

The Tier II project area between Soquel Avenue and 41st Avenue ranges in elevation from 95 to 115 ft.

3.2.3.2 Soils and Geology

The soils for the segment of the Tier II project area from 41st Avenue north to Soquel Avenue are predominantly Danville Loam, Elkhorn Sandy Loam, Lompico-Felton complex, Pinto Loam, Soquel Loam, and Watsonville Loam (United States Department of Agriculture, Natural Resources Conservation Service, 2008).

3.2.3.3 Erosion Potential

The California Department of Transportation "Construction General Permit Info" GIS mapping system identifies the K factor for the Tier II project area as 0.32; this value is used for the risk level determination associated with the Construction General Permit.

Refer to Table 1 for soil information presented in the Geologic and Seismic Section (2008) report within the Tier I project limits.

3.2.3.4 Climate and Precipitation

Climate and precipitation data for the Tier II project area were obtained from the Western Regional Climate Center's historic climate database. All information was recorded at the Santa Cruz station and the Watsonville Waterworks station (see Table 2, Table 3, and Table 4).

3.2.3.5 Regional Hydrology

Refer to Section 3.1.3.5 for regional hydrology information for the Tier II project.

3.2.3.6 Local Hydrology

Refer to Section 3.1.3.6 for descriptions of Soquel Creek, Rodeo Creek Gulch, and Arana Gulch, which are affected by the added impervious areas from the Tier II project.

3.2.4 Existing Surface Water Resources Environment

Surface water resources near and along the Tier II project limits include rivers, lakes and lagoons, Monterey Bay, and the Pacific Ocean.

3.2.4.1 Surface Streams

Within the Tier II project, there is one major waterway crossing: the Rodeo Creek Gulch crossing, which is a 9-ft concrete arch culvert.

3.2.4.2 Beneficial Uses of Receiving Water Bodies

Refer to Table **6** for the Tier II project receiving water bodies: Soquel Creek, Rodeo Creek Gulch, and Arana Gulch, which have designated beneficial uses listed in the Central Coast Regional Water Quality Control Board.

3.2.4.3 Water Quality Objectives

Refer to Section 3.1.4.3 for water quality objectives for the Tier II project.

3.2.4.4 Possible Pollutants Affecting Water Quality

Two of the Tier II project receiving water bodies are included on the 2010 Clean Water Act Section 303(d) List. Soquel Creek and Rodeo Creek Gulch do not meet water quality objectives. Table 8 lists the water bodies with impaired water quality, including the pollutants affecting them.

A separate total maximum daily load for pathogens has been established for Soquel Creek. Table 7 lists the approval dates for these total daily maximum loads.

The 303(d) List shows a proposed total maximum daily load completion date for turbidity for Soquel Creek and Rodeo Creek Gulch of 2021, and a proposed total maximum daily load completion date for pH for Rodeo Creek Gulch of 2021. Currently, no information is available on the Regional Water Quality Control Board website for the status of these total maximum daily loads.

3.2.4.5 Flooding Sources

The Federal Emergency Management Agency, *Flood Insurance Study*, Santa Cruz County, CA and Incorporated Areas (2006) shows that there are delineated floodplains associated with the three streams affected by the Tier II project: Soquel Creek, Rodeo Creek Gulch, and Arana Gulch. The existing 100-year peak discharges and drainage areas of these waterways are specified in Section 3.1.4.5.

3.2.4.6 Fluvial Geomorphology

Fluvial geomorphology is the study of rivers and streams and the processes that form them; specific to this report, fluvial geomorphology is the study of the Tier II project effects on the existing waterways. The Tier II project is a smaller project than either of the Tier I project alternatives. The Tier II project would have fewer impacts than the impacts of the Tier I project alternatives presented in Section 3.1.4.6.

3.2.4.7 Existing Surface Water Quality and Sensitivity

Refer to Section 3.1.4.7 for existing surface water quality information for the Tier II project.

3.2.5 Existing Groundwater Resources Environment

Refer to Section 3.1.5 for information about existing groundwater within the Tier II project limits. Refer to Figure 6 and Table 9 for a groundwater map and basin/subbasin numbers of the Central Coast Hydrologic Unit.

3.2.5.1 Study Area and Recharge Areas

The Tier II project is within the Central Coast Hydrologic Region. This Hydrologic Region has 50 delineated groundwater basins. The Tier II project is within the Soquel Valley (3-1) and the West Santa Cruz Terrace (3-26) groundwater basins. Soquel Valley Basin covers an area of 2,500 acres (1,012 hectares); the West Santa Cruz Terrace covers an area of 7,870 acres (3,185 hectares). Groundwater is an extremely important source of the water supply, and within this region, groundwater accounted for 83 percent of the annual supply used for agriculture and urban purposes in 1995 (Department of Water Resources, 2003).

A geotechnical study was performed to provide additional information on groundwater resources. A groundwater study was conducted within the proposed Route 1 improvement segment based on historic boring data, as-built information, and current topography and geologic information. Table 10 indicates the locations and groundwater elevations and provides brief

descriptions of sub-soil characteristics and compositions (Geologic and Seismic Section Report March 2008). The Soquel Creek bridge and the 41st Avenue overcrossing are within the Tier II project area. Further borings would be performed during the design phase to evaluate groundwater depths beyond these areas.

3.2.5.2 Local Area Springs and/or Wells

Figure 7 is a map obtained from the Department of Water Resources' groundwater level monitoring program database, which indicates the approximate locations and positions of groundwater wells within the proposed highway improvement corridor.

3.2.5.3 Objectives for Groundwater Quality and Local Groundwater Constituents

According to the Basin Plan, established for the Central Coast Regional Water Quality Control Board, objectives for groundwater quality include monitoring and controlling the tastes, odor and radioactivity, which applies to all groundwater in the basin. Specific objectives were established for groundwater used for municipal and domestic supply and groundwater for agricultural supply. Table 11 lists contaminant groups frequently found to exist in the groundwater resources in the Central Coast Hydrologic Region.

3.2.6 Other Existing Water Quality Considerations

Areas adjacent to existing creek crossings and along the coastline are under the jurisdiction of the California Department of Fish and Wildlife, the United States Army Corps of Engineers, or the California Coastal Commission. These crossings make up a part of the surface water resources
environment that serves different functions within the Tier II project limits.

3.2.6.1 Hazardous Waste Material

A limited site investigation from the Soquel Avenue interchange to the Morrissey Boulevard interchange was completed and documented in the *Limited Site Investigation Report* (October, 2010). Although this site investigation was not completed within the Tier II project limits, the investigation results were assumed to be relevant at the Tier II project site because of its close proximity. This assumption is consistent with the Environmental Document.

A total of 77 soil samples were collected from 19 soil borings, and a total of 44 soil samples were collected from 11 retaining wall borings along the Tier II project corridor. The borings ranged in maximum depth from 4.5 feet to 16 feet; groundwater was not encountered during the site investigation. Soils along the Route 1 southbound shoulder were classified as hazardous from the surface to a depth of 1.5 feet, and non-hazardous between depths of 1.5 feet and 4.5 feet. Along the Route 1 northbound shoulder, soils were classified as hazardous from the surface to a depth of 4 feet, and non-hazardous between 4 feet and 4.5 feet. Groundwater is not expected to be affected by the hazardous contaminants because it was not encountered during the site investigation and is assumed to be beneath the layer of hazardous materials. Disturbance of the hazardous materials during construction activities may affect the water quality of the receiving water bodies.

3.2.6.2 Biotic/Aquatic Considerations

As stated in Section 3.1.6.1, there are areas within the project limits that potentially contain biotic and aquatic species of significance. These areas are characterized by whether they are under the jurisdiction of the United States Army Corps of Engineers, the California Coastal Commission, or the California Department of Fish and Wildlife. Section 3.1.6.1 details how the jurisdictional areas were identified and mapped.

The functions and rating criteria of the jurisdictional areas identified within the Tier I and Tier II project limits are shown in Table 13. Based on these criteria, the identified biotic/aquatic areas were rated moderate to high in function and value, as shown in Table 14.

Table 16 lists the jurisdictional wetlands and other waters within the Tier II project limits. Additional mitigation proposed to address the permanent impacts to jurisdictional areas from the Tier II project is discussed in the *Wetland Assessment Report*.

Table 16. Jurisdictional Areas in the BSA- Tier II Project

Site No.	Jurisdictional Area	Impacts to CDFW Jurisdiction	
	(Outside Coastal Zone)	Permanent (Acre)	Temporary (Acre)
10a	Rodeo Creek Gulch	0.13	0.09
10b	Soquel Drive-In roadside Ditch	0.02	0.06
CDFW Jurisdiction- Impact Totals		0.15	0.15

Source: Nolte Vertical Five, September 2010

4 ENVIRONMENTAL CONSEQUENCES AND PROJECT IMPACTS

The following sections present potential temporary and permanent water quality impacts anticipated from the proposed project activities. The discussions include California Department of Transportation procedures for identifying potential impacts.

4.1 Tier I Project

4.1.1 Temporary Impacts to Storm Water

During construction, both Build Alternatives for the Tier I project have the potential for temporary water quality impacts due to grading activities and removal of existing vegetation, which can cause increased erosion. Storm water runoff from the Tier I project site may transport pollutants to nearby creeks and storm drains if Best Management Practices are not properly implemented. Storm water runoff drains into the creeks listed in Table 5 of this report, into its unnamed tributaries and eventually discharges to Monterey Bay. Generally, as the Disturbed Soil Areas increase, the potential for temporary water quality impacts also increases. The Transportation Systems Management Alternative has an estimated Disturbed Soil Area of 101 acres (41 hectares) and the High Occupancy Vehicle Lane Alternative has an estimate of 250 acres (101 hectares). Based on these preliminary calculated areas, the High Occupancy Vehicle Lane Alternative would have potentially more water quality impacts during construction than the Transportation Systems Management Alternative.

Fueling or maintenance of construction vehicles would occur within the Tier I project site during construction, so there is the risk of accidental spills or releases of fuels, oils, or other potentially toxic materials. An accidental release of these materials may pose a threat to water quality if contaminants enter storm drains, open channels, or surface water receiving bodies. The magnitude of the impact from an accidental release depends on the amount and type of material spilled.

4.1.2 Temporary Impacts to Groundwater

The proposed improvements for the Tier I project do not involve substantial excavations that affect groundwater resources. Excavation work would mostly consist of roadbed construction for the new auxiliary or High Occupancy Vehicle lanes. New footings are proposed for the widening or reconstruction of bridges, and dewatering may be needed for improvements in perennial creeks or at locations with high groundwater. Based on United States Geological Survey topography maps, there are four perennial streams: Soquel Creek, Rodeo Creek Gulch, Aptos Creek, and Valencia Creek.

4.1.3 Temporary Impacts to Water Resources

During construction, both build alternatives have a potential for temporary water quality impacts to jurisdictional biotic/aquatic (wetland) areas and Waters of the United States or State. Potential temporary impacts can occur to United States Army Corps of Engineers, California Department of Fish and Wildlife, or California Coastal Commission jurisdictional biotic/aquatic (wetland)

areas associated with creeks and drainages that cross or are adjacent to the Tier I project area, by changing the waters' chemical and biological compositions. These temporary impacts can result from temporary stream diversion installation and removal, streambed disturbance during culvert removal and replacement, vegetation removal, and road construction (Wetland Assessment, 2004). The High Occupancy Vehicle Lane Alternative would have potentially more water quality impacts during construction than the Transportation Systems Management Alternative due to the proposed larger area of impacts. Temporary water quality impacts due to grading activities will be addressed with Construction Site Best Management Practices.

