SOUTH ORANGE COUNTY TRANSPORTATION INFRASTRUCTURE IMPROVEMENT PROJECT GEOTECHNICAL, GEOLOGY AND SOILS TECHNICAL REPORT

FINAL

Prepared for:

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PREFACE

The alternatives considered for the South Orange County Transportation Infrastructure Improvement Project (SOCTIIP) are described in detail in the following technical report:

Project Alternatives Technical Report (P&D Consultants, 2003).

The alternatives include a number of build alternatives including extensions to the existing Foothill Transportation Corridor, improvements to Interstate 5 and arterial highway improvements.

Individual technical reports were prepared to assess the potential environmental impacts of the SOCTIIP alternatives. Each of the following reports describes the study area for the individual parameter, existing conditions, study methodology, short and long term adverse and beneficial effects of the SOCTIIP alternatives, and appropriate mitigation measures.

Air Quality Technical Report (Mestre Greve Associates, 2003).

Geotechnical, Geology and Soils Technical Report (GeoPentech, 2003).

Hazardous Materials and Wastes Technical Report (Initial Site Assessment) (P&D Consultants, 2003).

Phase I Historical Resource Inventory Report (Greenwood and Associates, 2003).

Hydrology Technical Report (Psomas, 2003).

Land Use Technical Report (P&D Consultants, 2003).

Location Hydraulic Studies (Psomas, 2003).

Military Impacts Technical Report (P&D Consultants, 2003).

Natural Environment Study (P&D Consultants, 2003).

Noise Assessment (Mestre Greve Associates, 2003).

Paleontological Resources Technical Report (SWCA, 2003).

Phase I Archeological Inventory (Greenwood and Associates, 2003).

Public Services and Utilities Technical Report (P&D Consultants, 2003).

Recreation Resources Technical Report (P&D Consultants, 2003).

Relocation Impacts Technical Report (P&D Consultants, 2003).

Runoff Management Plan (Psomas, 2003).

Socioeconomics and Growth Inducing Impacts Technical Report (P&D Consultants, 2003).

Traffic and Circulation Technical Report (Austin Foust Associates, 2003).

Visual Impact Assessment Technical Report (P&D Consultants, 2003).

These technical reports are available for review at the Transportation Corridor Agencies office.

This Technical Report identifies and evaluates the potential environmental impacts of a wide range of build and no action alternatives considered for the SOCTIIP. Based on the findings of the analysis of the potential effects of these alternatives as documented in the technical reports, the SOCTIIP Collaborative evaluated each alternative and made a decision whether to advance an alternative for detailed evaluation in the EIS/SEIR or to eliminate that alternative from detailed consideration in the EIS/SEIR. Table P-1 lists the SOCTIIP alternatives described in this Technical Report and identifies which were advanced for detailed evaluation in the EIS/SEIR and which were eliminated from further consideration in the EIS/SEIR. The detailed explanation for why each alternative was eliminated is provided in the EIS/SEIR.

During the preparation of the technical studies for the SOCTIIP, the name of the Rancho Mission Viejo (RMV) Land Conservancy was changed to the Donna O'Neill Land Conservancy. All references to the RMV Land Conservancy or the RMV Conservancy in this Technical Report should be interpreted to refer to the Donna O'Neill Land Conservancy.

TABLE P-1
SOCTIIP ALTERNATIVES ADVANCED TO THE EIS/SEIR OR ELIMINATED FROM DETAILED EVALUATION IN THE EIS/SEIR

TOLL ROAD CORRIDOR ALTERNATIVES	
FAR EAST CORRIDOR ALIGNMENT ALTERNATIVES	**Alternative Advanced or Eliminated (1)**
Far East Corridor - Complete - Initial Alternative	Eliminated.
Far East Corridor - Complete - Ultimate Alternative	Eliminated.
Far East Corridor - Talega Variation - Initial Alternative	Eliminated
Far East Corridor - Talega Variation - Ultimate Alternative	Eliminated
Far East Corridor - Cristianitos Variation - Initial Alternative	Eliminated.
Far East Corridor - Cristianitos Variation - Ultimate Alternative	Eliminated.
Far East Corridor - Agricultural Fields Variation - Initial Alternative	Eliminated.
Far East Corridor - Agricultural Fields Variation - Ultimate Alternative	Eliminated.
Far East Corridor - Ortega Highway Variation - Initial Alternative	Eliminated.
Far East Corridor - Ortega Highway Variation - Ultimate Alternative	Eliminated.
Far East Corridor - Avenida Pico Variation - Initial Alternative	Eliminated.
Far East Corridor - Avenida Pico Variation - Ultimate Alternative	Eliminated.
Far East Corridor-West-Initial Alternative	Advanced.
Far East Corridor-West-Ultimate Alternative	Advanced.
Far East Corridor-Modified-Initial Alternative	Advanced.
Far East Corridor-Modified-Ultimate Alternative	Advanced.
CENTRAL CORRIDOR ALIGNMENT ALTERNATIVES	**Alternative Advanced or Eliminated (1)**
Central Corridor - Complete - Initial Alternative	Advanced.
Central Corridor - Complete - Ultimate Alternative	Advanced.
Central Corridor - Avenida La Pata Variation - Initial Alternative	Advanced.
Central Corridor - Avenida La Pata Variation - Ultimate Alternative	Advanced.
Central Corridor - Ortega Highway Variation - Initial Alternative	Eliminated.
Central Corridor - Ortega Highway Variation - Ultimate Alternative	Eliminated.
ALIGNMENT 7 CORRIDOR ALIGNMENT ALTERNATIVES	**Alternative Advanced or Eliminated (1)**
Alignment 7 Corridor - Complete - Initial Alternative	Eliminated.
Alignment 7 Corridor - Complete - Ultimate Alternative	Eliminated.
Alignment 7 Corridor - 7 Swing Variation - Initial Alternative	Eliminated.
Alignment 7 Corridor - 7 Swing Variation - Ultimate Alternative	Eliminated.
Alignment 7 Corridor - Far East Crossover Variation - Initial Alternative	Eliminated.
Alignment 7 Corridor - Far East Crossover Variation - Ultimate Alternative	Eliminated.
Alignment 7 Corridor - Far East Crossover (Cristianitos) Variation - Initial Alternative	Eliminated.
Alignment 7 Corridor - Far East Crossover (Cristianitos) Variation - Ultimate Alternative	Eliminated.
Alignment 7 Corridor - Far East Crossover (Agricultural Fields) Variation - Initial Alternative	Eliminated.

TABLE P-1
SOCTIIP ALTERNATIVES ADVANCED TO THE EIS/SEIR OR ELIMINATED FROM DETAILED EVALUATION IN THE EIS/SEIR

TOLL ROAD CORRIDOR ALTERNATIVES	
Alignment 7 Corridor - Far East Crossover (Agricultural Fields) Variation - Ultimate Alternative	Eliminated.
Alignment 7 Corridor - Ortega Highway Variation - Initial Alternative	Eliminated.
Alignment 7 Corridor - Ortega Highway Variation - Ultimate Alternative	Eliminated.
Alignment 7 Corridor - Avenida La Pata Variation - Initial Alternative	Advanced.
Alignment 7 Corridor - Avenida La Pata Variation - Ultimate Alternative	Advanced.
Alignment 7 Corridor-Far East Corridor-Modified-Initial Alternative	Advanced.
Alignment 7 Corridor-Far East Corridor-Modified-Ultimate Alternative	Advanced.
NON-TOLL ROAD ALTERNATIVES	
ARTERIAL IMPROVEMENTS ALTERNATIVES	**Alternative Advanced or Eliminated (1)**
Arterial Improvements Only - Alternative	Advanced.
Arterial Improvements Only Plus HOV and Spot Mixed-Flow Lanes on I-5 Alternative	Eliminated.
I-5 ALTERNATIVE	**Alternative Advanced or Eliminated (1)**
I-5 Widening Alternative	Advanced.
NO ACTION ALTERNATIVES	**Alternative Advanced or Eliminated (1)**
No Action Alternative - Orange County Projections 2000	Advanced.
No Action Alternative - Rancho Mission Viejo (RMV) Development Plan	Advanced.

(1) Advanced: Alternative was advanced for detailed evaluation in the EIS/SEIR.
Eliminated: Alternative was eliminated from detailed evaluation in the EIS/SEIR and is discussed in the EIS/SEIR as an alternative “considered and eliminated.”

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

GLOSSARY OF ACRONYMS

G.1 ACRONYMS FOR THE SOCTIIP ALTERNATIVES

There are a number of build alternatives considered for the South Orange County Transportation Infrastructure Improvement Project (SOCTIIP). The acronyms for the build alternatives are listed below.

Far East Corridor Alignment Alternatives	
Far East Corridor – Complete – Initial Alternative	FEC – Initial Alternative
Far East Corridor – Complete – Ultimate Alternative	FEC – Ultimate Alternative
Far East Corridor – Talega Variation – Initial Alternative	FEC–TV – Initial Alternative
Far East Corridor – Talega Variation – Ultimate Alternative	FEC–TV – Ultimate Alternative
Far East Corridor – Cristianitos Variation – Initial Alternative	FEC–CV – Initial Alternative
Far East Corridor – Cristianitos Variation – Ultimate Alternative	FEC–CV – Ultimate Alternative
Far East Corridor – Agricultural Fields Variation – Initial Alternative	FEC–AFV – Initial Alternative
Far East Corridor – Agricultural Fields Variation – Ultimate Alternative	FEC–AFV – Ultimate Alternative
Far East Corridor – Ortega Highway Variation – Initial Alternative	FEC–OHV – Initial Alternative
Far East Corridor – Ortega Highway Variation – Ultimate Alternative	FEC–OHV – Ultimate Alternative
Far East Corridor – Avenida Pico Variation – Initial Alternative	FEC–APV – Initial Alternative
Far East Corridor – Avenida Pico Variation – Ultimate Alternative	FEC–APV – Ultimate Alternative
Far East Corridor-West-Initial Alternative	FEC–W – Initial Alternative
Far East Corridor-West-Ultimate Alternative	FEC–W – Ultimate Alternative
Far East Corridor-Modified-Initial Alternative	FEC–M – Initial Alternative
Far East Corridor-Modified-Ultimate Alternative	FEC–M – Ultimate Alternative

Central Corridor Alignment Alternatives	
Central Corridor – Complete – Initial Alternative	CC – Initial Alternative
Central Corridor – Complete – Ultimate Alternative	CC – Ultimate Alternative
Central Corridor – Avenida La Pata – Initial Alternative	CC–ALPV – Initial Alternative
Central Corridor – Avenida La Pata – Ultimate Alternative	CC–ALPV – Ultimate Alternative
Central Corridor – Ortega Highway – Initial Alternative	CC–OHV – Initial Alternative
Central Corridor – Ortega Highway – Ultimate Alternative	CC–OHV – Ultimate Alternative

Alignment 7 Corridor Alignment Alternatives	
Alignment 7 Corridor – Complete – Initial Alternative	A7C – Initial Alternative
Alignment 7 Corridor – Complete – Ultimate Alternative	A7C – Ultimate Alternative
Alignment 7 Corridor – 7 Swing Variation – Initial Alternative	A7C–7SV – Initial Alternative
Alignment 7 Corridor – 7 Swing Variation – Ultimate Alternative	A7C–7SV – Ultimate Alternative
Alignment 7 Corridor – Far East Crossover Variation – Initial Alternative	A7C–FECV – Initial Alternative
Alignment 7 Corridor – Far East Crossover Variation – Ultimate Alternative	A7C–FECV – Ultimate Alternative
Alignment 7 Corridor – Far East Crossover (Cristianitos) Variation – Initial Alternative	A7C–FECV–C – Initial Alternative
Alignment 7 Corridor – Far East Crossover (Cristianitos) Variation – Ultimate Alternative	A7C–FECV–C – Ultimate Alternative
Alignment 7 Corridor – Far East Crossover (Agricultural Fields) Variation – Initial Alternative	A7C–FECV–AF – Initial Alternative
Alignment 7 Corridor – Far East Crossover (Agricultural Fields) Variation – Ultimate Alternative	A7C–FECV–AF – Ultimate Alternative
Alignment 7 Corridor – Ortega Highway Variation – Initial Alternative	A7C–OHV – Initial Alternative

Alignment 7 Corridor – Ortega Highway Variation – Ultimate Alternative	A7C–OHV – Ultimate Alternative
Alignment 7 Corridor – Avenida La Pata Variation – Initial Alternative	A7C–ALPV – Initial Alternative
Alignment 7 Corridor – Avenida La Pata Variation – Ultimate Alternative	A7C–ALPV – Ultimate Alternative
Alignment 7 Corridor-Far East Crossover-Modified-Initial Alternative	A7C–FEC–M – Initial Alternative
Alignment 7 Corridor-Far East Crossover-Modified-Ultimate Alternative	A7C–FEC–M – Ultimate Alternative

Arterial Improvements Alternatives	
Arterial Improvements Only Alternative	AIO Alternative
Arterial Improvements Plus HOV and Spot Mixed-Flow Lanes on I-5 Alternative	AIP Alternative
I-5 Alternative	
I-5 Widening Alternative	I-5 Alternative
No Action Alternatives	
No Action Alternative – Orange County Projections 2000	No Action Alternative – OCP 2000
No Action Alternative – Rancho Mission Viejo (RMV) Development Plan	No Action Alternative – RMV

G.2 OTHER ACRONYMS

Ac	Acre, Acres
Avd	Avenida
BMP, BMPs	Best Management Practice, Best Management Practices
CAAs	Community Analysis Areas
CBWD	Capistrano Beach Water District
CDMG (CGS)	California Division of Mines and Geology (California Geological Survey)
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
Cm	Camino
DU or DUs	Dwelling Unit(s)
EIR	Environmental Impact Report
FTC	Foothill Transportation Corridor
FTC-N	Foothill Transportation Corridor – North
FTC-S	Foothill Transportation Corridor – South
FTC - South	Foothill Transportation Corridor – South
GDP	General Development Plan
GPA	General Plan Amendment
ha	hectare, hectares
HOV, HOVs	High Occupancy Vehicle, Vehicles
I-5	Interstate 5
I-405	Interstate 405
km	kilometer, kilometers
LUE, LUEs	Land Use Element, Elements
MCB	Marine Corps Base
mi	mile, miles
MOU	Memorandum Of Understanding
MPAH	Master Plan of Arterial Highways
MPSH	Master Plan of Scenic Highways
NCCP/HCP	Natural Community Conservation Plan/Habitat Conservation Plan
NEPA	National Environmental Policy Act
NPDES	National Pollution Discharge Elimination System

OCP-2000	Orange County Projections – 2000
PC	Planned Community
pg.	page, pages
Rms	Rooms
RMV	Rancho Mission Viejo
RTP	Regional Transportation Plan
SAMP	Special Area Master Plan
sf	Square feet
SDG&E	San Diego Gas & Electric
SOCTIIP	Southern Orange County Transportation Infrastructure Improvement Project
SR 73	State Route 73
SR 91	State Route 91
SR 241	State Route 241
TSF	Thousand Square Feet
TSM	Transportation System Management
TCA	Transportation Corridor Agencies
UBC	Uniform Building Code
USFWS	United States Fish and Wildlife Service
ZC	Zone Change

G.3 MEASUREMENTS

The measurement units in this report are expressed in both metric and English units, with metric units followed by English units in parentheses. For ease of translation, the following conversions are included to allow the reader to better understand the measurements in this report.

English – to – Metric Conversion	**Metric – to – English Conversion**
AREA	
1 square foot = 0.093 square meters	1 square meter = 10.752 square feet
1 acre = 0.405 hectares, 4047 square meters	1 hectare = 2.469 acres
1 square mile = 2.59 square kilometers	1 square kilometer = 0.386 square miles
LENGTH	
1 inch = 2.54 centimeters	1 centimeter = 0.394 feet
1 foot = 30.48 centimeters	1 centimeter = 0.328 feet
1 yard = 0.914 meters	1 meter = 1.094 yards
1 mile = 1.609 kilometers	1 kilometer = 0.621 miles

EXECUTIVE SUMMARY

Considering the basic project assumptions described in Section 4.0, the existing geotechnical, geology and soils conditions described in Section 5.0, and using the criteria for identifying impacts described in Section 6.0, an assessment was made regarding whether the South Orange County Transportation Infrastructure Improvement Project (SOCTIIP) alternatives would be negatively impacted by the natural environment, or whether the natural environment would be negatively impacted by the SOCTIIP Alternatives, related to earth resources. The results of this assessment are discussed in Section 7.0. Section 7.0 identifies the following impacts associated with the various SOCTIIP build Alternatives:

- Slight limitations on the potential for future mining of sand and gravel at San Juan Creek.
- Potential for impacts to groundwater wells, including the potential need for replacement of certain wells, and the potential for temporary groundwater level lowering in local wells during construction.
- The impact (for all but two of the A7C Alternatives) to a mapped spring located about ¾ km (½ mi) south of Ortega Highway.
- The potential need to dispose of excess soil (produced from planned cuts) during construction.
- An increase in impermeable surfaces.

Mitigation measures are discussed in Section 8.0. Considering these measures, only two of the above listed impacts are considered to remain significant after mitigation. These two issues are discussed below.

If project design and construction cannot balance the earthwork, or identify suitable disposal sites, construction of some of the build alternatives could involve potentially significant adverse impacts associated with the disposal of the excess soil. However, as discussed in Section 10.0, the Prima Deshecha Landfill has identified the need to import soil for its operation. As part of the design process to refine the SOCTIIP Alternatives, the volume of soil required by the landfill should be established so that appropriate planning can take place regarding the potential excess soil that may be available from the SOCTIIP. The potential impacts of the build alternatives related to disposal of excess soil are discussed in detail in the Public Services and Utilities Technical Report.

It is unlikely that construction impact to the mapped spring south of Ortega Highway can be mitigated, and therefore it is assumed to remain as a significant adverse impact for all of the A7C Alternatives, except the A7C-OHV Alternative.

TABLE ES-1
IMPACT SUMMARY

	Far East Corridor Alignment Alternatives (Initial and Ultimate)								**Central Corridor Alignment Alternatives (Initial and Ultimate)**			**Alignment 7 Corridor Alignment Alternatives (Initial and Ultimate)**								**Arterial Improvement Alternative**			**No Project Alternative**	
	FEC	FEC-TV	FEC-CV	FEC-AFV	FEC-OHV	FEC-APV	FEC-W	FEC-M	CC	CC-ALPV	CC-OHV	A7C	A7C-7SV	A7C-FECV	A7C-FECV-C	A7C-FECV-AF	A7C-OHV	A7C-ALPV	A7C-FEC-M	AIO	AIP	I-5	OCP-2000	RMV
Earthquake Damage																								
Fault Movement	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Liquefaction	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Landslides	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Differential Compaction/seismic settlement	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Ground Rupture	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Ground Shaking	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Tsunami	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Seiches	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Seismically Induced Flooding	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Loss of Mineral Resources																								
Loss of Access	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Deposits Covered by Changed Land Use	NS	NS	NS	NS	N	NS	NS	NS	NS	NS	N	NS	NS	NS	NS	NS	N	NS	NS	N	N	N	N	N
Zoning Restrictions	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Waste Disposal Problems																								
Change in Groundwater Levels	N	N	N	NS	N	N	N	N	NS	NS	NS	S	S	S	S	S	N	S	N	N	N	N	N	N
Disposal of Excavated Materials	NS	S	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NN	NN	NS	NS	NS	NS	N	N
Percolation of Waste Material	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Slope and/or Foundation Instability																								
Landslides and Mudlflows	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Unstable Cut and Fill Slopes	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Collapsible and Expansive Soils	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Erosion, Sedimentation and Flooding																								
Erosion of Graded Areas	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Alternation of Runoff	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Unprotected Drainage Ways	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Increased Impervious Surfaces	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	N	N
Land Subsidence																								
Extraction of Groundwater, Gas, Oil, Geothermal Energy	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Hydrocompaction and Pest Oxydation	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Volcanic Hazards																								
Lava Flow	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Ash Fall	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

"N" Indicates no impact.
"NS" Indicates non-significant impact.
"S" Indicates significant impact.

SECTION 1.0

INTRODUCTION

GeoPentech prepared this geotechnical, geology and soils technical report for the South Orange County Transportation Infrastructure Improvement Project (SOCTIIP). This report is an update of a previous geotechnical, geology and soils technical report prepared by Goffman, McCormick & Urban, Inc. (*Final Report of Geotechnical Reconnaissance, Foothill Transportation Corridor - South*, *BX and CP Alignments,* December 1996), for Michael Brandman Associates who prepared previous environmental documents for the BX and CP alignment alternatives. These alignments were under consideration as possible alternatives for the extension of the Foothill Transportation Corridor at that time. The current report expands that previous report, to cover the additional alignment alternatives that were added subsequent to the 1996 studies. In preparing this report, the information available from the Goffman, McCormick & Urban report was supplemented with information from various other published geologic and geotechnical studies, and most importantly, information from additional site-specific investigations completed by the Transportation Corridor Agencies (TCA) for the SOCTIIP build alternatives (Leighton and Associates 2001a, b; 2002a, b, c, d, e, f). This report is presented in the following Sections:

Section 1.0 Introduction
Section 2.0 Project Alternatives
Section 3.0 Resources/Environmental Parameter Overview
Section 4.0 Description of Assumptions
Section 5.0 Existing Conditions
Section 6.0 Methodology
Section 7.0 Impacts Analysis
Section 8.0 Mitigation Measures
Section 9.0 CEQA Significance
Section 10.0 Cumulative Impacts
Section 11.0 Growth Inducing Impacts
Section 12.0 References
Section 13.0 List of Preparers

SECTION 2.0
PROJECT ALTERNATIVES

2.1 INTRODUCTION

This Section provides a summary of the project alternatives for the South Orange County Transportation Infrastructure Improvement Project (SOCTIIP). A detailed discussion of the project alternatives is provided in the Project Alternatives Technical Report.

The proposed project involves locating, constructing and operating transportation improvements in south Orange County and north San Diego County. The alternatives under consideration consist of transportation improvement alternatives, two No Action Alternatives and several No Action scenarios. The transportation improvement alternatives include widening of I-5, arterial road improvements with and without widening I-5, and toll road corridors which would be southern extensions of the existing FTC-N. The corridor alternatives would extend the FTC south from its existing terminus at Oso Parkway to approximately the Orange/San Diego County border.

Two major categories of build alternatives are described in this Section:

- Build alternatives, which propose a southern extension of the existing FTC in south Orange County. The corridor extension alternatives to be evaluated in the EIS/SEIR propose the extension of the existing FTC south from Oso Parkway to I-5 in the vicinity of the Orange/San Diego County line. This proposed segment of the corridor is frequently referred to as the FTC-South or FTC-S. The corridor alternatives all propose extension of existing SR 241 south of Oso Parkway, to I-5 or to an intersecting arterial south of Oso Parkway. There are three primary alignments for the corridor alternatives; combinations and variations of these alignments result in the identification of a number of corridor alternatives. In addition, as described in detail later in this Section, each corridor alternative is proposed as an initial corridor alternative and an ultimate corridor alternative. The initial corridor alternatives would be permitted and constructed based on future traffic demand through 2025. The ultimate corridor alternatives, with a wider cross section, are not anticipated to be needed or constructed until 2025 or later, based on forecasted traffic demand. The initial corridor alternatives would result in smaller disturbance limits which would result in reduced environmental impacts. The ultimate corridor alternatives would be built after 2025 and will be evaluated in the EIS/SEIR in order to determine the extent of impacts associated with the wider ultimate cross sections. The TCA anticipates seeking environmental permits and constructing only the initial corridor alternatives. Additional permits would be required when the ultimate corridor alternatives are constructed sometime after 2025.

- Build alternatives which propose improvements to existing I-5 and/or to MPAH arterials in south Orange County and north San Diego County. The I-5, AIO and AIP Alternatives do not include any extension of existing SR 241 south of Oso Parkway.

In addition, two No Action Alternatives and several No Action scenarios, with different land use and transportation system assumptions, are also described in detail in this Section.

2.2 BUILD ALTERNATIVES

The proposed toll road corridor alternatives are described in detail in this Section, including a description of the features those alternatives have in common. The arterial, I-5 widening and No Action Alternatives are described in the following Sections.

As discussed in this Section, the corridor alternatives are subdivided into unique segments with letter codes. Each segment is unique to each alternative. However, on some segments, the corridor alternatives share a common horizontal alignment but do not share common vertical alignments and/or common disturbance limits. For example, the segment south of the terminus of the existing FTC-N is common to several corridor alternatives. However, the disturbance limits on this segment vary among those alternatives based on differences in the vertical profile for each alternative. This is based on objectives to meet federal and state standards and to balance cut and fill earthwork for each alternative. Therefore, each segment of each corridor alternative is unique in its disturbance limits, even when several alternatives have a common alignment on that segment.

2.2.1 FEATURES COMMON TO ALL THE INITIAL AND ULTIMATE CORRIDOR ALTERNATIVES

Initial and Ultimate Corridor Alternatives

Each corridor alternative is proposed as an *initial* alternative and as an *ultimate* alternative. The initial corridor alternatives propose a toll corridor on the identified alignment, with a cross section providing two general purpose lanes in each direction for the entire length of each alternative. The ultimate corridor alternatives propose a toll corridor on the same identified alignment, with the same centerline, with a cross section providing three general purpose lanes in each direction for the full length of each alignment.