4.1.4 Permanent Impacts to Storm Water

The Federal Highway Administration found that street and highway storm water runoff has the potential to affect receiving water quality. The nature of these impacts depends on the uses and flow rate or volume of the receiving water, rainfall characteristics, and street or highway characteristics. Heavy metals associated with vehicle tire and brake wear, oil and grease, and exhaust emissions are the primary pollutants associated with transportation corridors.

Generally, highway storm water runoff has the following pollutants: Total Suspended Solids, nitrate nitrogen, Total Kjeldahl Nitrogen, phosphorous, Ortho-phosphate, Copper, Lead and Zinc (California Department of Transportation, November 2003). Some sources of these pollutants are natural erosion, phosphorus from tree leaves, combustion products from fossil fuels, and the wearing of brake pads and tires. The No-Build Alternative may have potential permanent water quality impacts due to continuing congestion, leading to a greater deposition of particulates from exhaust and heavy metals from braking. There are no existing treatment Best Management Practices along Route 1 within the Tier I project limits to treat roadway runoff; therefore, the water quality of the receiving water bodies would still be affected by highway runoff as a result of this alternative. However, note that four Treatment Best Management Practices are being installed for the Soquel to Morrissey Auxiliary Lane project with an anticipated construction completion date of May 2013. The Best Management Practices installed for the project include two biofiltration strips and two biofiltration swales.

Highway widening projects increase impervious areas and therefore potentially increase the volume and velocity of storm water flow to downstream receiving water bodies. In addition, pollutant loading can also be increased. The added impervious area is directly related to the potential permanent water quality impacts. For the High Occupancy Vehicle Lane Alternative, the proposed increase in impervious area is 64 acres (25.63 hectares); for the Transportation Systems Management Alternative, the proposed increase in impervious area is 22 acres (8.81 hectares). Based on these preliminary calculations, the Transportation Systems Management Alternative would have fewer permanent impacts than the High Occupancy Vehicle Lane Alternative because it would add less impervious area. Storm water runoff from the Route 1 Widening Project drains into creek crossings beneath Route 1. It also drains into nearby storm drain systems which ultimately discharge into Monterey Bay and the Pacific Ocean. Storm water runoff volumes and velocities from the project area are expected to increase with the implementation of the Tier I project due to the increase in impervious surfaces (see Table 17). However, in comparison with the overall watershed of the creeks, the increase in flow due to the proposed widening of the highway for the High Occupancy Vehicle Lane or the Transportation

Systems Management Alternative would be less than significant (see Table 18). The Tier I project's design goal is to maintain pre-construction storm water discharge flows by promoting infiltration and metering or detaining flows to pre-construction rates prior to discharge to a receiving water body or to a Municipal Separate Storm Sewer System. By meeting this design goal, permanent water quality impacts are not expected to be significant.

Retaining walls are proposed for the Tier I project to reduce water quality impacts. Such retaining walls would be constructed at the most effective and visually appropriate locations, not only to minimize right-of-way acquisition and separate frontage roads from the highway, but also to reduce or avoid environmental impacts. Permanent impacts due to dredging or fill in Waters of the State or U.S. shall be mitigated and referenced in the Biological Evaluation for this Tier I project.

Table 17. Increase in Impervious Areas for Transportation Systems Management and High Occupancy Vehicle Lane Alternatives in Comparison to Existing Impervious Watershed Areas

Crossing	Increased Impervious Area				Existing Impervious Watershed Area		Proposed Impervious Watershed Area			
	HOV Lane (acres)	HOV Lane (ha)	TSM (acres)	TSM (ha)	(acres)	(ha)	HOV Lane (acres)	HOV Lane (ha)	TSM (acres)	TSM (ha)
Unnamed Water of the U.S.	0	0	0	0	Not available		Not available		Not available	
Valencia Channel	9.19	3.72	1.77	0.72	29.26	11.84	38.45	15.56	31.03	12.56
Valencia Creek	3.40	1.38	0.44	0.18	5.99	2.42	9.39	3.80	6.42	2.60
Aptos Creek	10.56	4.27	5.32	2.15	17.88	7.24	28.44	11.51	23.21	9.39
Ord Gulch	1.89	0.76	1.11	0.45	2.89	1.17	4.78	1.93	4.00	1.62
Pot Belly Creek	0.86	0.35	0.61	0.25	1.56	0.63	2.42	0.98	2.17	0.88
Borregas Creek	1.37	0.55	0.99	0.40	2.49	1.01	3.86	1.56	3.47	1.41
Tannery Gulch	1.73	0.70	0.83	0.33	2.31	0.94	4.04	1.64	3.14	1.27
Unnamed tributary to Tannery Gulch	1.86	0.75	0.49	0.20	2.94	1.19	4.80	1.94	3.43	1.39
Nobel Creek	5.90	2.39	1.71	0.69	9.70	3.92	15.60	6.31	11.40	4.61
Soquel Creek	13.79	5.58	2.27	0.92	19.54	7.91	33.32	13.49	21.81	8.83
Rodeo Creek Gulch	2.39	0.97	1.35	0.55	3.76	1.52	6.15	2.49	5.11	2.07
Arana Gulch	6.30	2.55	4.49	1.82	15.67	6.34	21.98	8.89	20.17	8.16
Tributary to Arana Gulch at Sta 175+98	0.38	0.15	0.15	0.06	1.66	0.67	2.04	0.83	1.81	0.73
Tributary to Arana Gulch at Sta 177+92	0.70	0.29	0.24	0.10	2.68	1.09	3.39	1.37	2.92	1.18
Tributary to Arana Gulch at Sta 183+01	3.00	1.22	0.00	0.00	8.23	3.33	11.23	4.54	8.23	3.33

Table 18. Increase in Impervious Areas for Transportation Systems Management and High Occupancy Vehicle Lane Alternatives in Comparison to Overall Watershed Areas

Crossing	Increased Impervious Area				Overall Watershed Area		Percentage Increase in Overall Watershed Area	
	HOV Lane (acres)	HOV Lane (ha)	TSM (acres)	TSM (ha)	(acres)	(ha)	HOV Lane	TSM
Unnamed Water of the U.S.	0	0	0	0	Not available		Not calculated	Not calculated
Valencia Channel	9.19	3.72	1.77	0.72	Not available		Not calculated	Not calculated
Valencia Creek	3.40	1.38	0.44	0.18	4,106	1,662	0.08%	0.01%
Aptos Creek	10.56	4.27	5.32	2.15	15,360	6,216	0.07%	0.03%
Ord Gulch	1.89	0.76	1.11	0.45	156	63	1.21%	0.71%
Pot Belly Creek	0.86	0.35	0.61	0.25	82	33	1.05%	0.75%
Borregas Creek	1.37	0.55	0.99	0.40	116	47	1.18%	0.85%
Tannery Gulch	1.73	0.70	0.83	0.33	797	323	0.22%	0.10%
Unnamed tributary to Tannery Gulch	1.86	0.75	0.49	0.20	146	59	1.28%	0.34%
Nobel Creek	5.90	2.39	1.71	0.69	614	248	0.96%	0.28%
Soquel Creek	13.79	5.58	2.27	0.92	27,520	11,137	0.05%	0.01%
Rodeo Creek Gulch	2.39	0.97	1.35	0.55	1,572	636	0.15%	0.09%
Arana Gulch	6.30	2.55	4.49	1.82	2,239	906	0.28%	0.20%
Tributary to Arana Gulch at Sta 175+98	0.38	0.15	0.15	0.06	71	29	0.53%	0.21%
Tributary to Arana Gulch at Sta 177+92	0.70	0.29	0.24	0.10	113	46	0.62%	0.21%
Tributary to Arana Gulch at Sta 183+01	3.00	1.22	0.00	0.00	Not available		Not calculated	Not calculated

4.1.5 Permanent Impacts to Groundwater

The proposed widening required for the Tier I project may have localized impacts to the flow of groundwater. Existing groundwater recharge areas within the Tier I project limits would be slightly affected due to the increase in impervious areas, which decreases the amount of areas available for infiltration. The High Occupancy Vehicle Lane Alternative would have more potential permanent effects to groundwater than the Transportation Systems Management Alternative due to the larger added impervious areas proposed. However, the impacts would not be significant in comparison to the overall groundwater area and due to the highly variable nature of the existing groundwater flow paths. In addition, because groundwater resources in the area do not represent a sole source aquifer, no significant impacts to water quality in groundwater wells are anticipated.

4.1.6 Permanent Impacts to Water Resources

Areas for culvert extension and bridge widening within jurisdictional wetlands and Waters of the United States and State also have permanent water quality impacts due to permanent filling of existing water resources. In addition, removal of riparian vegetation and stream bank modification can also lead to increased erosion. Both Build Alternatives have the potential to cause permanent impacts to the United States Army Corps of Engineers, California Department of Fish and Wildlife, and California Coastal Commission jurisdictional areas associated with creeks and drainages that cross or are located adjacent to the Tier I project area (Wetland Assessment, 2004); this is discussed in Section 3.1.6 of this report. The permanent impacts include the loss of biotic/aquatic (wetland) areas serving important water quality or water resources functions, changes to the stream bank configurations, and the loss of riparian habitat from the existing waterways. These potential permanent impacts are the result of road widening, bridge construction, culvert extensions, realignment of existing roadways, construction of new road sections, or additional discharge of storm water. Due to its larger footprint, the proposed High Occupancy Vehicle Lane Alternative has the potential to cause more permanent water quality impacts than the Transportation Systems Management Alternative.

4.2 Tier II Project

4.2.1 Temporary Impacts to Storm Water

The Tier II construction activities, such as grading and vegetation removal, can increase erosion and can temporarily impact water quality through storm water runoff. Storm water runoff from the Tier II project drains into Soquel Creek, Rodeo Creek Gulch, and Arana Gulch, and eventually discharges to Monterey Bay. A larger disturbed soil area has a higher potential for temporary water quality impacts. The Tier II project has a disturbed soil area of approximately 18.5 acres, which is lower than the disturbed soil areas of either alternative of the Tier I project. Section 4.1.1 discusses the Tier I temporary water quality impacts; the Tier II project is a smaller project and would have fewer impacts than the Tier I project.

4.2.2 Temporary Impacts to Groundwater

The proposed Tier II project does not involve substantial excavations that affect groundwater. Excavation work for the Tier II proposed widening mostly involves roadbed construction and footings for the proposed pedestrian overcrossing and retaining walls. Two of the retaining walls would span Rodeo Creek Gulch. Rodeo Creek Gulch is a perennial stream, as shown on the United States Geological Survey topography maps. Because Rodeo Creek Gulch is a perennial stream, dewatering may be necessary for construction within the creek. Section 4.1.2 discusses the Tier I temporary groundwater impacts; the Tier II project is a smaller project and would have fewer impacts than the Tier I project.

4.2.3 Temporary Impacts to Water Resources

The proposed Tier II project includes two new retaining walls within jurisdictional biotic/aquatic areas along the northbound side of Route 1. This proposed change would have a permanent impact on water quality due to permanent filling of the existing water resources, as shown in Figure 8. Permanent and Temporary Impacts to Water Resources at Rodeo Gulch and Figure 9. Additional potential temporary impacts may occur with temporary streambed disturbance, including the installation and removal of a temporary creek diversion system. Permanent and temporary impacts to jurisdictional areas identified within the Tier II project are shown in Table 19. Section 4.1.3 and Tables 15 and 16 discusses the Tier I temporary water quality impacts to jurisdictional areas, and show the Tier I project permanent and temporary impacts to jurisdictional areas; the Tier II project is a smaller project than the Tier I project and would have fewer impacts.

Table 19. Jurisdictional Waters/Wetlands within the Tier II Project Biological Study Area

Site No.	Jurisdictional Area	Impacts to CDFW Jurisdiction	
	(Outside Coastal Zone)	Permanent (Acre)	Temporary (Acre)
10a	Rodeo Gulch	0.13	0.09
10b	Soquel Drive-In roadside Ditch	0.02	0.06
CDFW Jurisdiction- Impact Totals		0.15	0.15

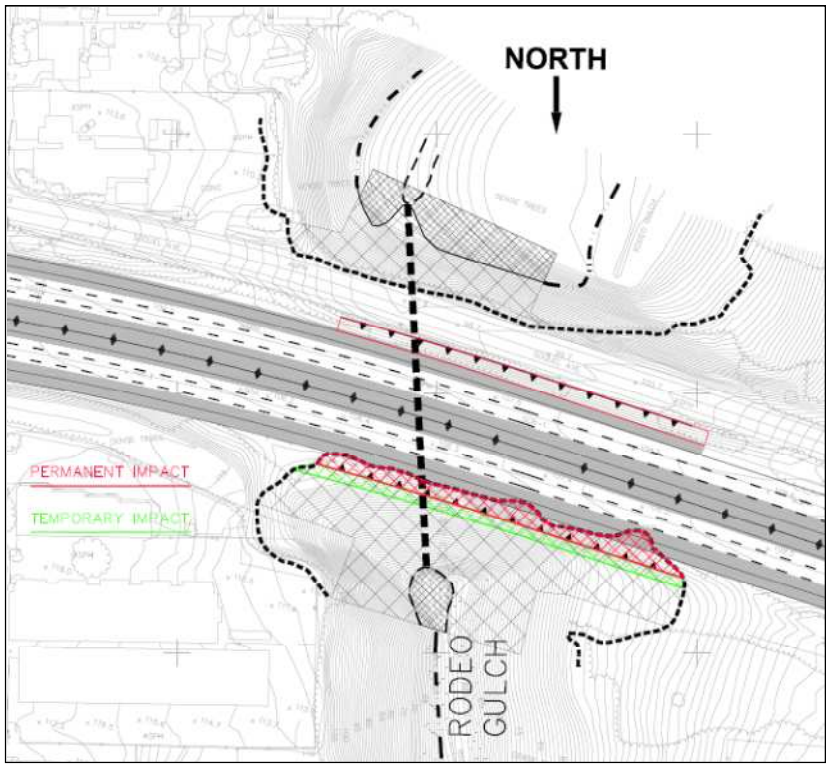

Figure 8. Permanent and Temporary Impacts to Water Resources at Rodeo Gulch

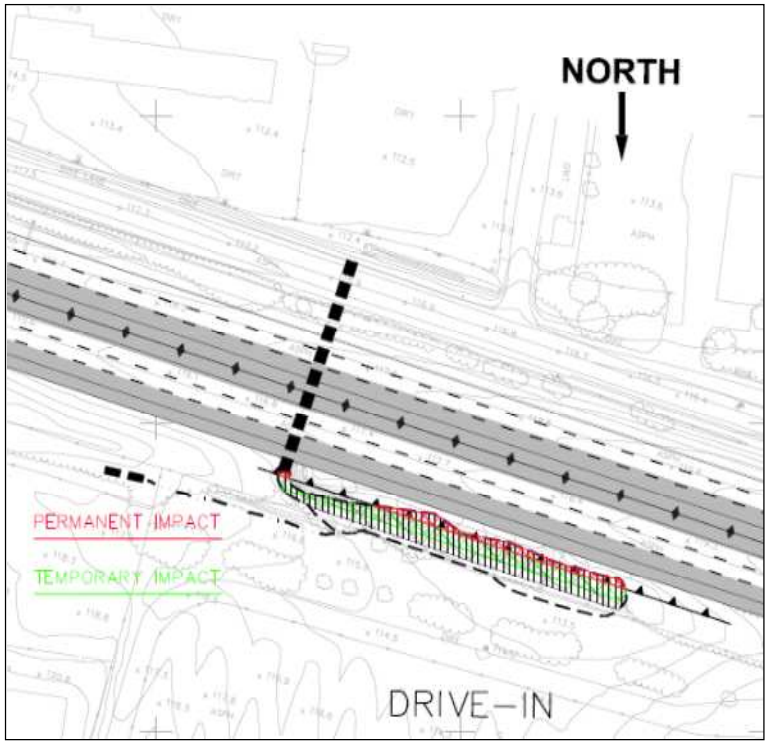

Figure 9. Permanent and Temporary Impacts to Water Resources at Soquel Drive-In Roadside Ditch

4.2.4 Permanent Impacts to Storm Water

Highway widening projects increase impervious areas and therefore potentially increase the volume and velocity of storm water flow to downstream receiving water bodies. The Tier II project proposes an increase in impervious area of 4.89 acres. Storm water runoff volumes and velocities from the Tier II project area are expected to increase with the implementation of the Tier II project due to the increase in impervious surfaces (see Table 20). However, in comparison with the overall watershed of the creeks, the increase in flow due to the proposed widening of the highway would be less than significant (see Table 21). The Tier II project's design goal is to maintain pre-construction storm water discharge flows by promoting infiltration and metering or detaining flows to pre-construction rates prior to discharge to a receiving water body or to a Municipal Separate Storm Sewer System. By meeting this design goal, permanent water quality impacts are not expected to be significant. In addition, the Tier II project proposes less added impervious area than the Tier I project and is expected to have fewer impacts. The Tier I project permanent storm water impacts are discussed in Section 4.1.4.

Table 20. Increase in Impervious Area in Comparison to Existing Impervious Watershed Area – Tier II Project

Location	Increased Impervious Area from Tier II Project (sq mi)	Existing Impervious Watershed Area (sq mi)	Proposed Impervious Watershed Area from Tier II Project (sq mi)
Soquel Creek	0.0019	0.031	0.032
Rodeo Creek Gulch	0.0029	0.006	0.009
Arana Gulch	0.0028	0.024	0.027

Table 21. Increase in Impervious Area in Comparison to Overall Watershed – Tier II Project

Location	Increased Impervious Area from Tier II Project (sq mi)	Existing Overall Watershed Area (sq mi)	Increase in Overall Watershed Area (%)
Soquel Creek	0.0019	43	0.005
Rodeo Creek Gulch	0.0029	2.5	0.12
Arana Gulch	0.0028	3.5	0.08

4.2.5 Permanent Impacts to Groundwater

The permanent impacts of the Tier I project to groundwater are discussed in Section 4.1.5. The Tier II project is a smaller project than the Tier I project, and would have fewer permanent impacts to groundwater.

4.2.6 Permanent Impacts to Water Resources

The proposed Tier II project includes two new retaining walls within jurisdictional biotic/aquatic areas along the northbound side of Route 1. This proposed change would have a permanent

impact on water quality due to permanent filling of the existing water resources, as shown in Figure 8. Permanent and Temporary Impacts to Water Resources at Rodeo Gulch and Figure 9, and quantified in Table 19. The proposed mitigation for the Tier II project impacts to jurisdictional areas is discussed in the *Wetland Assessment Report.* Section 4.1.6 discusses the Tier I project permanent water quality impacts to jurisdictional areas; the Tier II project is a smaller project than the Tier I project, and would have fewer impacts.

5 AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

5.1 Tier I Project

The Tier I project has evaluated a number of alternatives and has focused on two alternatives, which have considered avoiding or minimizing environmental impacts while maintaining the Tier I project's need and purpose. This Tier I project would have less than significant impacts to water quality with the following avoidance, minimization, and proposed mitigation measures incorporated.

5.1.1 Avoidance and/or Minimization Measures for Water Resources

Avoidance measures for the Tier I project were evaluated through preliminary consultation with local and regulatory agencies. There are wetlands and Waters of the United States and State within the Tier I project limits that are anticipated to be impacted. Other Environmentally Sensitive Areas (ESAs) that could have water quality impacts if disturbed include critical areas such as floodplains or disturbance of problem soils and steep slopes. Measures to minimize impacts to wetlands and Waters of the United States were done through consultation with regulatory partners and subsequent design modifications, such as the use of retaining walls. The Tier I project would maximize the avoidance of Environmentally Sensitive Areas that exist within or are adjacent to the Tier I project limits. Delineation of these areas can be achieved through field verification. Once verified, these locations would be delineated on all Tier I project contract plans.

In addition, all proposed construction work in jurisdictional areas would be scheduled per regulatory construction windows to minimize impacts.

5.1.2 Avoidance and/or Minimization Measures for Storm Water and Groundwater

The overall design features for water quality impacts is a condition of California Department of Transportation' National Pollutant Discharge Elimination System permit with the State Water Resource Control Board and other regulatory agencies requirements. Implementation of details for these design features or Best Management Practices would be developed and incorporated into the Tier I project design and operations prior to the Tier I project startup. With the proper implementation of these design features or Best Management Practices, short-term construction-related water quality impacts and permanent water quality impacts would be avoided or minimized.

5.1.2.1 Construction General Permit

In accordance with the Construction General Permit, this Tier I project is required to perform a risk assessment and determine the Tier I project risk level. Due to the length of the Tier I project and multiple receiving water bodies, multiple risk assessments were completed based on the Tier

I project planning watersheds. Table 22 lists the planning watersheds and risk factors used to determine the risk levels for the Tier I project.

Table 22. Risk Assessment by Planning Watershed – Tier I Project

Planning watershed	R	K	LS	Sediment Risk	Receiving Water Risk	Risk Level
Corralitos Lagoon	452	0.15	3.86	High	Low	2
Valencia Creek	469	0.15	3.89	High	High	3
Rio Del Mar	477	0.32	2.86	High	High	3
Borregas Creek	485	0.32	2.17	High	Low	2
Soquel Point	518	0.32	1.51	High	High	3
Mouth of San Lorenzo	575	0.32	1.59	High	High	3

The sediment risk factor is determined from the product of the rainfall runoff erosivity factor (R), the soil erodibility factor (K), and the length-slope factor (LS). The R factor was determined based on the United States Environmental Protection Agency's " Rainfall Erosivity Waiver Fact Sheet," and the K and LS factors were determined from the California Department of Transportation "Construction General Permit Info" GIS mapping system. See Figure 10 and Figure 11 for K Factor and L Factor determination, respectively. The sediment risk is HIGH for all the planning watersheds because the product of the R, K, and LS factors is greater than 75.