Typical Cross Sections for the Initial and Ultimate Corridor Alternatives

There are two typical cross sections for the initial corridor alternatives. From Oso Parkway to Ortega Highway, the typical section, from the edge of one outside shoulder to the edge of the other outside shoulder, is 39 meters (128 feet) wide. This cross section would accommodate two general purpose lanes in each direction and would accommodate one future HOV lane in each direction in the median, if needed in the future. South of Ortega Highway to I-5, the initial corridor alternative typical section would be 27 meters (89 feet) wide. This would accommodate two general purpose lanes in each direction. To accommodate one future HOV lane in each direction, this typical section would be widened on the outside.

Under the ultimate corridor alternatives, the majority of the length of each alternative would provide an eight lane cross section, with three general purpose lanes and one HOV lane in each direction, in a 47.6 meter (156 foot) wide typical section. As the ultimate corridor alternatives approach their southern termini, at major arterials or at I-5, the typical section would narrow to three lanes in each direction.

2.2.2 FAR EAST CORRIDOR ALTERNATIVES

The Far East Corridor (FEC) alignments, proposed for evaluation in the EIS/SEIR are listed below and are discussed in detail in the following sections.

Far East Corridor - Initial Alternatives

Far East Corridor – Complete - Initial (FEC- Initial) Alternative
Far East Corridor - Talega Variation - Initial (FEC-TV-Initial) Alternative
Far East Corridor - Cristianitos Variation - Initial (FEC-CV-Initial) Alternative
Far East Corridor - Agricultural Fields Variation - Initial (FEC-AFV-Initial) Alternative
Far East Corridor - Ortega Highway Variation - Initial (FEC-OHV-Initial) Alternative
Far East Corridor - Avenida Pico Variation - Initial (FEC-APV-Initial) Alternative
Far East Corridor-West-Initial (FEC-W-Initial) Alternative
Far East Corridor-Modified-Initial (FEC-M-Initial) Alternative

Far East Corridor - Ultimate Alternatives

Far East Corridor – Complete - Ultimate (FEC-Ultimate) Alternative
Far East Corridor - Talega Variation - Ultimate (FEC-TV-Ultimate) Alternative
Far East Corridor - Cristianitos Variation - Ultimate (FEC-CV-Ultimate) Alternative
Far East Corridor - Agricultural Fields Variation - Ultimate (FEC-AFV-Ultimate) Alternative
Far East Corridor - Ortega Highway Variation - Ultimate (FEC-OHV-Ultimate) Alternative
Far East Corridor - Avenida Pico Variation - Ultimate (FEC-APV-Ultimate) Alternative
Far East Corridor-West-Ultimate (FEC-W-Ultimate) Alternative
Far East Corridor-Modified-Ultimate (FEC-M-Ultimate) Alternative

2.2.2.1 Far East Corridor – Complete - Initial (FEC) Initial and Ultimate Alternatives

This alignment generally follows the alignment of the alternative previously referred to as the CP Alignment. The FEC Alternatives include Segments A, B, C and D. The corridor under the FEC Alternatives is approximately 26 km (16 mi) long, with an additional approximately 1.9 km (1.2 mi) of improvements on I-5. The individual segments which comprise the FEC-Initial and Ultimate Alternatives are described below.

Segment A. Segment A of the FEC Alternatives extends from the existing terminus of the FTC-N at Oso Parkway, on the east side of Cañada Chiquita to the southeast, south of Coto de Caza, crossing Cañada Gobernadora approximately four km (2.5 mi) north of San Juan Creek. This

Segment crosses San Juan Creek and terminates at Ortega Highway. This Segment includes realignment and potential widening of approximately 1.4 km (0.9 mi) of Ortega Highway and construction of a new connector road approximately 1.8 km (1.1 mi) long extending north from Ortega Highway to the FEC alignment. Ortega Highway at the corridor crossing is currently a two lane facility. Under the MPAH, Ortega Highway is designated as a six lane Major Arterial. If Ortega Highway is improved to the Major Arterial designation prior to the implementation of these Alternatives, no further widening of Ortega Highway would be required. If Ortega Highway is not improved to the MPAH designation by the time these Alternatives are implemented, an approximately 1.4 km (0.9 mi) segment of Ortega Highway would be widened, to the MPAH designation, as part of these Alternatives. These Alternatives would also result in the realignment of this same segment of Ortega Highway.

Segment B. Segment B of the FEC Alternatives starts at Ortega Highway approximately 5.5 km (3.5 mi) east of Antonio Parkway/Avenida La Pata. From Ortega Highway, Segment B extends south, east of the RMV Land Conservancy and Cristianitos Creek, extending southwest and crossing Blind/Gabino Creek and Cristianitos Creek approximately 1.5 km (one mi) north of the Orange/San Diego County line. Segment B crosses the southeast corner of the Talega Valley Planned Community (PC), on an alignment reflected in the Talega Valley Development Agreement, before terminating just south of Avenida Pico.

Segment C. Segment C of the FEC Alternatives starts south of Avenida Pico and the Orange/San Diego County line immediately west of the San Diego Gas and Electric (SDG&E) substation. The alignment travels south, crossing the inland part of the San Onofre State Beach lease on MCB Camp Pendleton in San Diego County, extending across Cristianitos Road approximately 1.1 km (0.7 mile) north of I-5. This Segment terminates where the corridor crosses San Mateo Creek.

Segment D. Segment D of the FEC Alternatives starts where the corridor crosses San Mateo Creek and extends southeast to I-5, with direct connectors between the corridor and I-5 one km (0.6 mi) south of Basilone Road. I-5 would be widened from 1.0 km (0.6 mi) south of Basilone Road to 2.9 km (1.8 mi) south of Basilone Road.

2.2.2.2 Far East Corridor - Talega Variation (FEC-TV)-Initial and Ultimate Alternatives

The alignment of the FEC-TV-Initial and Ultimate Alternatives follows the same alignment as the FEC Alternative from Oso Parkway to south of Ortega Highway as described earlier for Segment A. The FEC-TV Alternative includes Segments A, E and F. The corridor under the FEC-TV Alternatives is approximately 21 km (13 mi) long, with approximately 4.6 km (2.9 mi) of improvements on I-5. Segment A was described earlier under the FEC - Initial and Ultimate Alternatives.

Segment E. From Ortega Highway, the FEC-TV Alternatives extend southwest across the north part of the RMV Land Conservancy and enter the City of San Clemente approximately 3.2 km (2.0 mi) east of the City of San Juan Capistrano. The FEC-TV alignment then crosses the Talega

Valley PC, crossing Avenida Vista Hermosa approximately 0.5 km (0.3 mi) north of Avenida Pico to approximately 0.4 km (0.3 mi) south of Avenida La Pata.

Segment F. From south of Avenida La Pata, Segment F of the FEC-TV Alternatives extends southwest, traversing land owned by the City of San Clemente and several existing residential developments. Segment F continues parallel to and northwest of Avenida Pico, to direct connectors at I-5, 0.9 km (0.6 mi) south of Avenida Pico. This Segment then extends 4.6 km (2.9 mi) south on I-5 to the terminus just north of Cristianitos Road.

2.2.2.3 Far East Corridor - Cristianitos Variation (FEC-CV) - Initial and Ultimate Alternatives

The alignment of the FEC-CV - Initial and Ultimate Alternatives follows the alignment of the FEC Alternative on Segments A and B from Oso Parkway to just after it crosses into San Onofre State Park, south of Avenida Pico. From that point, the FEC-CV Alternatives become an undivided four lane collector road (secondary arterial) south to I-5. The FEC-CV Alternatives include Segments A, B and G. The corridor under the FEC-CV Alternatives is approximately 24 km (15 mi) long. Segments A and B were described earlier under the FEC Alternatives.

Segment G. Segment G of the FEC-CV Alternatives becomes a four lane undivided collector road just south of the Avenida Pico interchange. From that interchange, the FEC-CV alignment proceeds south to join the existing Cristianitos Road alignment south of the Camp Pendleton Guard Gate to the interchange of Cristianitos Road and I-5. Segment G includes widening (to four lanes) and reconstruction of existing Cristianitos Road south of the Camp Pendleton Guard Gate south to I-5 and reconstruction of the existing I-5/Cristianitos Road interchange.

2.2.2.4 Far East Corridor - Agricultural Fields (FEC-AFV) - Initial and Ultimate Alternatives

The alignment of the FEC-AFV Initial and Ultimate Alternatives follows the alignment of the FEC Alternative, on Segments A and B, from Oso Parkway to just after it crosses into the San Onofre State Beach, south of Avenida Pico. The FEC-AFV Alternatives include Segments A, B, H and D. The corridor under the FEC-AFV Alternatives is approximately 26 km (16 mi) long, with an additional approximately 1.9 km (1.2 mi) of improvements on I-5. Segments A, B and D were described earlier under the FEC Alternatives.

Segment H. Segment H extends southeast from just south of Avenida Pico as it crosses the Orange/San Diego County line. This Segment extends southeast through San Onofre State Beach on MCB Camp Pendleton and crosses Cristianitos Road 0.8 km (0.5 mi) southwest of San Mateo Road. It crosses San Mateo Creek just west of Cristianitos Creek and traverses the agricultural leased land on MCB Camp Pendleton east of San Mateo Creek to the intersection of the corridor with I-5.

2.2.2.5 Far East Corridor - Ortega Highway Variation (FEC-OHV) - Initial and Ultimate Alternatives

The alignment of the FEC-OHV Alternatives follows the alignment of Segment A of the FEC Alternatives, from Oso Parkway to Ortega Highway. Only Segment A would be constructed under these Alternatives. The corridor under the FEC-OHV Alternatives is approximately 9 km (6 mi) long.

No additional lanes or road widening on Ortega Highway, beyond those improvements already assumed in the MPAH (four lanes on Ortega Highway), are assumed under these Alternatives. Ortega Highway is shown on the MPAH as a Major Arterial with six travel lanes. No change to this MPAH designation or the number of travel lanes on Ortega Highway are proposed under these Alternatives. However, the TSM strategies may require construction within the existing Ortega Highway right-of-way to install surveillance, monitoring and information display equipment.

2.2.2.6 Far East Corridor - Avenida Pico Variation (FEC-APV) - Initial and Ultimate Alternatives

The alignment of the FEC-APV - Initial and Ultimate Alternatives follows the alignment of Segments A and B of the FEC Alternatives from Oso Parkway to Avenida Pico. Segments A and B are the only segments which would be constructed under these Alternatives. The corridor under the FEC-APV - Initial and Ultimate Alternatives is approximately 17 km (10 mi) long.

The FEC-APV Alternatives incorporate TSM technology improvements on Avenida Pico from the corridor terminus at Avenida Pico to I-5. No additional lanes or road widening on Avenida Pico, beyond those improvements already assumed in the MPAH (six lanes on Avenida Pico), are assumed under these Alternatives. Avenida Pico is shown on the MPAH as a Major Arterial with six travel lanes. No change to this MPAH designation or the number of travel lanes on Avenida Pico are proposed under these Alternatives. However, the TSM strategies may require construction within the existing Avenida Pico right-of-way to install surveillance, monitoring and information display equipment.

2.2.2.7 Far East Corridor-West-Initial and Ultimate Alternatives

The alignment of the FEC-W-Initial and Ultimate Alternatives follows the same alignment as the FEC Alternatives on Segments C and D. The FEC-W Alternative includes Segments U, V, C and D. The corridor under the FEC-W Alternatives is approximately 25 km (15 mi) long, with approximately 1.3 km (0.8 mi) of improvements on the I-5.

Segment U. Segment U of the FEC-W Alternatives extends from the existing terminus of the FTC-N at Oso Parkway, on the east side of Cañada Chiquita to the southeast, south of Coto de Caza, crossing Cañada Gobernadora approximately four km (2.5 mi) north of San Juan Creek.

Segment V. Segment V of the FEC-W Alternatives starts at Ortega Highway approximately 4.0 km (2.5 mi) east of Antonio Parkway/Avenida La Pata. From Ortega Highway, Segment V extends south traversing the west side of the RMV Land Conservancy, extending southeast and crosses the southeast corner of the Talega Valley PC before terminating just south of Avenida Pico.

2.2.2.8 Far East Corridor-Modified-Initial and Ultimate Alternatives

The alignment of the FEC-M-Initial and Ultimate Alternatives follows the same alignment as the FEC Alternatives on Segments C and D. The FEC-M Alternative includes Segments W, X, C and D. The corridor under the FEC-M Alternatives is approximately 26 km (16 mi) long, with approximately 1.3 km (0.8 mi) of improvements on the I-5.