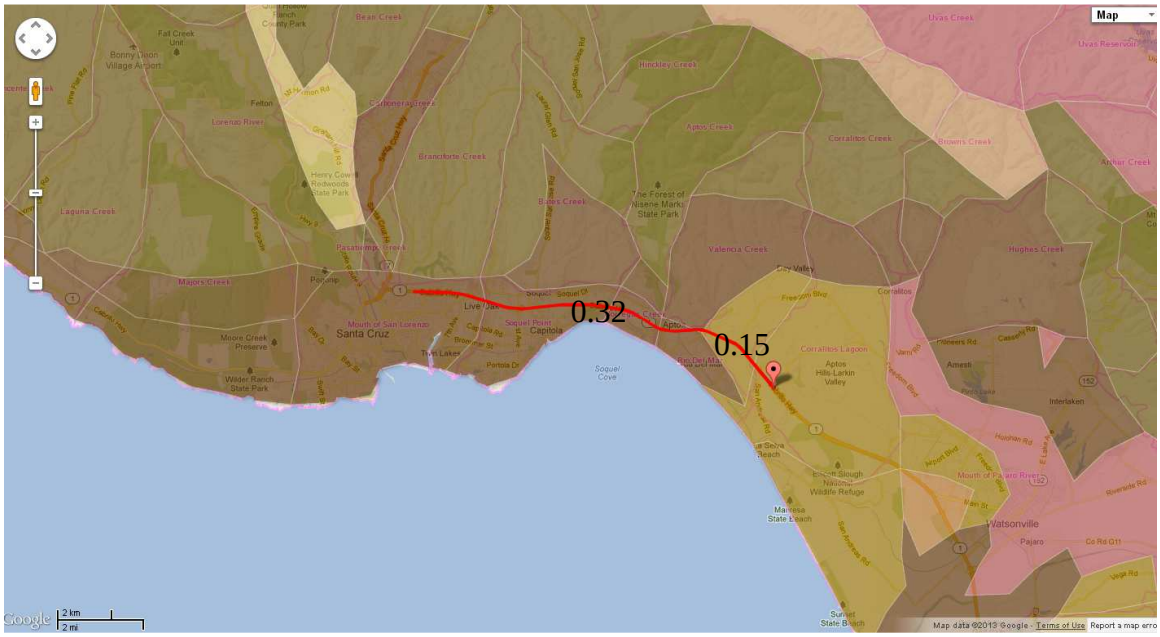

Figure 10. K Factor (for all planning watersheds)

Source: California Department of Transportation

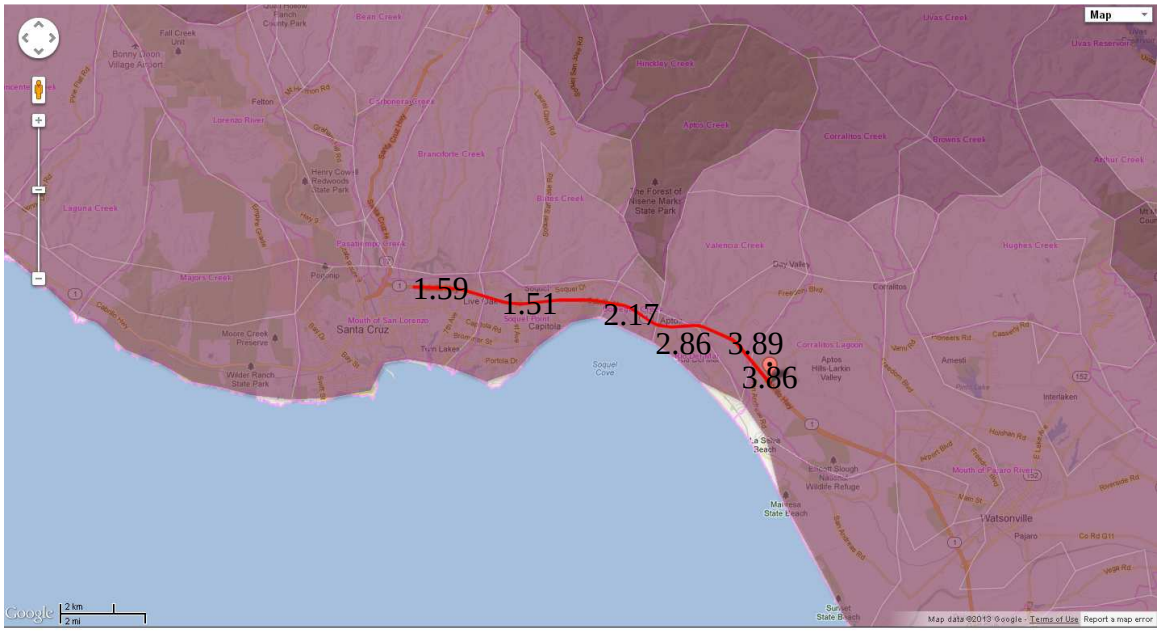

Figure 11. LS Factor (for all planning watersheds)

Source: California Department of Transportation

The receiving water risk can be classified as low or high. The receiving water risk was determined from the California Department of Transportation "Construction General Permit Info" GIS mapping system. The receiving water risks are confirmed by examining whether the Tier I project receiving water bodies are on the 303(d) List for sedimentation/siltation and/or have the beneficial uses of COLD, SPWN and MIGR.

Storm water sampling is required at all discharge locations for this Tier I project. Numeric Action Levels are applicable to Risk Level 2 and 3 areas, and Numeric Effluent Limitations are applicable to Risk Level 3 areas. Both Risk Level 2 and 3 areas would require compulsory storm water runoff pH and turbidity monitoring. This Tier I project may be required to incorporate bioassessment monitoring for impaired receiving waters within Risk Level 3 areas with a disturbed soil area greater than 30 acres. If required, bioassessment monitoring would be performed both upstream and downstream of the impacted area before and after construction. Appendix 3 of the Construction General Permit outlines requirements for the analysis, which should be identified in the Water Quality Assessment Report (WQAR) and included in the Environmental Compliance Record.

Preliminary risk level assessment has determined that this Tier I project has both Risk Level 2 and Risk Level 3 areas. As this 8.9-mile corridor is separated into portions, each will have a new risk level assessment preformed along with a separate assessment of treatment Best Management Practices and hydromodification requirements.

5.1.2.2 California Department of Transportation Standard Procedures and Practices

As previously stated, the Transportation Systems Management and the High Occupancy Vehicle Lane Alternatives are both major reconstruction projects. The Transportation Systems

Management Alternative has an estimated Disturbed Soil Area of 101 acres (41 hectares) and the High Occupancy Vehicle Lane Alternative has an estimate of 250 acres (101 hectares). The Tier I project is classified as a major reconstruction project. Measures will be considered to address potential temporary, as well as permanent water quality impacts. According to California Department of Transportation' National Pollutant Discharge Elimination System permit and the Construction General Permit, Best Management Practices will be incorporated into the contract documents of this Tier I project to reduce the discharge of pollutants temporarily, during construction, and permanently to the Maximum Extent Practicable. California Department of Transportation' Storm Water Handbooks, including the Project Planning and Design Guide (2010 with May 2012 Revisions), provide guidance for evaluating projects to determine the need for and feasibility of Best Management Practices, Design Pollution Prevention Best Management Practices, and Permanent Treatment Best Management Practices. Construction Site Best Management Practices are implemented during construction activities to reduce pollutants in storm water discharges throughout construction. Design Pollution Prevention Best Management Practices are permanent measures to improve storm water quality by reducing erosion, stabilizing disturbed soil areas, and maximizing vegetated surfaces. Treatment Best Management Practices are permanent devices and facilities that treat storm water runoff.

5.1.2.3 Project Construction

Because the Transportation Systems Management and the High Occupancy Vehicle Lane Alternatives would involve soil disturbance of more than 1 acres (0.4 hectares), a Notification of Intent would need to be filed with the State Water Resources Control Board's Storm Water Multiple Application and Report Tracking System. This Tier I project does not qualify for a low rainfall erosivity waiver. California Department of Transportation would require its contractors to implement a Storm Water Pollution Prevention Plan to comply with the conditions of the California Department of Transportation National Pollutant Discharge Elimination System permit and to address the temporary water quality impacts resulting from the construction activities associated with this Tier I project.

The Storm Water Pollution Prevention Plan would be submitted by the contractor and approved by California Department of Transportation prior to the start of construction. It is intended to address construction-phase impacts. The Storm Water Pollution Prevention Plan required for this Tier I project will include the following elements:

- Project Description – The project description will include maps and other information related to construction activities and potential sources of pollutants.
- Minimum Construction Control Measures – These measures may include limiting construction access routes, stabilizing areas denuded by construction, and using sediment controls and filtration.
- Erosion and Sediment Control – The Storm Water Pollution Prevention Plan is required to contain a description of soil stabilization practices, control measures to prevent a net increase in sediment load in storm water, controls to reduce tracking sediment onto roads, and controls to reduce wind erosion.

- Non-Stormwater Management – The Storm Water Pollution Prevention Plan will include provisions to reduce and control discharges other than storm water.
- Post-Construction Stormwater Management – The Storm Water Pollution Prevention Plan will include a list of storm water control measures that will provide ongoing (permanent) protection for water resources.
- Waste Management and Disposal – The Storm Water Pollution Prevention Plan will include a waste management section including equipment maintenance waste, used oil, batteries, etc. All waste must be disposed of as required by state and federal law.
- Maintenance, Inspection, and Repair – The Storm Water Pollution Prevention Plan requires an ongoing program to ensure that all controls are in place and operating as designed.
- Monitoring – This provision requires documented inspections of the control measures
- Reports – The contractor will prepare an annual report on the construction project and submit this report on July 15 each year. This report will be submitted on the Storm Water Multiple Application and Report Tracking System to the State Water Resources Control Board.
- Training – The Storm Water Pollution Prevention Plan will provide documentation on the training and qualifications of the designated Qualified Storm Water Pollution Prevention Plan Developer and Qualified Storm Water Pollution Prevention Plan Practitioner. Trained personnel must do inspections, maintenance, and repair of construction site Best Management Practices.
- Construction Site Monitoring Program – The Storm Water Pollution Prevention Plan will include a Construction Site Monitoring Program detailing the procedures and methods related to the visual monitoring and sampling and analysis plans for non-visible pollutants, sediment and turbidity, pH, suspended sediment concentration, and bioassessment.

To obtain permit coverage under the Construction General Permit, all dischargers must electronically file Project Registration Documents, Notice of Termination, changes of information, sampling and monitoring information, annual reporting, and other compliance documents required through the State Water Resources Control Board's Storm Water Multiple Application and Report Tracking System.

California Department of Transportation is required to reduce pollutants in storm water discharges to Maximum Extent Practicable levels. For discharges from a construction site, pollutants must be reduced using Best Available Technology Economically Feasible; and conventional pollutants must be reduced using Best Conventional Technology.

5.1.2.4 List of Proposed Temporary Construction Site Best Management Practices

Potential temporary impacts to water quality can be prevented or minimized by implementing standard Best Management Practices recommended for a particular construction activity. The selected temporary Best Management Practices are consistent with the practices required under the Construction General Permit and California Department of Transportation' National Pollutant Discharge Elimination System General Permit for Storm Water Discharges Associated

with Construction Activities and are intended to achieve compliance with the requirements of the permits. Compliance with the requirements of these Permits, as well as adherence to the conditions, reduces or avoids potentially significant construction-related impacts.

Adverse impacts can occur during construction-related activities. Soil erosion, especially during heavy rainfall, can increase the suspended solids, dissolved solids, and organic pollutants in storm water runoff generated within the Tier I project area. These conditions will likely persist until completion of construction activities and implementation of long-term erosion control measures.

The Tier I project site is adjacent to Environmentally Sensitive Areas. The use of Environmentally Sensitive Area fencing will be provided to prohibit disturbance in these areas.

Due to bridge widening over creeks, dewatering or temporary creek diversions may be necessary. Contract documents shall address any necessary permits for dewatering measures. Scheduling is also a Best Management Practice that needs to be considered for this Tier I project. All work done in wetlands or Waters of the United States or Waters of the State will need to be scheduled according to the appropriate regulatory agency requirements.

Non-stormwater waste management is also essential to minimize the potential for water quality impacts on the Project site. Accidental spills of petroleum hydrocarbons (such as fuels and lubricating oils), concrete wastewater, and possibly sanitary wastes are also of concern during construction activities. An accidental release of these wastes can adversely affect surface water quality, vegetation, and wildlife habitat.

A spill on the roadway will trigger immediate response actions to report, contain, and mitigate the incident. The California Office of Emergency Services has developed a Hazardous Materials Incident Contingency Plan, which provides a program for response to spills involving hazardous materials. The plan designates a chain of command for notification, evacuation, response, and cleanup of spills. California Department of Transportation also has spill contingency procedures and response crews.

Potential installation of active treatment systems at sites identified as potential areas of contamination may be required for this Tier I project. An active treatment system may be required if these locations have any potential impacts to surface water or groundwater quality. The Construction General Permit provides updated requirements for active treatment system design and provides specific Numeric Effluent Limitations for turbidity. The use of active treatment systems would be further analyzed during the design phase.

Temporary erosion and sediment control measures can be applied to all exposed areas during construction, including the trapping of sediments within the construction area through the placing of barriers, such as temporary large sediment barriers, at the perimeter of downstream drainage points or through the construction of temporary detention basins. Other methods of minimizing erosion impacts include the implementation of hydromulching and/or limiting the amount and length of exposure of graded soil. In addition to these erosion control measures, the

use of compost is strongly encouraged by California Department of Transportation. Compost not only improves erosion resistance and vegetation establishment, but it also helps immobilize heavy metals that are common among the highways. Compost can be considered or specified at the design phase of the Tier I project. The California Department of Transportation Project Planning and Design Guide (2010 with May 2012 Revisions) describes approved erosion control Best Management Practices. Temporary erosion control and water quality measures will be defined in detail in the Erosion Control and Water Pollution Control design sheets prepared for the Tier I project, which will also include the specifications for the Storm Water Pollution Prevention Plan. The proposed construction site Best Management Practices will be reviewed and approved by the Construction Stormwater Coordinator during the Plans, Specifications and Estimate phase.

Included in Table 23 is the suggested minimum temporary control Best Management Practices that will be necessary for the Tier I project, per the Project Planning and Design Guide. Further evaluation of the Best Management Practices necessary for this Tier I project to comply with the Construction General Permit and California Department of Transportation' permit will be detailed during the Plans, Specifications and Estimate phase. Furthermore, during construction the Contractor will be required to detail in the Storm Water Pollution Prevention Plan actual in-field implementation of Best Management Practices, plus amend the Storm Water Pollution Prevention Plan as necessary to match field conditions and phasing of the Tier I project.

Table 23. Temporary Construction Site Best Management Practices

Temporary Best Management Practices	Purpose	Cost Type
Soil Stabilization		
Move-In/Move-Out (temporary erosion control)	Mobilization locations where permanent erosion control or re-vegetation to sustain slopes is required within the projects.	Bid Item
Temporary Fence (Type ESA)	High visibility fence to designate areas off-limits to the contractor.	Bid Item
Scheduling	Sequencing of construction activities with the implementation of construction site Best Management Practices	
Preservation of Existing Vegetation	Minimization of disturbance on construction sites, erosion control, detention, and infiltration of storm water, biofiltration, velocity dissipation and aesthetic value.	
Hydraulic Mulch (Bonded Fiber Matrix)	Applied to disturbed areas to protect exposed soil from erosion by raindrop impact or wind.	Bid Item
Sediment Control		
Temporary Fiber Rolls	Degradable fibers rolled tightly and placed on the toe and face of slopes to intercept runoff.	Bid Item
Temporary Large Sediment Barriers	Linear, permeable fabric barriers to intercept sediment-laden sheet flow. Placed down slope of exposed soil areas, along channels and project perimeter.	Bid Item
Temporary Gravel Bag Berm	Single row of gravel bags installed end to end to form a barrier across a slope to intercept runoff. Can be used to divert or detain moderately	Bid Item

Temporary Best Management Practices	Purpose	Cost Type
	concentrated flows.	
Temporary Check Dams	Small constructed device of rock or other product placed across a channel or ditch to reduce flow velocity.	Bid Item
Temporary Drainage Inlet Protection	Runoff detainment devices used at storm drain inlets that is subject to runoff from construction activities.	Bid Item
Tracking Control		
Temporary Construction Entrances/Exits	Points of entrance/exit to a construction site that are stabilized to reduce the tracking of mud and dirt onto public roads.	Bid Item
Street Sweeping	Removal of tracked sediment to prevent them entering a storm drain or watercourse.	Bid Item
Non-Stormwater Management		
Temporary Creek Diversion	For work within live creeks. Prevents sediment and water from disrupting construction activities.	Bid Item
All other anticipated non-stormwater management measures are covered under the Job Site Management lump sum**.**		
Waste Management and Materials Pollution Control		
Temporary Concrete Washout Facilities	Specified vehicle washing areas to contain concrete waste materials.	Bid Item
All other anticipated waste management and materials pollution control measures are covered under the Job Site Management lump sum.		
Job Site Management		
Controlling potential sources of water pollution before these pollutants come in contact with storm water systems or watercourses. Covers: • spill prevention and control • materials management • stockpile management • waste management • hazardous waste management • contaminated soil • concrete waste • sanitary and septic waste and liquid waste Non-stormwater management consists of: • water control and conservation • illegal connection and discharge detection and reporting • vehicle and equipment cleaning • vehicle and equipment fueling and maintenance • material and equipment used over water • structure removal over or adjacent to water • paving, sealing, saw cutting and grinding operations • thermoplastic striping and pavement markers • concrete curing and concrete finishing Miscellaneous job site management includes: • training of employees and subcontractors • proper selection, deployment and repair of construction site Best Management Practices		Lump Sum

Several other Temporary Water Quality or Construction Site Best Management Practices are listed in the California Department of Transportation Statewide Storm Water Management Plan and each should be considered for inclusion as the design progresses.

5.1.2.5 Permanent Pollution Prevention Design Measures

In order to comply with the Statewide Permit (Order No. 99-06 DWQ), California Department of Transportation will take measures to reduce, to the maximum extent practicable, pollutant loadings from the facility once construction is complete. The permit stipulates that permanent measures that control pollutant discharges must be considered and implemented for all new or reconstructed facilities. Permanent control measures located within California Department of Transportation right-of-way reduce pollutants in storm water runoff from the roadway. These measures reduce the suspended particulate loads, and thus prevent pollutants associated with the particulates from entering waterways. The measures will be incorporated into the final engineering design or landscape design of the Tier I project and will take into account expected runoff from the roadway. In addition, the National Pollutant Discharge Elimination System permit also stipulates that an operation and maintenance program be implemented for permanent control measures. This category of water quality control measures can be identified as including both Design Pollution Prevention Best Management Practices and Treatment Best Management Practices.

Many design elements that are traditionally part of highway, drainage, and landscape design for a project are considered beneficial to pollution prevention. The particular discipline designers must consider all of the items listed below in the proper project design. In addition, the following elements should be considered with respect to the potential water quality impacts:

5.1.2.6 List of Proposed Design Pollution Prevention Best Management Practices

- Consideration of downstream effects related to potentially increased flow – The Tier I project would discharge into unlined channels; therefore, necessary erosion control should be applied to the ditches. Increased sediment loads may be transported to downstream waterways; therefore, permanent erosion control measures should be applied to all new or exposed slopes as soon as field conditions permit.
- Preservation of existing vegetation – At all locations, preserving existing vegetation is beneficial. At proposed permanent storm water treatment Best Management Practice locations, existing trees and branches will generally be removed unless they are delineated as sensitive environmental resources to be preserved. The following general steps should be taken to preserve existing vegetation during the design phase (California Department of Transportation, 2010):

    a) Identify and delineate in contract documents all vegetation to be retained

    b) Designer should provide specification in contract documents that the Contractor shall delineate the areas to be preserved in the field prior to the start of soil-disturbing activities

c) Designer should provide specification in contract documents that the Contractor shall minimize disturbed areas by locating temporary roadways to avoid stands of trees and shrubs and to follow existing contours to reduce areas of cut and fill

d) Designer should, when specifying the removal of vegetation, consider provisions included in the contract documents to minimize impacts (increased exposure or wind damage) to the adjacent vegetation that will be preserved

- Concentrated flow conveyance systems – The Tier I project would:
  a) have the potential to create water gullies
  b) create or modify existing slopes
  c) require the concentration of surface runoff
  d) require cross drains

  Each of these conditions will require the proper design of these drainage facilities to handle concentrated flows:
  - Ditches, berms, dikes, and/or swales
  - Overside drains
  - Flared end sections
  - Outlet protection/velocity dissipation devices
- Slope/surface protection systems – The Tier I project would create or modify existing slopes requiring the application of one or more of the following control measures:
  a) Vegetated surfaces
  b) Hard surfaces
- Visual impacts due to the incorporation of permanent stormwater treatment Best Management Practices – All flat areas as proposed permanent stormwater treatment Best Management Practice locations will potentially be impacted. Bio-filtration type Best Management Practices will require no plantings higher than low ground covers. Overhanging branches from trees or shrubs will be removed as a requirement. Extensive removal of existing trees and shrubs at interchanges for treatment Best Management Practice placement may be expected. For structural type treatment Best Management Practices (i.e. Austin sand filters), all vegetation may be removed. Any trees or shrubs that encroach on the treatment Best Management Practices will be removed for the life of the facility. A significant visual change from the existing condition may be expected due to the complete retrofit of this 8.9-mile corridor under Tier I project with permanent stormwater treatment Best Management Practices.

5.1.2.7 List of Proposed Treatment Best Management Practices

This Tier I project is considering treatment Best Management Practices because it is a major reconstruction project that directly or indirectly discharges to a surface water body and creates more than 1 acre (0.4 hectares) of impervious surfaces.

The California Department of Transportation Project Planning Design Guide (2010 with May 2012 Revisions) provides updated guidance for determination of preferred treatment Best Management Practices based on the estimated ability of a Best Management Practice to infiltrate

the water quality volume. The methodology prefers the use of biofiltration devices that can potentially infiltrate over 90% of the water quality volume, using either native or amended soils. If biofiltration devices are estimated to infiltrate less than 90 percent of the water quality volume, then infiltration devices should be evaluated. If infiltration devices are estimated to infiltrate less than 90 percent of the water quality volume, then earthen Best Management Practices (detention devices and Austin sand filters) should be evaluated for the percent of water quality volume infiltrated. The preferred treatment devices for this Tier I project would be biofiltration devices or infiltration devices (if the device infiltrates over 90 percent of the water quality volume); otherwise, "Best Management Practice Selection Matrix A," of the Project Planning Design Guide should be used. Based on preliminary treatment analysis, the feasible treatment Best Management Practices for the Tier I project are biofiltration strips, infiltration devices, Austin sand filters, and detention devices. Potential park and ride lot facilities will be addressed with appropriate treatment Best Management Practices in the PS&E phase of the Tier I project.

Potential Treatment Best Management Practice locations are limited due to the following site conditions: Environmentally Sensitive Areas, Archeological/Architectural Areas of Potential Effect, steep slopes, and retaining/sound wall considerations. As such, the treatment of all newly created impervious areas is not currently feasible without further design efforts; further detailed drainage and storm water design efforts will be made during the design phase to achieve the required treatment of impervious area.

The project design team needs to discuss with the Office of Environmental Engineering and all other responsible functional groups considering Treatment Best Management Practices for this Tier I project. This consideration process will be documented and reported in the technical reports prepared during the design phase.

5.1.2.8 Project Operation and Maintenance

Because the California Department of Transportation Maintenance Unit is responsible for maintaining Route 1 and Best Management Practices facilities once the Tier I project is complete, the Maintenance Unit will be involved in the development process from conception through construction. The Maintenance Unit field representative has unique insight into local problems and maintenance and safety concerns. The California Department of Transportation Maintenance Unit typically comments on the following project-related issues:

- Drainage patterns (particularly known areas of flooding, debris, etc.)
- Stability of slopes and roadbed (help determine if the project can be built and maintained economically)
- Possible material borrow or spoil sites
- Concerns of the local residents
- Existing and potential erosion problems
- Facilities within the right-of-way that would affect alternative designs
- Special problems such as deer crossings, endangered species, etc.
- Whether facilities are safe to maintain
- Known environmentally sensitive areas

- Frequency of traction sand use and estimate of sand quantity applied annually

The Maintenance Stormwater Coordinator will be involved in the design review of any permanent stormwater treatment Best Management Practices and will need to approve any such devices at the end of the Plans, Specifications and Estimate phase.