<u>Segment W</u>. Segment W of the FEC-W Alternatives extends from the existing terminus of the FTC-N at Oso Parkway, on the east side of Cañada Chiquita to the southeast, south of Coto de Caza, crossing Cañada Gobernadora approximately four km (2.5 mi) north of San Juan Creek. This Segment crosses San Juan Creek and terminates at Ortega Highway. This Segment includes potential widening of approximately 1.4 km (0.9 mi) of Ortega Highway and construction of a new connector road approximately 1.8 km (1.1 mi) long extending north from Ortega Highway to the FEC alignment. Ortega Highway at the corridor crossing is currently a two lane facility. Under the MPAH, Ortega Highway is designated as a six lane Major Arterial. If Ortega Highway is improved to the Major Arterial designation prior to the implementation of these Alternatives, no further widening of Ortega Highway would be required. If Ortega Highway is not improved to the MPAH designation by the time these Alternatives are implemented, an approximately 1.4 km (0.9 mi) segment of Ortega Highway would be widened, to the MPAH designation.

<u>Segment X</u>. Segment X of the FEC Alternatives starts at Ortega Highway approximately 5.4 km (3.4 mi) east of Antonio Parkway/Avenida La Pata. From Ortega Highway, Segment X extends south, east of the RMV Land Conservancy and Cristianitos Creek, extending southwest and crossing Cristianitos Creek approximately 2.8 km (1.7 mi) north of the Orange/San Diego County line. Segment X crosses the southeast portion of the RMV Land Conservancy and the southeast corner of the Talega Valley PC before terminating just south of Avenida Pico.

2.2.3 CENTRAL CORRIDOR ALTERNATIVES

The Central Corridor (CC) alignments proposed for evaluatation in the EIS/SEIR are listed below.

<u>Central Corridor - Initial Alternatives</u>

Central Corridor – Complete - Initial (CC-Initial) Alternative
Central Corridor - Avenida La Pata Variation - Initial (ALPV-Initial) Alternative
Central Corridor - Ortega Highway Variation - Initial (OHV-Initial) Alternative

Central Corridor - Ultimate Alternatives

Central Corridor – Complete - Ultimate (CC-Ultimate) Alternative
Central Corridor - Avenida La Pata Variation - Ultimate (ALPV-Ultimate) Alternative
Central Corridor - Ortega Highway Variation - Ultimate (OHV-Ultimate) Alternative

2.2.3.1 Central Corridor - Complete (CC) - Initial and Ultimate Alternatives

The alignment of the CC Alternatives generally follows the alignment of the alternative previously referred to as BX. The CC Alternatives include Segments I, J and K. The corridor under the CC Alternatives is approximately 19 km (12 mi) long, with an additional approximately 4.6 km (2.9 mi) of improvements on I-5. These Alternatives would also require widening (to the MPAH designation), but no realignment, of approximately 1 km (0.6 mi) of Ortega Highway. Ortega Highway at the corridor crossing is currently a two lane facility. Under the MPAH, Ortega Highway is designated as a six lane Major Arterial. If Ortega Highway is improved to the Major Arterial designation prior to the implementation of these Alternatives, no further widening of Ortega Highway would be required. If Ortega Highway is not improved to the MPAH designation by the time these Alternatives are implemented, an approximately 1.0 km (0.6 mi) segment of Ortega Highway would be widened, to the MPAH designation, as part of these Alternatives. These Alternatives would not result in the realignment of this same segment of Ortega Highway. The individual segments which comprise the CC Alternatives are described below.

Segment I. Segment I extends from the existing terminus of the FTC-N at Oso Parkway, crosses Cañada Chiquita approximately 2.1 km (1.3 mi) south of Oso Parkway, extending along the west side of Cañada Chiquita, crossing San Juan Creek and Ortega Highway approximately 0.4 km (0.25 mi) east of Antonio Parkway/Avenida La Pata.

Segment J. Segment J extends south from Ortega Highway, paralleling Avenida La Pata, crossing through Prima Deshecha Landfill, south to Avenida Vista Hermosa, traversing property owned by the City of San Clemente and terminating 0.4 km (0.3 mi) south of Avenida La Pata.

Segment K. Segment K of the CC Alternatives extends southwest from the crossing of Avenida La Pata, traversing several existing residential developments. Segment K continues parallel to and northwest of Avenida Pico, to direct connectors at I-5. This Segment then extends 4.6 km (2.9 mi) south on I-5 to Cristianitos Road.

2.2.3.2 Central Corridor - Avenida La Pata Variation (CC-ALPV) - Initial and Ultimate Alternatives

The CC-ALPV Alternatives include Segments I and J only. The corridor under the CC-ALPV Initial and Ultimate Alternatives is approximately 14 km (9 mi) long.

TSM technology improvements on Avenida Vista Hermosa from the corridor terminus at Avenida Vista Hermosa to Avenida La Pata, on Avenida La Pata from Avenida Vista Hermosa to Avenida Pico, and on Avenida Pico from Avenida La Pata to I-5. No additional lanes or road widening on Avenida Vista Hermosa, Avenida La Pata and Avenida Pico, beyond those improvements already assumed in the MPAH, are assumed under these Alternatives. Avenida Vista Hermosa is shown on the MPAH as a Primary Arterial, with four travel lanes and Avenida La Pata and Avenida Pico are shown on the MPAH as Major Arterials with six travel lanes. No changes to these MPAH designations or number of travel lanes on these arterial segments are proposed under these Alternatives. However, the TSM strategies may require construction within the existing arterial rights-of-way to install surveillance, monitoring and information display equipment.

2.2.3.3 Central Corridor - Ortega Highway Variation (OHV) - Initial and Ultimate Alternatives

The CC-OHV Alternatives includes only Segment I. The corridor under the CC-OHV Alternatives is approximately 8 km (5 mi) long. The CC-OHV Alternatives incorporate TSM technology improvements on Ortega Highway from the corridor terminus at Ortega Highway to I-5. No additional lanes or road widening on Ortega Highway, beyond those improvements already assumed in the MPAH (four lanes on Ortega Highway), are assumed under these Alternatives. Ortega Highway is shown on the MPAH as a Major Arterial with six travel lanes. No change to this MPAH designation or the number of travel lanes on Ortega Highway are proposed under these Alternatives. However, the TSM strategies may require construction within the existing Ortega Highway right-of-way to install surveillance, monitoring and information display equipment.

2.2.4 ALIGNMENT 7 CORRIDOR ALTERNATIVES

The Alignment 7 Corridor (A7C) alignments proposed for evaluation in the EIS/SEIR are listed below.

<u>Alignment 7 Corridor – Initial Alternatives</u>

Alignment 7 Corridor – Complete - Initial (A7C-Initial) Alternative
Alignment 7 Corridor - 7 Swing Variation - Initial (A7C-7SV-Initial) Alternative
Alignment 7 Corridor - Far East Crossover Variation - Initial (A7C-FECV-Initial) Alternative
Alignment 7 Corridor - Far East Crossover (Cristianitos) Variation - Initial (A7C-FECV-C-Initial) Alternative
Alignment 7 Corridor - Far East Crossover (Agricultural Fields) Variation - Initial (A7C-FECV-AF-Initial) Alternative
Alignment 7 Corridor - Ortega Highway Variation - Initial (A7C-OHV-Initial) Alternative
Alignment 7 Corridor - Avenida La Pata Variation - Initial (A7C-ALPV-Initial) Alternative
Alignment 7 Corridor-Far East Crossover-Modified-Initial (A7C-FEC-M-Initial) Alternative

<u>Alignment 7 Corridor - Ultimate Alternatives</u>

Alignment 7 Corridor - Complete - Ultimate (A7C-Ultimate) Alternative
Alignment 7 Corridor - 7 Swing Variation - Ultimate (A7C-7SV-Ultimate) Alternative

Alignment 7 Corridor - Far East Crossover Variation - Ultimate (A7C-FECV-Ultimate) Alternative
Alignment 7 Corridor - Far East Crossover (Cristianitos) Variation - Ultimate (A7C-FECV-C-Ultimate) Alternative
Alignment 7 Corridor - Far East Crossover (Agricultural Fields) Variation - Ultimate (A7C-FECV-AF-Ultimate) Alternative
Alignment 7 Corridor - Ortega Highway Variation - Ultimate (A7C-OHV-Ultimate) Alternative
Alignment 7 Corridor - Avenida La Pata Variation - Ultimate (A7C-ALPV-Ultimate) Alternative
Alignment 7 Corridor-Far East Crossover-Modified-Initial (A7C-FEC-M-Ultimate) Alternative

2.2.4.1 Alignment 7 Corridor - Complete - (A7C) – Initial and Ultimate Alternative

The A7C-Initial and Ultimate Alternatives include Segments L, M and N. The corridor under the A7C Alternatives is approximately 19 km (12 mi) long, with an additional approximately 4.6 km (2.9 mi) of improvements on I-5.

Segment L. Segment L extends from the existing terminus of the FTC-N at Oso Parkway, on the east side of Cañada Chiquita and east of the Cañada Chiquita Water Reclamation Plant. It then extends south, across San Juan Creek to Ortega Highway, approximately 1.7 km (1.1 mi) east of the intersection of Antonio Parkway/Avenida La Pata. This Segment includes construction of a new connector road approximately 2.2 km (1.4 mi) long, extending east from Antonio Parkway to the A7C alignment.

Segment M. Segment M extends south from Ortega Highway and across Prima Deshecha Landfill, entering the City of San Clemente and crossing the Talega Valley PC. Segment M then extends southeast to Avenida Vista Hermosa approximately 0.5 km (0.3 mi) northwest of Avenida Pico.

Segment N. From the crossing of Avenida Vistas Hermosa, Segment N extends southwest, traversing land owned by the City of San Clemente and several existing residential developments. Segment N continues parallel to and northwest of Avenida Pico, to direct connectors at I-5. Segment N includes widening of I-5 from south of Avenida Pico to just north of Cristianitos Road.

2.2.4.2 Alignment 7 Corridor – 7 Swing Variation (A7C-7SV) - Initial and Ultimate Alternatives

The alignment of the A7C-7SV-Initial and Ultimate Alternatives includes Segments L, O and P. The corridor under the A7C-7SV Alternatives is approximately 18 km (11 mi) long, with an additional approximately 4.6 km (2.9 mi) of improvements on I-5.

Segment O. Segment O extends from Ortega Highway south across the Prima Deshecha Landfill to Avenida Vista Hermosa, traversing land owned by the City of San Clemente and terminating 0.43 km (0.17 mi) south of Avenida La Pata.

Segment P. Segment P extends southwest from the crossing of Avenida La Pata, traversing several existing residential developments. Segment P continues parallel to and northwest of Avenida Pico, to direct connectors at I-5. Segment P includes widening 4.6 km (2.9 mi) of I-5 from south of Avenida Pico to just north of Cristianitos Road.

2.2.4.3 Alignment 7 Corridor - Far East Crossover Variation (A7C-FECV) - Initial and Ultimate Alternatives

The alignment of the A7C-FECV Initial and Ultimate Alternatives includes Segments L, Q, R and D. The corridor under the A7C-FECV Alternatives is approximately 25 km (15 mi) long, with an additional approximately 1.9 km (1.2 mi) of improvements on I-5. The individual segments which comprise the A7C-FECV Alternatives are described below. Segment L was described previously for the A7C Alternatives and Segment D was described earlier for the FEC Alternatives.

Segment Q. Segment Q extends from south of Ortega Highway, across Prima Deshecha Landfill, through the southeast corner of the Rolling Hills (Talega) PC, through the southeast corner of the RMV Land Conservancy and south to Avenida Pico.

Segment R. Segment R starts at Avenida Pico and the Orange/San Diego County line immediately west of the SDG&E substation. The alignment travels south, crossing the inland part of San Onofre State Beach on MCB Camp Pendleton in San Diego County, extending across Cristianitos Road approximately 1.1 km (0.7 mi) north of I-5. This Segment terminates where the corridor crosses San Mateo Creek.

2.2.4.4 Alignment 7 Corridor - Far East Crossover (Cristianitos) Variation (A7C-FECV-C) - Initial and Ultimate Alternatives

The alignment of the A7C-FECV-C-Initial and Ultimate Alternatives includes Segments L, Q and S. The corridor under the A7C-FEC-C Alternatives is approximately 23 km (14 mi) long. The individual segments which comprise the A7C-FECV-C Alternative are described below. Segments L and Q were described earlier for the A7C and A7C-FECV Alternatives, respectively.

Segment S. Segment S becomes a four lane undivided collector road south of the Avenida Pico interchange. From that interchange, the alignment would proceed south to join the existing Cristianitos Road alignment south of the Camp Pendleton Guard Gate to the interchange of Cristianitos Road and I-5. Segment S includes widening and reconstruction of existing Cristianitos Road from south of the Camp Pendleton Guard Gate south to I-5 and reconstruction of the existing I-5/Cristianitos Road interchange.

2.2.4.5 Alignment 7 Corridor - Far East Crossover (Agricultural Fields) Variation (A7C-FECV-AF) - Initial and Ultimate Alternatives

The alignment of the A7C-FECV-AF-Initial and Ultimate Alternatives includes Segments L, Q, T and D. The corridor under the A7C-FECV-AF Alternatives is approximately 25 km (15 mi) long. Segments L, Q and D were described earlier for the A7C, A7C-FECV and FEC Alternatives, respectively. Segment T is described below.