5.1.3 Water Quality Assessment Checklists

This Water Quality Assessment Checklist is a summary of the storm water quality evaluation process presented in the California Environmental Quality Act Environmental Checklist Form.

The following list of questions is from the Hydrology and Water Quality Checklist from Section 8 of the California Environmental Quality Act Environmental Checklist Form. The possible answers are: "Potentially Significant Impact," "Less than Significant with Mitigation," "Less than Significant Impact," and "No Impact."

Would the project:

a) *Violate any water quality standards or waste discharge requirements?*

Less than Significant Impact

The primary potential for impacts to water quality is soil erosion or suspended solids being introduced into the waterways. The proposed project has a proposed soil disturbance of 1 ac (0.4 ha) or more, and therefore shall be regulated under the Construction General Permit (Order No. 2009-0009-DWQ, as amended by 2010-0014-DWG). Minimization measures that comply with the Construction General permit such as requiring the contractor to submit a Storm Water Pollution Prevention Plan prior to start of construction, will focus on the control of sediment and suspended solids from entering the waterways. In addition, California Department of Transportation' National Pollutant Discharge Elimination System permit requires the contractor to implement permanent Best Management Practices such as erosion control and treatment Best Management Practices in the project to address long-term impacts. Therefore, the proposed project would comply with all water quality standards and waste discharge requirements, and the impact to water quality would be less than significant.

b) *Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?*

Less than Significant Impact

Groundwater recharge is reduced when the ground is compacted or when it is covered completely (by development) and less water can seep into the soil. The additional impervious area is small in relation with the size of the groundwater basin located within the project limits; therefore, groundwater recharge impacts would be insignificant for the Build Alternatives. For the High Occupancy Vehicle Lane Alternative, the additional impervious area is less than one percent of the overall groundwater basin area. In addition, because groundwater resources in the area do not represent a sole source aquifer, no significant impacts to water quality in groundwater wells are anticipated.

Implementing permanent Treatment Best Management Practices to the maximum extent practicable, such as infiltration basins and biofiltration strips and swales will also promote infiltration within the project limits.

c) *Substantially alter the existing drainage pattern of the site area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?*

Less Than Significant Impact

While existing culverts may be extended and/or replaced to accommodate the widened roadway, there would be no proposed changes to the existing drainage pattern. No stream or river would be altered such that substantial erosion or siltation would result. The objective of the drainage design is to limit the design water surface elevations and velocities to no greater than the existing conditions, or to what can be handled by the existing conditions, at the boundary of the proposed project. To maintain pre-construction storm water discharge flows, the Project would also need to match pre-construction storm water discharge flow rates and duration.

In addition, the following permits would be required for impacts to drainages within jurisdictional areas: United States Army Corps of Engineers 404 permit, 401 water quality certification from the Regional Water Quality Control Board, and a Streambed Alteration Agreement from the California Department of Fish and Wildlife. All permit requirements would ensure a less than significant impact to drainage patterns onsite. Long-term erosion and sediment controls will be addressed with the Design Permanent Treatment Best Management Practices. Short-term erosion and sediment controls will be addressed with the Construction Site Best Management Practices. These Best Management Practices will be implemented to ensure that sediment potential will not increase.

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 which would result in flooding on- or off-site?*

Less Than Significant Impact

Existing drainage patterns would be perpetuated. While the proposed project would introduce additional pavement/impervious surface area, the effect on the flow rate and amount of surface runoff would be negligible in comparison to the overall watershed of the receiving water bodies, and would not result in any flooding. The project's design goal is to maintain pre-construction storm water discharge flows by metering or detaining these flows to pre-construction rates prior to discharge to a receiving water body or to a Municipal Separate Storm Sewer System.

The T-1 Infiltration Tool will be used in the PS&E phase to determine if the project is meeting pre-construction storm water discharge flows. Structural measures will be taken, as necessary, to increase soil infiltration rates in order to meet the project's design goal.

e) *Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?*

Less than Significant

The proposed project would increase the total impervious surface within the proposed project limits, and therefore, increase the volume of storm water runoff. Potential sources of pollutants from the right-of-way include: total suspended solids, nutrients, pesticides, particulate metals, dissolved metals, pathogens, litter, biochemical oxygen demand, and total dissolved solids. Existing drainage facilities throughout the proposed project limits, however, will be extended, replaced, repaired, and/or improved as necessary to provide proper offsite and highway drainage. In compliance with California Department of Transportation' National Pollutant Discharge Elimination System requirements, water quality treatment Best Management Practices will be included where practicable, which include infiltration devices, detention basins, media filters, biofiltration swales, or biofiltration strips at various locations throughout the proposed project area. Asphalt concrete dikes will not be used for areas with side slopes flatter than 1:4 (V:H). This will allow the pavement runoff to flow across the vegetated slopes, and flow in the vegetated swales along the highway. The impact to runoff, therefore, would be less than significant.

f) *Otherwise substantially degrade water quality?*

Less than Significant Impact

The primary potential for impacts to water quality is soil erosion or suspended solids being introduced into the waterways. The proposed project has a soil disturbance of 1 ac (0.4 ha) or more, and therefore shall be regulated under the Construction General Permit (Order No. 2009-0009 DWQ, as amended by 2010-0014-DWG). Minimization measures that comply with the Construction General permit such as requiring the contractor to submit a Storm Water Pollution Prevention Plan prior to start of construction, will focus on the control of sediment and suspended solids from entering the waterways. In addition, California Department of Transportation' National Pollutant Discharge Elimination System permit requires the contractor to implement permanent Best Management Practices such as erosion control and treatment Best Management Practices in the project to address long-term impacts. Therefore, the proposed project would comply with all water quality standards and waste discharge requirements, and the impact to water quality would be less than significant.

5.2 Tier II Project

The Tier II project has focused on one build alternative, which has considered avoiding or minimizing environmental impacts while maintaining the Tier II project's need and purpose. This Tier II project would have less than significant impacts to water quality with the following avoidance, minimization, and proposed mitigation measures incorporated. Because both the Tier I and Tier II projects involve a soil disturbance greater than 1 acre in size and have overlapping locations, the information presented in Section 5.1 is applicable to both projects, unless otherwise stated below.

5.2.1 Avoidance and/or Minimization Measures for Water Resources

Section 5.1 discusses the avoidance, minimization, and proposed mitigation measures for the Tier I project. The Tier II project has an estimated disturbed soil area of 18.5 acres, and is classified as a major construction project. Because the Tier II project would involve a soil disturbance of more than 1 acre, a Storm Water Pollution Prevention Plan is necessary to comply

with the conditions of the Construction General Permit (Order No. 2009-0009 DWQ, as amended by 2010-0014-DWG). Minimization and/or mitigation measures discussed in Section 5.1.1 that are also applicable to the Tier II project include minimizing impacts to wetlands and Waters of the United States, implementing Best Management Practices to minimize impacts to water quality, determining the Tier II project risk level, and developing a Storm Water Pollution Prevention Plan.

5.2.2 Avoidance and/or Minimization Measures for Storm Water and Groundwater

The overall design features for water quality impacts are conditions of the California Department of Transportation' National Pollutant Discharge Elimination System permit with the State Water Resource Control Board and other regulatory agencies requirements. Implementation of details for these design features or Best Management Practices would be developed and incorporated into the Tier II project design and operations prior to the Tier II project startup. With the proper implementation of these design features or Best Management Practices, short-term construction related water quality impacts and permanent water quality impacts would be avoided or minimized.

5.2.2.1 Construction General Permit

In accordance with the Construction General Permit, the Tier II project is required to perform a risk assessment and determine the Tier II project risk level. Section 5.1.2.1 discusses the components of the risk assessment in detail. Because the Tier II project has multiple receiving water bodies, risk assessments were completed based on the Tier II project planning watersheds. The Tier II project is within the Soquel Point and Mouth of San Lorenzo planning watersheds.

Table 24 lists the planning watersheds and risk factors used to determine the risk levels for the Tier II project. The sediment risk is medium for both planning watersheds because the product of the R, K, and LS factors is greater than 15 but less than 75. The receiving water risk is classified as low or high, depending on whether the receiving water bodies are on the 303(d) List for sedimentation/siltation and/or have the beneficial uses of COLD, SPWN, and MIGR. Based on these risk assessments, the Tier II project was classified as Risk Level 2 and Risk Level 3.

The California Department of Transportation "Construction General Permit Info" GIS mapping system identifies the K factor for the Tier II project area as 0.32; this value is used for the risk level determination associated with the Construction General Permit. See Figure 10 and Figure 11 for K factor and L factor determinations, respectively.

Table 24. Risk Assessment by Planning Watershed – Tier II Project

Planning watershed	R	K	LS	Sediment Risk	Receiving Water Risk	Risk Level
Soquel Point - Tier II project	130	0.32	1.51	Medium	High	2
Mouth of San Lorenzo - Tier II project	136		1.59	Medium	High	2

5.2.3 Water Quality Assessment Checklist

Section 5.1.3 evaluates the Tier I project through the questions in the Hydrology and Water Quality Checklist from Section 8 of the California Environmental Quality Act Environmental Checklist Form. As shown in section 5.1.3 of the report, the Tier I project was determined to have a "Less than Significant" impact for all questions. Because the Tier II project is a smaller project than the Tier I project and is located within the Tier I project footprint, it would also have a less than significant impact.

6 PERMITS AND COORDINATION

6.1 Tier I Project

Permits from the following listed agencies are anticipated. Some of the agencies that issue these permits have differing jurisdiction over all or specific parts of the Tier I project, depending on the resources present at any one location along each Tier I project segment. Therefore, specific permit jurisdiction and requirements will be determined at the time applications are prepared or sought.

- California Coastal Commission Local Coastal Program-permit to discharge into Critical Coastal Areas
- California Department of Fish and Game, 1600-1607 Permit (Streambed Alteration Agreement) - Required for all work in streams
- Central Coast Regional Water Quality Control Board, 401 Permit (Water Quality Certification) - Impacts to Waters of the State
- City of Santa Cruz General Permit for Discharges of Storm Water from Small Municipal Separate Storm Sewer Systems
- Dewatering Permit. Based on the Initial Site Assessment for the project, three potential locations within the project limits were determined areas of concern. According to the Initial Site Assessment, these areas are potentially contaminated with existing hazardous waste. If these areas are excavated and are at or near a dewatering area, then groundwater testing may be required. Setting up monitoring wells will be considered at these three specific locations where excavation is proposed with anticipated high groundwater depths or at locations where treatment Best Management Practices are proposed, to verify whether those are feasible.
- National Oceanic and Atmospheric Administration Biological Opinion (for Fisheries)
- Santa Cruz County and City of Capitola Permit for Discharges of Storm Water from Small Municipal Separate Storm Sewer Systems
- State Water Resources Control Board Construction General Permit Order Number 2009-0009-DWQ, as amended by 2010-0014-DWG
- State Water Resources Control Board California Department of Transportation Statewide National Pollutant Discharge Elimination System Storm Water Permit (Order Number 99-06-DWQ)
- United States Army Corps of Engineers, 404 Permit - Required for all projects impacting the Waters of the United States below the ordinary high water line.

6.2 Tier II Project

Section 6.1 lists the agencies from which permits are anticipated for the Tier I project. Although the Tier II project is a smaller project, the same agencies are expected to require permits for the Tier II project.