Segment T. Segment T extends southeast from Avenida Pico as it crosses the Orange/San Diego County line. This Segment then extends southeast through San Onofre State Beach on MCB Camp Pendleton, crossing Cristianitos Road 0.8 km (0.5 mi) southwest of San Mateo Road. It then crosses San Mateo Creek just west of Cristianitos Creek and traverses the agricultural leased land on MCB Camp Pendleton east of San Mateo Creek.

2.2.4.6 Alignment 7 Corridor - Ortega Highway Variation (A7C-OHV) - Initial and Ultimate Alternatives

The alignment of the A7C-OHV-Initial and Ultimate Alternatives include Segment L, which was described earlier for the A7C Alternatives. The corridor under the A7C-OHV Alternatives is approximately 7 km (4 mi) long. The A7C-OHV Alternatives incorporates TSM technology improvements on Ortega Highway from the corridor terminus at Ortega Highway to I-5. No additional lanes or road widening on Ortega Highway, beyond those improvements already assumed in the MPAH (four lanes on Ortega Highway), are assumed under these Alternatives. Ortega Highway is shown on the MPAH as a Major Arterial with six travel lanes. No change to this MPAH designation or the number of travel lanes on Ortega Highway are proposed under these Alternatives. However, the TSM strategies may require construction within the existing arterial right-of-way to install surveillance, monitoring and information display equipment.

2.2.4.7 Alignment 7 Corridor - Avenida La Pata Variation (A7C-ALPV) - Initial and Ultimate Alternatives

The alignment of the A7C-ALPV-Initial and Ultimate Alternatives includes Segments L and M, which were described earlier for the A7C Alternative. The corridor under the A7C-ALPV Alternatives is approximately 14 km (8 mi) long.

The A7-ALPV Alternatives incorporate TSM technology improvements on Avenida Vista Hermosa from the corridor terminus at Avenida Vista Hermosa to Avenida La Pata, on Avenida La Pata from Avenida Vista Hermosa to Avenida Pico and on Avenida Pico from Avenida La Pata to I-5. No additional lanes or road widening on Avenida Vista Hermosa, Avenida La Pata or Avenida Pico, beyond those improvements already assumed in the MPAH, are assumed under these Alternatives. Avenida Vista Hermosa is shown on the MPAH as a Primary Arterial, with four travel lanes and Avenida La Pata and Avenida Pico are shown on the MPAH as Major Arterials with six travel lanes. Typical cross sections for Major and Primary Arterials are shown on Figures 4.2-2 and 4.2-16. No changes to these MPAH designations or number of travel lanes on these arterial segments are proposed under these Alternatives. However, the TSM strategies may require construction within the existing arterial right-of-way to install surveillance, monitoring and information display equipment.

2.2.4.8 Alignment 7 Corridor-Far East Crossover-Modified-Initial and Ultimate Alternatives

The alignment of the A7C-FEC-M-Initial and Ultimate Alternatives follows an alignment similar to the A7C-FECV Alternatives on Segments L and Q and the same alignment on Segments C and D. The A7C-FEC-M Alternative includes Segments Y, Z, C and D. The corridor under the A7C-FEC-M Alternatives is approximately 26 km (16 mi) long, with approximately 1.3 km (0.3 mi) of improvements on the I-5. The individual segments which comprise the A7C-FEC-W Alternative are described below.

Segment Y. Segment Y extends from the existing terminus of the FTC-N at Oso Parkway, on the east side of Cañada Chiquita and east of the Cañada Chiquita Water Reclamation Plant. It then extends south, across San Juan Creek to Ortega Highway, approximately 2.1 km (1.3 mi) east of the intersection of Antonio Parkway/Avenida La Pata.

Segment Z. Segment Z extends southeast from Ortega Highway, then south traversing the west side of the RMV Land Conservancy and then southeast and crosses the southeast corner of the Rolling Hills (Talega) PC before terminating just south of Avenida Pico.

2.2.5 ARTERIAL IMPROVEMENT ALTERNATIVES

The Arterial Improvement Alternatives that are considered are described below. The arterial alternatives assume the MPAH and RTP would be built out in the area. Each of the arterial improvements assumes additional improvements to the circulation system, beyond those in the MPAH and RTP, as described in the following sections.

2.2.5.1 Arterial Improvements Under the AIO Alternative

The AIO Alternative assumes full build out of the MPAH and the RTP. The AIO Alternative incorporates the following additional improvements to the transportation system:

- Expansion of Antonio Parkway/Avenida La Pata to an eight lane smart street from Oso Parkway south to San Juan Creek Road, and to a six lane Smart Street from San Juan Creek Road south to Avenida Pico. Antonio Parkway/Avenida La Pata currently exists from south of Ortega Highway to the north. The MPAH shows Antonio Parkway/La Pata Avenue being extended south to south of Avenida Pico, with a six or four lane cross section. The AIO Alternative proposes adding one lane in each direction on Antonio Parkway/La Pata Avenue from Oso Parkway to San Juan Creek Road.

- Smart street improvements which include a combination of advanced traffic management strategies such as traffic signal coordination, real time traffic monitoring and surveillance, and traveler information; and modest physical improvements such as additional turn lanes at intersections and select grade separations.

- Smart street improvements/TSM strategies on Ortega Highway, Camino Las Ramblas and Avenida Pico between Antonio Parkway/Avenida La Pata and I-5.

Focused improvements are proposed for the intersections of Antonio Parkway/Avenida La Pata with Avenida Pico, Ortega Highway, Crown Valley Parkway and Oso Parkway. These improvements would include either left turn flyovers or full grade separated intersections.

2.2.5.2 Arterial Improvements Plus HOV and Spot Mixed Flow Lanes on I-5 Alternative

The AIP Alternative assumes full build out of the MPAH and the RTP. The AIP Alternative assumes the same arterial improvements described earlier as the AIO Alternative and would include the following additional improvements to the transportation system:

- The addition of one HOV lane on I-5 in each direction between El Toro Road and Cristianitos Road.

- The addition of spot mixed flow (auxiliary) lanes on the segments of I-5 between San Juan Creek Road and Ortega Highway and between Avenida Pico and El Camino Real.

A number of bridges, interchanges and other structures on the segment of the I-5 from El Toro Road to Cristianitos Road would be reconstructed.

2.2.5.3 I-5 Improvements Under the I-5 Alternative

The I-5 Alternative assumes full build out of the MPAH and the RTP assumes the following improvements to I-5:

- The addition of either one or two general purpose lanes in each direction between Cristianitos Road and north of Lake Forest Drive; and the provision of one HOV lane in each direction, except where HOV lanes are already programmed between Camino Las Ramblas and Avenida Pico. Additional mixed flow (auxiliary) lanes will be provided on several segments of I-5.

- A number of bridges, interchanges and other structures on the segment of the I-5 from north of Lake Forest Drive to Cristianitos Road would be reconstructed.

2.3 NO ACTION ALTERNATIVES

2.3.1 OBJECTIVE OF THE NO ACTION ALTERNATIVE

The No Action Alternative under NEPA (referred to as the No Project Alternative under CEQA) is included in an EIS to provide a basis for comparison with what would happen without the federal lead agency's approval of the proposed project or other action alternatives. In an EIS, the

No Action Alternative is analyzed at the same level of detail as the proposed project and other build alternatives.

The CEQA Guidelines state that "The purpose of describing and analyzing a no project alternative is to allow decision makers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project."

To comply with the requirements of NEPA and CEQA, it is critical to define and describe the No Action Alternative. Because the EIS/SEIR will be a joint NEPA/CEQA document, the term "No Action Alternative" will be used consistently in this technical report and is intended to meet the requirements of NEPA for the No Action Alternative and of CEQA for the No Project Alternative. As described in this Section, two No Action Alternatives for the SOCTIIP have been identified.

2.3.2 METHODOLOGY FOR DEFINING THE NO ACTION ALTERNATIVES

The No Action Alternatives were based on consideration of several specific factors as described in the following sections. In defining the No Action Alternatives, it was necessary to make certain assumptions regarding the background road system and the background land use patterns. These conditions will be used to forecast future conditions without the proposed project. These assumptions are based on the planned road network shown on local jurisdictions' General Plan Circulation Elements, anticipated land uses and land use patterns based on build out of local jurisdictions' adopted General Plan LUEs and regionally adopted population growth assumptions and proposed development plans for the RMV property. For the SOCTIIP, these assumptions will be based on the MPAH, the LUEs of the local jurisdictions' General Plans and the OCP-2000 growth projections, as described in the following sections. In addition, certain assumptions must be made regarding regional transportation improvements, based on the adopted RTP.

2.3.3 NO ACTION ALTERNATIVE FOR THE EIS/SEIR

Based on consideration of the No Action/No Project Alternative requirements under NEPA and CEQA and the factors described above, two No Action Alternatives were defined by the Collaborative for evaluation in detail in the EIS/SEIR, for all environmental parameters. These Alternatives vary in the number of DUS assumed on the RMV property and in the on site circulation improvements assumed to support the development on the Ranch. Specifically, the first No Action Alternative assumes the OCP-2000 demographic projections for Orange County, which is consistent with the demographic assumptions in the RTP and as required by the federal Clean Air Act. The second No Action Alternative assumes fewer DUS on the RMV property and, because it is consistent with the current proposed RMV development plan, it reflects current reasonably foreseeable development levels in this part of Orange County. These No Action Alternatives are described in the following sections.

2.3.3.1 No Action Alternative – OCP-2000

This No Action Alternative assumes the following:

- Build out of the LUEs of the General Plans for the cities and unincorporated Orange County.
- OCP-2000 population and employment projections for 2025, which assume substantial development in CAAs 59, 60 and 70. This specifically assumes the construction of approximately 35,888 additional DUS in CAAs 59, 60 and 70 by 2025, including a total of 21,000 DUS on the RMV site.
- Build out of the MPAH, with all arterials constructed to their ultimate cross sections consistent with the MPAH.
- Build out of the RTP improvements in South Orange County.
- No extension of the existing FTC-North south of its existing terminus at Oso Parkway.
- An on site circulation system on the RMV property, to support the 21,000 DUS forecasted in OCP-2000. This on site circulation system will be defined conceptually in the traffic analysis.

2.3.3.2 No Action Alternative – RMV Development Plan

This No Action Alternative assumes:

- Build out of the LUEs of the General Plans for the cities and unincorporated Orange County.
- OCP-2000 population and employment projections for 2025, which assumed substantial development in CAAs 59, 60 and 70. Under this No Action Alternative, the 21,000 DUS assumed on the RMV under OCP-2000 would be excluded and the 14,000 DUS proposed on the RMV by the Company would be included.
- Build out of the MPAH, with all arterials constructed to their ultimate cross sections consistent with the MPAH.
- Build out of the RTP improvements in south Orange County.
- No extension of the existing FTC-North south of its existing terminus at Oso Parkway.
- An on site circulation system on the RMV property, to support the 14,000 DUS proposed by the Company, based on the on site circulation system defined by the RMV for the 14,000 DU development plan.

2.3.3.3 No Action Special Studies Scenarios

In addition to the No Action Alternatives, some of the environmental analyses will consider additional No Action scenarios based on different assumptions than those included in the No Action Alternatives. These No Action scenarios are described in the following sections. Specifically, these No Action Scenarios will test the sensitivity of changes in development levels and the transportation network related to traffic, air quality, growth inducement and cumulative impacts.

No Action Scenario 1: Committed Mpah And Rtp Only And Ocp-2000

This No Action Scenario assumes:

- Build out of the General Plans, plus additional growth based on the development of 21,000 units on the RMV, based on the OCP-2000 projections.
- Construction of committed and funded MPAH and RTP improvements only. This scenario does not include build out of the MPAH and there would be no TSM enhancements to the arterial system. This scenario includes assumptions for on site circulation on the RMV property, to support the 21,000 DUS forecasted under OCP-2000, based on the on site circulation system proposed by the RMV Company for the 14,000 DUS proposal. If no information is available about the on site circulation system, a conceptual system will be defined in the traffic analysis for this scenario.
- No extension of the existing FTC-N south of its existing terminus at Oso Parkway.

No Action Scenario 2: Committed Mpah And Rtp Only And Rmv Development Plan

This No Action Scenario assumes the following:

- Build out of the General Plans, plus additional growth based on the development of 14,000 DUS as proposed by the RMV Company in July 2001.
- Construction of committed and funded MPAH and RTP improvements only shown on Figure 4.1-3. This scenario does not assume build out of the MPAH and there would be no TSM enhancements to the arterial system. This scenario includes assumptions for on site circulation on the RMV property, to support the 14,000 DUS proposed by the Company. If no information is available about the on site circulation system, a conceptual system will be defined in the traffic analysis.
- No extension of the existing FTC-N south of its existing terminus at Oso Parkway.