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Appendix A Water Quality Objectives

Appendix A.1 Objectives for All Inland Surface Waters, Enclosed Bays, and Estuaries

OBJECTIVES FOR ALL INLAND SURFACE WATERS, ENCLOSED BAYS, AND ESTUARIES

GENERAL OBJECTIVES

The following objectives apply to all inland surface waters, enclosed bays, and estuaries of the basin:

Color
Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses. Coloration attributable to materials of waste origin shall not be greater than 15 units or 10 percent above natural background color, whichever is greater.

Tastes and Odors
Waters shall not contain taste or odor producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, that cause nuisance, or that adversely affect beneficial uses.

Floating Material
Waters shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.

Suspended Material
Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.

Settleable Material
Waters shall not contain settleable material in concentrations that result in deposition of material that causes nuisance or adversely affects beneficial uses.

Oil and Grease
Waters shall not contain oils, greases, waxes, or other similar materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect beneficial uses.

Biostimulatory Substances
Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.

Sediment
The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

Turbidity
Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses.

Increase in turbidity attributable to controllable water quality factors shall not exceed the following limits:

1. Where natural turbidity is between 0 and 50 Jackson Turbidity Units (JTU), increases shall not exceed 20 percent.

2. Where natural turbidity is between 50 and 100 JTU, increases shall not exceed 10 JTU.

3. Where natural turbidity is greater than 100 JTU, increases shall not exceed 10 percent.

Allowable zones of dilution within which higher concentrations will be tolerated will be defined for each discharge in discharge permits.

pH
For waters not mentioned by a specific beneficial use, the pH value shall not be depressed below 7.0 or raised above 8.5.

Dissolved Oxygen
For waters not mentioned by a specific beneficial use, dissolved oxygen concentration shall not be reduced below 5.0 mg/l at any time. Median values should not fall below 85 percent saturation as a result of controllable water quality conditions.

Temperature
Temperature objectives for Enclosed Bays and Estuaries are as specified in the "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California" including any revisions thereto. A copy of this plan is included in the Appendix.

Natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration in temperature does not adversely affect beneficial uses.

Toxicity
All waters shall be maintained free of toxic substances in concentrations which are toxic to, or which produce detrimental physiological responses in, human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, toxicity bioassays of appropriate duration, or other appropriate methods as specified by the Regional Board.

Survival of aquatic life in surface waters subjected to a waste discharge or other controllable water quality conditions, shall not be less than that for the same water body in areas unaffected by the waste discharge or, when necessary, for other control water that is consistent with the

requirements for "experimental water" as described in Standard Methods for the Examination of Water and Wastewater, latest edition. As a minimum, compliance with this objective shall be evaluated with a 96 hour bioassay.

In addition, effluent limits based upon acute bioassays of effluents will be prescribed where appropriate, additional numerical receiving water objectives for specific toxicants will be established as sufficient data become available, and source control of toxic substances is encouraged.

The discharge of wastes shall not cause concentrations of unionized ammonia (NH3) to exceed 0.025 mg/l (as N) in receiving waters.

Pesticides
No individual pesticide or combination of pesticides shall reach concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life.

For waters where existing concentrations are presently non-detectable or where beneficial uses would be impaired by concentrations in excess of non-detectable levels, total identifiable chlorinated hydrocarbon pesticides shall not be present at concentrations detectable within the accuracy of analytical methods prescribed in Standard Methods for the Examination of Water and Wastewater, latest edition, or other equivalent methods approved by the Executive Officer.

Chemical Constituents
Where wastewater effluents are returned to land for irrigation uses, regulatory controls shall be consistent with Title 22 of the California Code of Regulations and other relevant local controls.

Other Organics
Waters shall not contain organic substances in concentrations greater than the following:

Methylene Blue Activated Substances	0.2 mg/l
Phenols	0.1 mg/l
PCB's	0.3 mg/l
Phthalate Esters	0.002 mg/l

Radioactivity
Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life; or result in the accumulation of radionuclides in the food web to an extent which presents a hazard to human, plant, animal, or aquatic life.

OBJECTIVES FOR ALL INLAND SURFACE WATERS, ENCLOSED BAYS, AND ESTUARIES BASED ON BENEFICIAL USES:

Municipal and Domestic Supply (MUN)

pH

The pH value shall neither be depressed below 6.5 nor raised above 8.3.

Organic Chemicals

All inland surface waters, enclosed bays, and estuaries shall not contain concentrations of organic chemicals in excess of the limiting concentrations set forth in California Code of Regulations, Title 22, Chapter 15, Article 5.5, Section 64444.5, Table 5 and listed in Table 3-1.

Chemical Constituents

Waters shall not contain concentrations of chemical constituents in excess of the limits specified in California Code of Regulations, Title 22, Article 4, Chapter 15, Section 64435, Tables 2 and 3 as listed in Table 3-2.

Phenol

Waters shall not contain phenol concentrations in excess of 1.0 mg/l.

Radioactivity

Waters shall not contain concentrations of radionuclides in excess of the limits specified in California Code of Regulations, Title 22, Chapter 15, Article 5, Sections 64441 and 64443, Table 4.

Agricultural Supply (AGR)

pH

The pH value shall neither be depressed below 6.5 nor raised above 8.3.

Dissolved Oxygen

Dissolved oxygen concentration shall not be reduced below 2.0 mg/l at any time.

Chemical Constituents

Waters shall not contain concentrations of chemical constituents in amounts which adversely affect the agricultural beneficial use. Interpretation of adverse effect shall be as derived from the University of California Agricultural Extension Service guidelines provided in Table 3. Monthly Total Precipitation (in inches): Santa Cruz Station (No. 047916).

In addition, waters used for irrigation and livestock watering shall not exceed concentrations for those chemicals listed in Table 3 4. Salt concentrations for irrigation waters shall be controlled through implementation of the anti-degradation policy to the effect that mineral constituents of currently or potentially usable waters shall not be increased. It is emphasized that no controllable water quality factor shall degrade the quality of any groundwater resource or adversely affect long-term soil productivity.

Where wastewater effluents are returned to land for irrigation uses, regulatory controls shall be consistent with Title 22 of the California Code of Regulations and with relevant controls for local irrigation sources.

Water Contact Recreation (REC-1)
pH
The pH value shall neither be depressed below 6.5 nor raised above 8.3.

Bacteria
Fecal coliform concentration, based on a minimum of not less than five samples for any 30 day period, shall not exceed a log mean of 200/100 ml, nor shall more than ten percent of total samples during any 30 day period exceed 400/100 ml.

Non-Contact Water Recreation (REC-2)
pH
The pH value shall neither be depressed below 6.5 nor raised above 8.3.

Bacteria
Fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 2000/100 ml, nor shall more than ten percent of samples collected during any 30-day period exceed 4000/100 ml.

Cold Freshwater Habitat (COLD)
pH
The pH value shall not be depressed below 7.0 or raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters.

Dissolved Oxygen
The dissolved oxygen concentration shall not be reduced below 7.0 mg/l at any time.

Temperature
At no time or place shall the temperature be increased by more than 5oF above natural receiving water temperature.

Chemical Constituents
Waters shall not contain concentrations of chemical constituents known to be deleterious to fish or wildlife in excess of the limits listed in Table 3-5.

Warm Freshwater Habitat (WARM)
pH
The pH value shall not be depressed below 7.0 or raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters.

Dissolved Oxygen
The dissolved oxygen concentration shall not be reduced below 5.0 mg/l at any time.

Temperature

At no time or place shall the temperature of any water be increased by more than 5oF above natural receiving temperature.

Chemical Constituents
Waters shall not contain concentrations of chemical constituents known to be deleterious to fish or wildlife in excess of the limits listed in Table 3-5.

Fish Spawning (SPWN)
Cadmium
Cadmium shall not exceed .003 mg/l in hard water or .0004 mg/l in soft water at any time. (Hard water is defined as water exceeding 100 mg/l CaCO3.)

Dissolved Oxygen
The dissolved oxygen concentration shall not be reduced below 7.0 mg/l at any time.

Marine Habitat (MAR)
pH
The pH value shall not be depressed below 7.0 or raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.2 units.

Dissolved Oxygen
The dissolved oxygen concentration shall not be reduced below 7.0 mg/l at any time.

Chemical Constituents
Waters shall not contain concentrations of chemical constituents known to be deleterious to fish or wildlife in excess of limits listed in Table 3-6.

Shellfish Harvesting (SHELL)
Chromium
The maximum permissible value for waters designated SHELL shall be 0.01 mg/l.

Bacteria
At all areas where shellfish may be harvested for human consumption, the median total coliform concentration throughout the water column for any 30-day period shall not exceed 70/100 ml, nor shall more than ten percent of the samples collected during any 30-day period exceed 230/100 ml for a five-tube decimal dilution test or 330/100 ml when a three-tube decimal dilution test is used.

Appendix A.2 Objectives for Ground Water

OBJECTIVES FOR GROUND WATER

GENERAL OBJECTIVES

The following objectives apply to all groundwaters of the basin.

Tastes and Odors
Ground waters shall not contain taste or odor producing substances in concentrations that adversely affect beneficial uses.

Radioactivity
Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life; or result in the accumulation of radionuclides in the food web to an extent which presents a hazard to human, plant, animal, or aquatic life.

Median Ground Water Objectives, mg/l[a]

Sub basin/Sub-Area	TDS	Cl	SO4	B	Na	Nb
South Coast						
Goleta	1000	150	250	0.2	150	5
Santa Barbara	700	50	150	0.2	100	5
Carpinteria	700	100	150	0.2	100	7
Santa Ynez						
Santa Ynez	600	50	10	0.5	20	1
Santa Rita	1500	150	700	0.5	100	1
Lompoc Plain[f]	1250	250	500	0.5	250	2
Lompoc Upland[f]	600	150	100	0.5	100	2
Lompoc Terrace[f]	750	210	100	0.3	130	1
San Antonio Creek	600	150	150	0.2	100	5
Santa Maria[c]						
Upper Guadalupe[f]	1000[d]	165	500[d]	0.5	230	1.4[e]
Lower Guadalupe[f]	1000[d]	85	500[d]	0.2	90	2.0[e]
Lower Nipomo Mesa[f]	710	95	250	0.15	90	5.7[e]
Orcuttf	740	65	300	0.1	65	2.3[e]
Santa Maria[f]	1000[d]	90	510	0.2	105	8.0[e]
Cuyama Valley	1500	80	--	0.4	--	5
Soda Lake	e	e	e	e	e	e
Estero Bay						
Santa Rosa	700	100	80	0.2	50	5
Chorro	1000	250	100	0.2	50	5
San Luis Obispo	900	200	100	0.2	50	5
Arroyo Grande	800	100	200	0.2	50	10

a Objectives shown are median values based on data averages; objectives are based on preservation of existing quality or water quality enhancement believed attainable following control of point sources.
b Measured as Nitrogen
c Basis for objectives is in the "Water Quality Objectives for the Santa Maria Ground Water Basin Revised Staff Report, May 1985" and February 1986, Staff Report.
d These are maximum objectives in accordance with Title 22 of the Code of Regulations.
e Ground water basin currently exceeds usable mineral quality.
f Ground water basin boundary map available in appendix.
g Basis for objectives is in the report "A Study of the Paso Robles Ground Water Basin to Establish Best Management Practices and Establish Salt Objectives", Coastal Resources Institute, June 1993.
h Standard exceeds California Secondary Drinking Water Standards contained in Title 22 of the Code of Regulations. Water quality standard is based upon existing water quality. If water quality degradation occurs, the Regional Board may consider salt limits on appropriate discharges.