No Action Scenario 3: Committed Mpah And Rtp And General Plan Land Use

This No Action Scenario assumes the following:

- OCP-2000 population and employment projections for 2025, excluding the approximately 21,000 new DUS assumed in CAAs 59, 60 and 70 for the RMV, but including the approximately 6,250 DUS that could be constructed on the RMV under the existing LUE. All other growth assumed for these three CAAs and all other CAAs under OCP-2000 would be consistent with the projections in OCP-2000.

- Construction of committed and funded MPAH and RTP improvements only. This scenario does not assume build out of the MPAH and there would be no TSM enhancements to the arterial system. The committed and funded MPAH improvements assumed in this scenario will be defined in detail in the traffic analysis. This scenario does not include any other assumptions regarding circulation because the 6,250 DUS are currently shown in the LUE. The Circulation Element and the LUE are required to be consistent. Therefore, the 6,250 DUS are understood to be supported by the current Circulation Element.

- No extension of the existing FTC-N south of its existing terminus at Oso Parkway.

<u>No Action Scenario 4: Committed Mpah And Rtp Only And Constrained Land Use</u>

This No Action Scenario assumes the following:

- OCP-2000 population and employment projections for 2025, excluding 21,000 of the approximately 35,888 new DUS assumed in CAAs 59, 60 and 70. This scenario assumes no development on the RMV property in these three CAAs. All other growth assumed for these three CAAs and all other CAAs under OCP-2000 would be consistent with the projections in OCP-2000.

- Construction of committed and funded MPAH and RTP improvements only. This scenario does not assume build out of the MPAH and there would be no TSM enhancements to the arterial system.

- No extension of the existing FTC-N south of its existing terminus at Oso Parkway.

TABLE 2-1
SUMMARY OF CUT, FILL AND REMEDIAL AMOUNTS FOR THE INITIAL AND ULTIMATE CORRIDOR ALTERNATIVES

Initial and Ultimate Corridor Alternative	Estimated Cut in 1000s of Cubic Meters (cubic yards)	Estimated Fill in Cubic Meters (cubic yards)	Total Net in Cubic Meters (cubic yards)	Remedial in Cubic Meters (cubic yards)
FAR EAST CORRIDOR ALIGNMENT ALTERNATIVES				
FEC - Initial Alternative	-14,200 (-18,574)	11,900 (15,565)	-2,300 (-3,008)	20,600 (26,945)
FEC - Ultimate Alternative	-20,800 (-27,206)	19,300 (25,244)	-1,500 (-1,962)	22,000 (28,776)
FEC-TV - Initial Alternative	-17,400 (-22,760)	14,000 (18,312)	-3,400 (-4,447)	17,700 (23,152)
FEC-TV - Ultimate Alternative	-21,800 (-28,514)	14,100 (18,443)	-7,700 (-10,716)	19,000 (24,852)
FEC-CV - Initial Alternative	-10,900 (-14,257)	7,100 (9,287)	-3,800 (-4,970)	16,800 (21,974)
FEC-CV - Ultimate Alternative	-14,100 (-18,443)	11,800 (15,434)	-2,300 (-3,008)	18,500 (24,198)
FEC-AFV - Initial Alternative	-11,800 (-15,434)	10,900 (14,257)	-900 (-1,177)	17,500 (22,890)
FEC-AFV - Ultimate Alternative	-14,700 (-19,228)	15,200 (19,882)	+500 (+654)	18,800 (24,590)
FEC-OHV - Initial Alternative	-4,300 (-5,624)	4,100 (5,363)	-200 (-261)	5,200 (6,802)
FEC-OHV - Ultimate Alternative	-9,400 (-12,295)	6,900 (9,025)	-2,500 (-3,270)	6,400 (8,371)
FEC-APV - Initial Alternative	-8,800 (-11,510)	7,400 (9,679)	-1,400 (-1,831)	12,800 (16,742)
FEC-APV - Ultimate Alternative	-12,000 (-15,696)	12,300 (16,085)	+300 (+392)	14,200 (18,574)
FEC-W-Initial Alternative	-12,771 (-16,704)	13,062 (17,085)	+292 (+382)	11,837 (15,483)
FEC-W-Ultimate Alternative	-14,993 (-19,610)	15,864 (20,750)	+871 (+1,139)	12,500 (16,350)
FEC-M-Initial Alternative	-14,307 (-18,714)	11,008 (14,398)	-3,299 (**-4,315**)	13,513 (17,675)
FEC-M-Ultimate Alternative	-16,732 (-21,885)	13,712 (17,935)	-3,019 (-3,949)	14,200 (18,574)
CENTRAL CORRIDOR ALIGNMENT ALTERNATIVES				
CC - Initial Alternative	-11,600 (-15,173)	8,900 (11,641)	-2,700 (-3,532)	31,100 (40,679)
CC - Ultimate Alternative	-19,400 (-25,375)	14,600 (19,097)	-4,800 (-6,278)	32,400 (42,379)
CC-ALPV - Initial Alternative	-6,700 (8,764)	7,000 (9,156)	+300 (+392)	28,600 (37,409)
CC-ALPV - Ultimate Alternative	-10,500 (-13,734)	10,800 (14,126)	+300 (+392)	29,500 (38,586)
CC-OHV - Initial Alternative	-1,900 (-2,485)	2,100 (2,747)	+200 (+261)	13,500 (17,658)
CC-OHV - Ultimate Alternative	-3,800 (-4,970)	3,000 (5,924)	-800 (-1,046)	13,500 (17,658)
ALIGNMENT 7 CORRIDOR ALIGNMENT ALTERNATIVES				
A7C - Initial Alternative	-37,800 (-49,442)	35,500 (46,434)	-2,300 (-3,008)	30,500 (39,894)
A7C - Ultimate Alternative	-49,000 (-64,092)	43,600 (57,028)	-5,400 (-7,063)	30,600 (40,025)
A7C-7SV - Initial Alternative	-40,700 (-53,236)	30,500 (38,894)	-10,200 (-13,342)	27,000 (35,316)
A7C-7SV - Ultimate Alternative	-52,800 (-69,062)	38,200 (44,236)	-14,600 (-19,097)	26,500 (34,662)
A7C-FECV - Initial Alternative	-41,300 (-54,020)	31,400 (41,071)	-9,900 (-12,949)	34,500 (45,126)
A7C-FECV - Ultimate Alternative	-43,700 (-57,160)	36,900 (48,265)	-6,800 (-8,894)	35,700 (46,696)
A7C-FECV-C - Initial Alternative	-38,000 (-49,704)	26,600 (34,793)	-11,400 (-14,911)	30,600 (40,025)
A7C-FECV-C - Ultimate Alternative	-51,300 (-67,100)	44,600 (58,337)	-6,700 (-8,764)	31,500 (41,202)

TABLE 2-1
SUMMARY OF CUT, FILL AND REMEDIAL AMOUNTS FOR THE INITIAL AND ULTIMATE CORRIDOR ALTERNATIVES

Initial and Ultimate Corridor Alternative	Estimated Cut in 1000s of Cubic Meters (cubic yards)	Estimated Fill in Cubic Meters (cubic yards)	Total Net in Cubic Meters (cubic yards)	Remedial in Cubic Meters (cubic yards)
A7C-FECV-AF - Initial Alternative	-39,200 (-51,274)	30,400 (39,763)	-8,800 (-11,510)	31,300 (40,940)
A7C-FECV-AF - Ultimate Alternative	-51,400 (-67,231)	46,300 (60,560)	-5,100 (-5,294)	32,200 (42,118)
A7C-OHV - Initial Alternative	-3,700 (-4,840)	7,900 (10,333)	+4,200 (+5,493)	5,900 (7,712)
A7C-OHV - Ultimate Alternative	-4,500 (-5,886)	12,200 (15,958)	+7,700 (+10,071)	6,100 (7,979)
A7C-ALPV - Initial Alternative	-33,300 (-43,556)	33,800 (44,210)	+500 (+654)	27,500 (35,970)
A7C-ALPV - Ultimate Alternative	-34,500 (-45,124)	34,000 (44,470)	+1,700 (+2,224)	27,500 (35,970)
A7C-FEC-M-Initial Alternative	-12,149 (-15,891)	13,530 (17,697)	+1,380 (+1,805)	12,703 (16,616)
A7C-FEC-M-Ultimate Alternative	-14,192 (-18,563)	16,503 (21,586)	+2,310 (+3,021)	13,400 (17,527)
AIO Alternative	-4,800 (-6,278)	3,700 (4,840)	-1,100 (-1,439)	11,200 (14,650)
AIP Alternative	-10,300 (13,500)	5,600 (7,300)	-4,700 (-6,100)	15,600 (20,370)
I-5 Widening Alternative	-6,600 (-8,633)	5,585 (7,300)	-4,300 (-5,624)	4,400 (5,155)

Source: CDMG and P&D Consultants (2003).

Note: Remedial Grading is defined as earthwork related to the remediation of landslides and other geotechnical preparation work.

SECTION 3.0

RESOURCES / ENVIRONMENTAL PARAMETER OVERVIEW

The California Division of Mines and Geology (CDMG) [now known as the California Geological Survey - CGS] published a guideline for discussing geologic/seismic considerations in Environmental Impact Reports (EIR). This guideline is known as Note 46. The issues identified in Note 46 are summarized in Table 3-1.

TABLE 3-1
CDMG (CGS) CHECKLIST OF GEOTECHNICAL AND GEOLOGIC ISSUES

Earthquake Damage Fault movement, liquefaction, landslides, differential compaction/seismic settlement, ground shaking and seismically induced flooding.
Loss of Mineral Resources Loss of access, deposits covered by changed land use and zoning restrictions.
Waste Disposal Problems Change in groundwater levels, disposal of excavated material and percolation of waste material.
Slope and/or Foundation Instability Landslides and mudflows, unstable cut and fill slopes and collapsible and expansive soils.
Erosion, Sedimentation and Flooding Erosion of graded areas, alteration of runoff, unprotected drainage ways and increased impervious surfaces.
Land Subsidence Extraction of groundwater, gas, oil, geothermal energy; hydrocompaction and peat oxidation
Volcanic Hazards Lava flow and ash fall

For the South Orange County Transportation Infrastructure Improvement Project (SOCTIIP), most of these issues are potential impacts to the project that need to be recognized, and mitigated where possible. Mitigation for these issues is usually accomplished by implementing various engineering measures, during project design and construction.

For some issues, such as slope stability and landslides, the construction of the project has the potential to adversely impact the existing geology, and potentially create unstable slopes or trigger the movement of existing landslides. Many of these types of issues are also mitigated by engineering measures that are incorporated in the project's design and construction.

In the case of mineral resources, construction of a new highway could have the potential to render existing resources unrecoverable. It may be difficult or impractical to mitigate such an issue, and to the extent this is the case, such an impact needs to be recognized.

The purpose of this report is to review the proposed SOCTIIP alternatives, relative to the existing site conditions, and identify whether the existing conditions have potential negative impacts to the SOCTIIP alternatives, or on the other hand, whether the alternatives have the potential to negatively affect the existing geologic conditions.

SECTION 4.0
DESCRIPTION OF ASSUMPTIONS

For evaluating the South Orange County Transportation Infrastructure Improvement Project (SOCTIIP) alternatives, certain assumptions were made relative to design and construction. For example, if it were assumed that earthwork (cuts and fills) would be performed without regard to existing adverse conditions (i.e., poor soil conditions, landslides, and unstable slopes) then significant adverse impacts to the project could occur and would need to be identified. Such an approach would be unrealistic, because standard practice for this type of project includes investigation, design and construction techniques that are intended to mitigate potential problems related to earth resources. It is recognized that standard practices do not necessarily mitigate all potential problems. For this evaluation, it is assumed that standard investigation, design and construction practices would be implemented in the project alternatives, as noted below. As is common on similar projects, the implementation of these standard practices will have the effect of mitigating many, but not all, of the potential earth resources related impacts. Those impacts that remain are discussed in Section 7.0.

In some cases, adverse effects cannot be mitigated through standard investigation, design and construction. For example, construction over a sand and gravel resource area would result in making these mineral resources unavailable in the future. Also, standard investigation, design and construction efforts may not totally eliminate the potential for an adverse effect, such as the potential for slope instability due to an undetected weak clay layer within a cut slope, and therefore, there is the potential for residual adverse effects even with mitigation.

The primary assumptions regarding standard practices that will be utilized during construction were made for this evaluation:

- Grading would be performed using standard, heavy earthmoving equipment, with ripping operations being performed by tractors of the Caterpillar D9N size or larger. (If smaller machines are assumed, estimates of rippability would need to be revised to indicate that more difficult conditions would be present.)
- Groundwater is not contaminated, such that construction dewatering would encounter substantial problems in discharging of pumped water (i.e. water can be discharged under a typical National Pollutant Discharge Elimination System (NPDES) construction discharge permit).
- Bedrock and soil units do not contain contaminants that would require special handling or disposal.
- Standard structural designs would be implemented to resist damage due to strong seismic shaking.
- Areas of potentially liquefiable soils would be identified and appropriately treated to remove the potential for distress to embankments and/other foundations.