Median Ground Water Objectives, mg/l[a] (continued)

Sub basin/Sub-Area	TDS	Cl	SO4	B	Na	Nb
Salinas River						
Upper Valley[f]	600	150	150	0.5	70	5
Upper Forebay[f]	800	100	250	0.5	100	5
Lower Forebay[f]	1500	250	850	0.5	150	8
180 foot Aquifer[f]	1500	250	600	0.5	250	1
400 foot Aquifer[f]	400	50	100	0.2	50	1
Paso Robles[g]						
Central Basin[f]	400	60	45	0.3	80	3.4
San Miguel[f]	750	100	175	0.5	105	4.5
Paso Robles[f]	1050	270	200	2.0	225	2.3
Templeton[f]	730	100	120	0.3	75	2.7
Atascadero[f]	550	70	85	0.3	65	2.3
Estrella[f]	925	130	240	0.75	170	3.2
Shandon	1390	430	1025[h]	2.8	730	2.3
Pajaro River						
Hollister	1200	150	250	1.0	200	5
Tres Pinos	1000	150	250	1.0	150	5
Llagas	300	20	50	0.2	20	5
Big Basin						
Near Felton	100	20	10	0.2	10	1
Near Boulder Creek	250	30	50	0.2	20	5

a Objectives shown are median values based on data averages; objectives are based on preservation of existing quality or water quality enhancement believed attainable following control of point sources.
b Measured as Nitrogen
c Basis for objectives is in the "Water Quality Objectives for the Santa Maria Ground Water Basin Revised Staff Report, May 1985" and February 1986, Staff Report.
d These are maximum objectives in accordance with Title 22 of the Code of Regulations.
e Ground water basin currently exceeds usable mineral quality.
f Ground water basin boundary map available in appendix.
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h Standard exceeds California Secondary Drinking Water Standards contained in Title 22 of the Code of Regulations. Water quality standard is based upon existing water quality. If water quality degradation occurs, the Regional Board may consider salt limits on appropriate discharges.

Appendix B Descriptions of Beneficial Uses

(From the Central Coast, Region 3, Basin Plan)

BENEFICIAL USE DEFINITIONS

Beneficial uses for surface and groundwaters are divided into the twenty standard categories listed below. One of the principal purposes of this standardization is to facilitate establishment of both qualitative and numerical water quality objectives that will be compatible on a statewide basis.

Municipal and Domestic Supply (MUN)
Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply. According to State Board Resolution No. 88-63, "Sources of Drinking Water Policy" all surface waters are considered suitable, or potentially suitable, for municipal or domestic water supply except where:

a. TDS exceeds 3000 mg/l (5000 uS/centimeters electrical conductivity);
b. Contamination exists, that cannot reasonably be treated for domestic use;
c. The source is not sufficient to supply an average sustained yield of 200 gallons per day;
d. The water is in collection or treatment systems of municipal or industrial wastewaters, process waters, mining wastewaters, or storm water runoff; and;
e. The water is in systems for conveying or holding agricultural drainage waters.

Agricultural Supply (AGR)
Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

Industrial Process Supply (PROC)
Uses of water for industrial activities that depend primarily on water quality (i.e., waters used for manufacturing, food processing, etc.).

Industrial Service Supply (IND)
Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization.

Ground Water Recharge (GWR)
Uses of water for natural or artificial recharge of groundwater for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers. Ground water recharge includes recharge of surface water underflow.

Freshwater Replenishment (FRSH)
Uses of water for natural or artificial maintenance of surface water quantity or quality (e.g., salinity) which includes a water body that supplies water to a different type of water body, such as, streams that supply reservoirs and lakes, or estuaries; or reservoirs and lakes that supply streams. This includes only immediate upstream water bodies and not their tributaries.

Navigation (NAV)
Uses of water for shipping, travel, or other transportation by private, military, or commercial vessels. This Board interprets NAV as, "Any stream, lake, arm of the sea, or other natural body of water that is actually navigable and that, by itself, or by its connections with other waters, for a period long enough to be of commercial value, is of sufficient capacity to float watercraft for the purposes of commerce, trade, transportation, and including pleasure; or any waters that have been declared navigable by the Congress of the United States" and/or the California State Lands Commission.

Hydropower Generation (POW)
Uses of water for hydropower generation.

Water Contact Recreation (REC-1)
Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.

Non-Contact Water Recreation (REC-2)
Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

Commercial and Sport Fishing (COMM)
Uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.

Aquaculture (AQUA)
Uses of water for aquaculture or mariculture operations including, but not limited to, propagation, cultivation, maintenance, or harvesting of aquatic plants and animals for human consumption or bait purposes.

Warm Fresh Water Habitat (WARM)
Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Cold Fresh Water Habitat (COLD)
Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.

Inland Saline Water Habitat (SAL)
Uses of water that support inland saline water ecosystems including, but not limited to, preservation or enhancement of aquatic saline habitats, vegetation, fish, or wildlife, including invertebrates. Soda Lake is a saline habitat typical of desert lakes in inland sinks.

Estuarine Habitat (EST)
Uses of water that support estuarine ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds). An estuary is generally described as a semi-enclosed body of water having a free connection with the open sea, at least part of the year and within which the seawater is diluted at least seasonally with fresh water drained from the land. Included are water bodies which would naturally fit the definition if not controlled by tidegates or other such devices.

Marine Habitat (MAR)
Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).

Wildlife Habitat (WILD)
Uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

Preservation of Biological Habitats of Special Significance (BIOL)
Uses of water that support designated areas or habitats, such as established refuges, parks, sanctuaries, ecological reserves, or Areas of Special Biological Significance (ASBS), where the preservation or enhancement of natural resources requires special protection.

Rare, Threatened, or Endangered Species (RARE)
Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened, or endangered.

Migration of Aquatic Organisms (MIGR)
Uses of water that support habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.

Spawning, Reproduction, and/or Early Development (SPWN)
Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

Shellfish Harvesting (SHELL)
Uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial, or sport purposes. This includes waters that have in the past, or may in the future, contain significant shellfisheries.

Areas of Special Biological Significance (ASBS)
are those areas designated by the State Water Resources Control Board as requiring protection of species or biological communities to the extent that alteration of natural water quality is undesirable.

The following areas have been designated Areas of Special Biological Significance in the Central Coastal Basin:

1. Ano Nuevo Point and Island, San Mateo County
2. Pacific Grove Marine Gardens Fish Refuge and Hopkins Marine Life Refuge, Monterey County
3. Point Lobos Ecological Reserve, Monterey County
4. Carmel Bay, Monterey County
5. Julia Pfeiffer Burns Underwater Park, Monterey County
6. Ocean area surrounding the mouth of Salmon Creek, Monterey County
7. Channel Islands, Santa Barbara County - San Miguel, Santa Rosa, Santa Cruz

An ASBS designation implies the following requirements:

- Discharge of elevated temperature wastes in a manner that would alter water quality conditions from those occurring naturally will be prohibited.
- Discharge of discrete, point source sewage or industrial process wastes in a manner that would alter water quality conditions from those occurring naturally will be prohibited.
- Discharge of waste from nonpoint sources, including but not limited to storm water runoff, silt, and urban runoff, will be controlled to the extent practicable. In control programs for waste from nonpoint sources, Regional Boards will give high priority to areas tributary to ASBS.
- Further information concerning ASBS areas can be found by reviewing Regional Board Policies in Chapter Five.

Appendix C Central Coast Hydrologic Region Ground Water Data

(From the Department of Water Resources)

Table 21 Central Coast Hydrologic Region groundwater data

Basin/Subbasin	Basin Name	Area (acres)	Groundwater Budget Type	Well Yields (gpm)		Types of Monitoring			TDS (mg/L)	
				Maximum	Average	Levels	Quality	Title 22	Average	Range
3-1	SOQUEL VALLEY	2,500	C	1,421	665	6	6	16	482	270-990
3-2	PAJARO VALLEY	76,800	A	2,000	500	185	185	149	580-910	300-30,000
3-3	GILROY-HOLLISTER VALLEY									
3-3.01	LLAGAS AREA	55,600	C	-	-	-	-	95	-	-
3-3.02	BOLSA AREA	21,000	A	-	400	11	<11	3	-	400-1800
3-3.03	HOLLISTER AREA	32,700	A	-	400	42	<42	35	-	400-1600
3-3.04	SAN JUAN BAUTISTA AREA	74,300	A	-	400	37	<37	40	-	460-1700
3-4	SALINAS VALLEY									
3-4.01	180/400 FOOT AQUIFER	84,400	A	-	-	166	218	82	478	223-1,013
3-4.02	EAST SIDE AQUIFER	57,500	A	-	-	74	67	53	450	168-977
3-4.04	FOREBAY AQUIFER	94,100	A	-	-	89	91	35	624	300-1,100
3-4.05	UPPER VALLEY AQUIFER	98,200	A	4,000	-	36	37	17	443	140-3,700
3-4.06	PASO ROBLES AREA	597,000	A	3,300	-	183	-	58	614	165-3,868
3-4.08	SEASIDE AREA	25,900	B	3,500	1,000		7	24	400	200-900
3-4.09	LANGLEY AREA	15,400	B	1,570	450	-	-	52	-	52-348
3-4.10	CORRAL DE TIERRA AREA	22,300	C	948	450	-	3	26	-	355-679
3-5	CHOLAME VALLEY	39,800	C	3,000	1,000	1	-	1	-	-
3-6	LOCKWOOD VALLEY	59,900	C	1,500	100	-	-	9	-	-
3-7	CARMEL VALLEY	5,160	C	1,000	600	50	23	12	260-670	220-1,200
3-8	LOS OSOS VALLEY	6,990	A	700	230	-	-	10	354	78-33,700
3-9	SAN LUIS OBISPO VALLEY	12,700	A	600	300	-	-	11	583	278-1,949
3-12	SANTA MARIA RIVER VALLEY	184,000	A	2,500	1,000	286	10	108	598	139-1,200
3-13	CUYAMA VALLEY	147,000	A	4,400	1,100	17	2	8	-	206-3,905
3-14	SAN ANTONIO CREEK VALLEY	81,800	A	-	400	30	-	9	415	129-8,040
3-15	SANTA YNEZ RIVER VALLEY	204,000	A	1,300	750	163	21	76	507	400-700
3-16	GOLETA	9,210	A	800	500	49	11	17	755	617-929
3-17	SANTA BARBARA	6,160	A	625	560	75	36	5	-	217-385
3-18	CARPINTERIA	8,120	A	500	300	41	41	4	557	317-1,780
3-19	CARRIZO PLAIN	173,000	C	1,000	500	-	-	1	-	-
3-20	ANO NUEVO AREA	2,032	C	-	-	-	-	2	-	-
3-21	SANTA CRUZ PURISIMA FORMATION	40,200	C	200	20	-	-	39	440	380-560
3-22	SANTA ANA VALLEY	2,720	C	130	-	-	-	-	-	-
3-23	UPPER SANTA ANA VALLEY	1,430	C	-	-	-	-	-	-	-
3-24	QUIEN SABE VALLEY	4,710	C	122	122	-	-	-	-	-
3-25	TRES PINOS VALLEY	3,390	C	1,225	-	-	-	3	-	-
3-26	WEST SANTA CRUZ TERRACE	7,870	C	550	200	-	-	7	480	378-684
3-27	SCOTTS VALLEY	774	C	410	100-900	26	7	7	360	100-980
3-28	SAN BENITO RIVER VALLEY	24,200	C	2,000	-	-	-	3	-	-
3-29	DRY LAKE VALLEY	1,420	C	-	-	-	-	-	-	-
3-30	BITTER WATER VALLEY	32,200	C	-	-	-	-	-	-	-
3-31	HERNANDEZ VALLEY	2,860	C	160	58	-	-	-	-	-

gpm - gallons per minute
mg/L - milligram per liter
TDS -total dissolved solids