- Landslides and potentially unstable slopes would be identified and treated with remedial grading to achieve stable slopes along the roads.
- Fills would be constructed to standard specifications so that the potential for slope failure or damaging settlement would be avoided.
- Areas of collapsible soils would be identified and appropriate treatments would be implemented during construction so that potentially damaging settlement would be avoided.
- Areas of highly expansive soils would be identified and design/construction measures will be implemented so that the potential for foundation damage would be avoided.
- Slope faces would be finished in standard ways (i.e., with appropriate slope angles, soil compaction, and surficial treatments), so that erosion is controlled to within the natural levels of the pre-construction environment.
- Standard hydraulic evaluations would be performed and the results incorporated into project design so that surface water flows are sufficiently controlled to prevent excess erosion and/or flooding.
- Standard designs would be implemented for ditches and watercourses so that excessive flows and the potential for damaging erosion are controlled.
- Any construction dewatering that may be required will be performed under permit, within the requirements of the Regional Water Quality Control Board. Final Design Level geotechnical studies will provide recommendations to mitigate dewatering settlement that could result in substantial damage.

SECTION 5.0
EXISTING CONDITIONS

This section discusses the geologic and geotechnical conditions that exist along the build alternatives of the South Orange County Transportation Infrastructure Improvement Project (SOCTIIP). This discussion provides general descriptions of the various geologic units and geologic structure, and geotechnical conditions present in the site region, and also some specific details along each of the build alternatives. More detailed geologic information along a specific build alternative is available in the Preliminary Geotechnical Reports that were prepared for the Alternatives (Leighton and Associates; 2001a, b; 2002a, b, c, d, e, f).

5.1 REGIONAL GEOLOGIC AND SEISMIC SETTING

The alignments of the SOCTIIP build alternatives trend generally north to northwest across the foothills of the Santa Ana and Santa Margarita Mountains. These mountains lie within the Peninsular Ranges Physiographic Province of California, which is characterized by its generally northwest trending mountains and geologic structure. The Peninsular Ranges Province is bounded on the north by the Transverse Ranges Province, which is characterized by its east-west geologic structural and topographic grain, and on the east by the Colorado and Mojave Desert Provinces.

The most complete section of late Mesozoic and Cenozoic geologic units in the north part of the Peninsular Ranges Province (Schoelhamer et al, 1981) is exposed in the foothills and valleys along the alignments of the SOCTIIP build alternatives. These units are divided into surficial and bedrock units. The surficial units are generally composed of poorly to moderately consolidated sediments of Pleistocene and Holocene geologic age, and generally occur in valley bottoms. As discussed below, the surficial units also include landslide deposits within the bedrock units, and man-made fills. The bedrock units consist of a series of clastic sedimentary rocks of Upper Cretaceous to Tertiary geologic age (Miller and Morton, 1984). They are composed dominantly of marine and non-marine sandstones and siltstones that form a blanket (Miller and Morton, 1984) that thickens to the south and west with a thickness estimated to be as much as 7,500 meters (24,600 feet) (Morton et al, 1975). Below the sedimentary bedrock units, and not exposed along the alignments of the SOCTIIP alternatives, is the basement or subjacent series rocks, of Middle to Upper Jurassic geologic age. These rocks form much of the core of the Santa Ana Mountains, and consist of crystalline and metamorphic rocks that are unconformably overlain by the sedimentary bedrock units.

5.2 SITE GEOLOGIC SETTING

The geologic units and structure in the vicinity of the project alternatives are described in this Section. The locations of the project alternatives with respect to these geologic units and structures are shown on Figures 5-1a and 5-1b, following the last page of text in this section.

5.2.1 PRINCIPAL SURFICIAL UNITS

5.2.1.1 Man-Made Fills

Although not shown on Figure 5-1a, deposits of artificial (man- made) fill exist locally along the alignments of the SOCTIIP alternatives. The extent of these fills is shown on mapping contained in a series of Preliminary Geotechnical Reports for the alternatives, prepared by Leighton and Associates (2001a, b; 2002a, b, c, d, e, f). In most cases, these fills were likely derived from nearby geologic units and, thus, would be similar in lithology. However, wide variability in material type can occur in man-made fills, because of variability in the source materials (i.e., varied bedrock and alluvial units), and also because of variations in the way the fills were placed. Important factors associated with man-made fills include: 1) the degree to which the area beneath the fill was prepared before fill placement; and 2) the degree to which the fill material was compacted. For this reason, in the Preliminary Geotechnical Reports, man-made fills were mapped as either "Artificial Fill, controlled," where records of compaction tests and remedial removal procedures used during fill placement are available, or as "Artificial Fill," where records may be lacking. Depending on site-specific conditions, non-engineered fill may need to be removed as part of the project grading. Specific recommendations regarding man-made fills present along the alignments of the SOCTIIP Alternatives are provided in the Preliminary Geotechnical Reports by Leighton and Associates (2001a, b; 2002a, b, c, d, e, f).

5.2.1.2 Landslide Deposits

As shown on Figure 5-1, and on geologic maps in the Preliminary Geotechnical Reports (Leighton and Associates, 2001a, b; 2002a, b, c, d, e, f) areas of small to very large landslide deposits are present within the sedimentary bedrock units in the general areas of the SOCTIIP build alternatives. As shown on Figure 5-1a, certain bedrock units are more prone to landsliding than others. For example, relatively few landslides are mapped within the Santiago Formation, whereas landslides are common within the Monterey and Capistrano Formations.

The lithology of the landslide materials is dependant on the bedrock source, and tends to be clayey silt to silty sand. Because these masses have moved, they may be more porous and lower in density than the intact bedrock. These masses are prone to continued downslope movement during or after periods of substantial rainfall. However, some landslide masses may be relatively stable in their current configurations. Although perhaps otherwise stable, renewed downhill movement of a landslide mass can result if grading operations remove support at the base, or add weight near the top of a landslide mass. In many cases, landslide deposits would not be suitable for the support of embankments and road improvements. Therefore these types of materials are commonly avoided, or removed and replaced as compacted fill during grading operations.

5.2.1.3 Colluvium

Colluvial deposits are those formed by in-place weathering or by downslope creep and slumping of weathered material (i.e., not deposited by streams). Colluvium is mapped together with alluvium on Figure 5-1a, but is differentiated on the more detailed mapping provided in the Preliminary Geotechnical Reports (Leighton and Associates, 2001a, b; 2002a, b, c, d, e, f).

Colluvium is locally present along all the alignments of the SOCTIIP build alternatives, specifically in landslide head scarp areas, on gentle slopes and over parent material which is more susceptible to in-place weathering. Colluvial deposits are derived from the underlying or locally adjacent bedrock and, therefore, are of varying composition, reflecting the lithology of the parent material. In general, colluvial materials are clay-rich and contain varying amounts of organic material, usually as roots. These materials are typically unconsolidated and uncemented, low in density, lack structure, and are poorly sorted to unsorted. Substantial amounts of the parent bedrock may be present as clasts within the colluvium.

5.2.1.4 Alluvium

Alluvium is present in the bottoms of all the major drainages and many of the minor drainages crossed by the alignments of the SOCTIIP build alternatives. Alluvium is typically fine- to very coarse-grained sand and gravel, with varying amounts of silt and/or clay. Boulders may be present in the larger canyons or areas susceptible to debris flows. Alluvial deposits typically exhibit poor sorting, moderately to poorly developed lenticular bedding and local cross-bedding. The composition of alluvial deposits is varied, depending on source area and typical stream-flow velocity. The smaller drainages, which are developed on less consolidated and finer-grained bedrock units, typically contain alluvium that is more fine-grained. The fine-grained alluvium is typically of relatively low density and is often compressible. However, the coarse-grained sand and gravel deposits in major drainage courses may be well consolidated and dense. Older deposits of alluvium are locally present along the bottoms of the larger drainages in the area of the SOCTIIP build alternatives. It is differentiated from active alluvial deposits because it is no longer in the active regime of the stream. Older alluvium is generally similar in lithology to younger alluvium deposits, except the older material may have a higher silt and clay content and may have a higher density.

5.2.1.5 Non-Marine Terrace Deposits

Non-marine terrace deposits are locally present as uplifted terraces along major drainages and as isolated erosional remnants of alluvial terraces in lower lying areas. These deposits have been in place for sufficient time for soil development. Soils on non-marine terrace deposits are commonly well-developed with clayey B horizons and may contain a calcareous C horizon (caliche horizon). The terrace deposits are commonly light brown, yellowish-brown and gray conglomerate, and reddish-brown sands and gravels. They are moderately consolidated and fine- to coarse-grained, possibly with scattered boulders. The finer material commonly forms a matrix around the larger grains and is normally silty and/or clayey. Poorly developed bedding can be lenticular and/or cross-bedded in nature. Scattered clayey buried soil horizons may be present. These deposits are generally well consolidated and dense, although beds or zones of porous, compressible material may be present. Numerous cobbles and boulders are often present.

5.2.1.6 Marine Terrace Deposits

As shown on Figure 5-1, marine terrace deposits are present along the coast, at the southern ends of the alignments of the SOCTIIP build alternatives. The deposits are the result of tectonic uplift and/or changes in sea level, which resulted in beach and near-shore deposits being exposed. Soil development within these deposits is dependent on age. Older deposits have well-developed soils with localized, moderately developed calcareous horizons. The deposits are commonly light brown to yellowish-brown to orange, and are fine- to medium-grained sand and silty sand, with local lenses of coarse-grained sand and pebble gravel, especially near the base. Bedding is commonly poorly developed, but can be lenticular and/or cross-bedded. The deposits are typically well consolidated and dense, except where loosened by weathering.

5.2.2 BEDROCK UNITS

As shown on Figure 5-1, the alignments of the SOCTIIP alternatives cross eight mapped bedrock units, which from youngest to oldest are: Capistrano, Monterey, San Onofre Breccia, Topanga, Sespe, Santiago, Silverado and Williams Formations. The general characteristics of these formations are described below.

5.2.2.1 Capistrano Formation

The siltstone member of the Capistrano Formation is present along the southwestern part of the study area, along most of Interstate 5 (I-5) through San Clemente and along parts of the alignments parallel to Avenida Pico, and north to Ortega Highway. This formation is present along the eastern alignments, from their intersection with I-5, north to about the trace of the Cristianitos Fault. The Capistrano Formation is generally composed of medium-gray to brown, clay-rich, micaceous siltstone. Whitish-gray sandstone is common in poorly developed beds and lenses. Locally hard, dark gray to bright orange, calcareous concretions form irregular discontinuous beds. Below the oxidation zones, the siltstone is commonly dark olive-gray and, when freshly exposed, has a strong petroliferous odor. Locally, thin interbeds of well-developed clay are present. Gypsum-filled joints and irregular seams are common in the oxidized portion of the siltstone.

Based on preliminary geotechnical studies (Leighton and Associates, 2001a, b; 2002a, b, c, d, e, f), general characteristics of the Capistrano Formation (siltstone facies) are:

- Erodibility is moderate.
- Expansivity ranges from moderate to low.
- Rippability is typically easy.
- Collapsibility/Compressibility is generally low.
- Slope stability is generally poor for natural and cut slopes.
- Suitability for fill is poor.
- Liquefaction potential is low.
- Permeability is low.

5.2.2.2 Monterey Formation

The Monterey Formation is present along portions of the western alignments, uphill (westward) from Avenida Pico and northward to near the ridge top south of the Prima Deshecha Sanitary Landfill. The massive landslide present in the hillside area east of and uphill from the Alignment 7 Corridor, between the Landfill and Ortega Highway, may also consist of materials mostly derived from the Monterey Formation. This formation also appears to be present along the Far East Corridor alignments, in a small area west of Cristianitos Creek and south of the existing electrical substation at the end of Avenida Pico.

The Monterey Formation is an interbedded mix of thinly bedded siltstones, claystones and sandstones. The siltstones are commonly gray to greenish-gray to buff, thinly bedded, and commonly diatomaceous and/or tuffaceous. The siltstones are poorly indurated to well indurated and commonly sandy and/or clayey. The claystones are commonly gray to olive-gray to buff, thinly bedded, and commonly sandy or silty. They are generally poorly to moderately indurated. The sandstones are very light gray, to gray, commonly stained orange, predominately very fine- to fine-grained and feldspathic. They are unconsolidated to moderately cemented, generally with calcareous cement and are commonly micaceous and locally tuffaceous. In most areas, the tuffaceous component of the sandstones and siltstones is bentonitic and can result in beds to about 30 centimeters (cm) (one foot) of nearly pure clay. Below the oxidation zone, the various lithologies in the Monterey Formation are light gray, to gray, to black. Regionally, the Monterey Formation contains basal coquina limestone beds, travertine beds, and substantial amounts of montmorillonite clay.

Based on preliminary geotechnical studies (Leighton and Associates, 2001a, b; 2002a, b, c, d, e, f), general characteristics of the Monterey Formation are:

- Erodibility is high.
- Expansivity ranges from moderate to high.
- Rippability is typically easy.
- Collapsibility/Compressibility is generally low.
- Slope stability is generally poor to moderate for natural and cut slopes.
- Suitability for fill is poor.
- Liquefaction potential is low.
- Permeability is low.

5.2.2.3 San Onofre Breccia

San Onofre Breccia is present along the Alignment 7 Corridor Alternatives, adjacent to both sides of San Juan Creek, and along the Central Corridor alignments, for about three kilometers (km) (two miles) south of San Juan Creek. This formation is not present along the Far East Corridor alignments.

San Onofre Breccia in the SOCTIIP area is an extremely varied unit consisting chiefly of breccia with interbedded siltstones, sandstones and conglomerate. The unit is massive to very poorly-bedded and is characterized by large variations in structure and lithology over very short distances. The unit is both marine and non-marine in origin. Typically, the breccias of the San Onofre have a siltstone to very coarse sandstone matrix with angular clasts as large as a meter (a few feet) in maximum dimension. The siltstone matrix is commonly brown to brownish-gray, poorly sorted, poorly bedded and moderately well-indurated. The matrix can grade laterally and vertically into sandstone or gravelly conglomerate, with little change in enclosed clasts. The sandstone to conglomerate matrix is commonly well indurated, but can be poorly indurated, poorly sorted and poorly bedded, to massive and characterized by very angular grains. The sandstone/conglomerate matrix is argillaceous, quartzo-feldspathic and generally contains substantial amounts of biotite. It is commonly iron-stained and red to reddish-brown in color, with some orange staining in the finer-grained material. Locally, the matrix is composed of white to light gray to pink tuffaceous siltstone, which has devitrified to mostly clay. Clasts in the San Onofre Breccia have varied composition, but include volcanics, green schist facies metamorphics and a wide range of sedimentary lithologies. The clasts are generally angular to subangular, and in the finer matrices, have a rind of sheared and polished green to gray clay up to several inches in thickness. San Onofre Breccia interfingers both with the underlying Topanga and the overlying Monterey Formations and is reported to contain siltstone and sandstone interbeds in lenticular structure similar to both these bounding formations. Local beds of tuff also exist.

Based on preliminary geotechnical studies (Leighton and Associates, 2001a, b; 2002a, b, c, d, e, f), general characteristics of the San Onofre Breccia are:

- Erodibility is low to moderate.
- Expansivity is low.
- Rippability is typically difficult.
- Collapsibility/Compressibility is generally moderate.
- Slope stability is generally moderate to good for natural and cut slopes.
- Suitability for fill is good.
- Liquefaction potential is moderate.
- Permeability is moderate to high.

5.2.2.4 Topanga Formation

The Topanga Formation appears to exist along limited reaches of the Alignment 7 Corridor alignments, in the vicinity of San Juan Creek. The formation typically consists of yellowish-brown to light-brown, fine-grained, thinly bedded, marine, silty sandstone with interbedded siltstone and minor conglomerate. The unit is typically moderately to well indurated, and well-cemented sandstone beds are common.

Based on preliminary geotechnical studies (Leighton and Associates, 2001a, b; 2002a, b, c, d, e, f), general characteristics of the Topanga Formation are:

- Erodibility is moderate to high.
- Expansivity is low to moderate.
- Rippability is typically moderate to difficult.
- Collapsibility/Compressibility is generally moderate.
- Slope stability is generally good for natural and cut slopes.
- Suitability for fill is good.
- Liquefaction potential is moderate.
- Permeability is high.

5.2.2.5 Sespe Formation

The Sespe Formation is mapped along the northern approximately two km (1½ mile) of all the SOCTIIP build alternatives within Cañada Chiquita. The Sespe Formation is predominantly an arkosic sandstone with interbedded conglomerate, siltstone and claystone. The sandstones are reddish to pale orange to light yellowish-gray, medium- to coarse-grained, poorly and thickly bedded, and poorly to moderately well-indurated. They are generally somewhat silty and commonly crossbedded and locally well and thinly bedded. Grains are subangular to subrounded, quartzo-feldspathic in composition, and the sandstones are locally biotite rich. The siltstones and claystones are pale orange to light gray, generally thinly bedded, and gradational in grain size distribution. Conglomeratic beds are composed of well-rounded clasts in a subangular sandstone matrix. Clasts are commonly volcanic. They are commonly moderately well-indurated.

Based on preliminary geotechnical studies (Leighton and Associates, 2001a, b; 2002a, b, c, d, e, f), general characteristics of the Sespe Formation are:

- Erodibility is moderate.
- Expansivity is low to moderate.
- Rippability is typically moderate.
- Collapsibility/Compressibility is generally low.
- Slope stability is generally moderate to good for natural and cut slopes.
- Suitability for fill is good.
- Liquefaction potential is low.
- Permeability is high.

5.2.2.6 Santiago Formation

The Santiago Formation is present along about three to four km (two to three miles) of the Far East Corridor and Central Corridor Alternatives, north of San Juan Creek. The Formation is also present along portions of these Alternatives south of San Juan Creek. It underlies the downhill portions of the massive landslide areas along and uphill from the Alignment 7 Corridor, on the west side of Cañada Chiquita.

The Santiago Formation is marine in origin, with some possible non-marine portions. It consists predominately of silty to clayey sandstone with subordinate siltstone with basal conglomerates being present in some areas. In the lower portions of the unit, the sandstones are grayish-yellow to white to very light gray, silty and/or clayey, massive to broadly crossbedded, and moderately to well-indurated. The medium- to coarse-grained sandstones are generally friable, poorly sorted, contain angular grains and are quartzo-feldspathic in composition. In the upper parts of the unit, the sandstones are grayish-yellow to greenish-gray to brownish-gray, fine- to medium-grained, and poorly bedded. Grains are angular to subangular, poorly to well-sorted, and quartzo-feldspathic in composition with minor biotite. The siltstones are greenish-gray to reddish-brown, sandy and/or clayey, and thinly bedded. In the lower parts, they may be chloritic and are generally lenticular in nature. The basal conglomerates are lenticular in nature and composed of cobbles of red and green metavolcanics, light colored plutonic rocks, quartzite, and hard sediments. They are massive and well-indurated. Local, thin, lenticular bodies of greenish-gray clay also occur.

Based on preliminary geotechnical studies (Leighton and Associates, 2001a, b; 2002a, b, c, d, e, f), general characteristics of the Santiago Formation are:

- Erodibility is moderate.
- Expansivity is low.
- Rippability is typically moderate.
- Collapsibility/Compressibility is generally low.
- Slope stability is generally moderate to good for natural and cut slopes.
- Suitability for fill is good.
- Liquefaction potential is low.
- Permeability is moderate to high.

5.2.2.7 Silverado Formation

The Silverado Formation appears to be present along the easternmost alignments (i.e., the Far East Corridor Alternatives). Along the Far East Corridor Alternatives, the northernmost mapped extent of the formation is just north of San Juan Creek. South of San Juan Creek, the formation is exposed locally along Cristianitos Canyon.

The Silverado Formation is thought to be non-marine in origin in the lower parts and mixed marine and non-marine sediments in the upper parts. The lower parts consist of a moderately indurated basal conglomerate overlain by interbedded sandstone, siltstone and claystone. The sandstones are gray, greenish-gray and buff, coarse-grained, and generally thickly bedded with some crossbedding with some lower beds being lenticular. Grains are angular to subangular, unsorted to poorly sorted, and quartzo-feldspathic in composition, with lesser amounts of biotite, anauxite and carbonates. Sandstones are generally poorly indurated. The interbedded siltstones and claystones are red to brown, with two distinctive "marker" clay beds of brownish-gray to olive-brown pisolitic clay and whitish-gray clay near the bottom of the unit. The upper part of the Silverado Formation is predominately massive pebbly sandstones of non-marine origin with fine-grained bedded sandstone in areas representing marine deposition. These are moderately to well-indurated and crossbedded. Minor yellowish-brown siltstone and clayey siltstone is interbedded in thin beds. Regional studies (CDMG, 1976) also report local occurrences of lignitic shale beds.

According to CDMG (1976), the general characteristics of the Silverado Formation are:

- Erodibility is generally high.
- Expansivity is generally low.
- Rippability is typically moderate.
- Slope stability is generally moderate to good for natural and cut slopes.
- Suitability for fill is generally good.
- Permeability is low to moderately low.

5.2.2.8 Williams Formation (Pleasants Sandstone Member)

The Pleasants Sandstone Member of the Williams Formation is present along the Far East Corridor alignments, east of the Mission Viejo Fault, extending from about the ridge top south of San Juan Creek northward to the creek. This formation is not present along the other alternatives.

The Pleasants Sandstone Member of the Williams Formation is predominately light tan to olive-gray, medium- to fine-grained sandstone interbedded with light gray to yellowish-gray, medium- to fine-grained sandstones and siltstone. The sandstones are poorly bedded and massive, thinly bedded where silty or clayey, well-sorted, and generally poorly cemented. Some calcareous sandstones have very well-cemented concretionary layers and may be crossbedded. Grains are angular and quartzo-feldspathic in composition with subordinate biotite. The siltstones are thinly bedded, poorly indurated and clayey.

According to CDMG (1976), the general characteristics of the Pleasants Sandstone Member are:

- Erodibility ranges from low to high.
- Expansivity is generally low.
- Rippability is typically moderate to difficult.
- Slope stability is generally moderate to poor.
- Suitability for fill is generally good.
- Permeability is moderately low.

5.2.3 GEOLOGIC STRUCTURE

The dominant structural features of the Peninsular Ranges Province are northwest to west-northwest trending fault zones. These zones separate large elongated blocks that stand at different structural elevations. Most of the faults either die-out to the northwest, or merge with or are terminated by the east-trending steep reverse faults that form the southern margin of the Transverse Ranges Province (Yerkes et al, 1965). Within this framework, the Santa Ana Mountains are a large flexure which has been tilted upward on the eastern side along the Whittier-Elsinore Fault zone, thereby producing an irregular and complex highlands (Jahns, 1954) that slopes west toward the sea.

Yerkes et al, (1965) include the Santa Ana Mountains within the east margin of a wedge-shaped central block, which is one of four large subdivisions of the Los Angeles basin. Contacts between adjoining blocks are major fault zones of faulting or flexure in the basement rocks along which vertical and lateral movements took place intermittently during the deposition of the superjacent bedrock units.

Uplift occurred during the Pleistocene along the Whittier-Elsinore Fault Zone. Schoelhamer et al, (1981) suggest that the structure of the northern Santa Ana Mountains is dominated by a broad, north-plunging anticline that underlies the main mass of the mountains and is truncated on the northeast by the Whittier-Elsinore Fault Zone. Numerous north- to northwest-trending, down-to-the-west, normal faults cut the folds into many blocks. In a broad sense, the west limb of this north-plunging anticline above appears as a homoclinal sequence (Morton et al, 1973) of mostly westerly-dipping rocks. Three mapped inactive faults disrupting the strata of the homoclinal feature in the immediate area of the alignments are the Aliso Viejo, Mission Viejo and Cristianitos Faults. These faults, as shown on Figure 5-1a, are roughly subparallel to each other and are about three to five km (two to three miles) apart.

5.2.4 GROUNDWATER

The presence of groundwater in bedrock units in the study area is generally at depths greater than will be encountered during construction of the SOCTIIP build alternatives. However, groundwater may be encountered in deep cuts, particularly those created for landslide and slope stability mitigation. Perched groundwater may be encountered locally within cut slopes, ancient landslides and at fault zones present along the alignments of the SOCTIIP build alternatives (Leighton and Associates, 2001a, b; 2002a, b, c, d, e, f).

Groundwater also occurs at relatively shallow depths (i.e. on the order of a few meters [several feet]) in some canyon bottoms and local depressions (Leighton and Associates, 2001a, b; 2002a, b, c, d, e, f). For example, shallow groundwater conditions were observed in Cañada Chiquita where marsh-like conditions are present. Other locations of shallow groundwater conditions include segments of Cristianitos Canyon, San Juan Creek, Cañada Gobernadora, Segunda Deshecha Cañada and San Mateo Creek. Shallow groundwater may also be present to a limited extent in some of the many smaller first- and second-order drainages that are not identified as wetlands or having perennial stream flow.

Figures 5-2a and 5-2b show the locations of known water wells in the vicinity of the alignments of the SOCTIIP build alternatives. The operational status of these wells was not confirmed as a part of this study. In addition to the known wells shown on Figures 5-2a and 5-2b, there may be additional wells for which records are not currently available.

5.2.5 FAULTING AND SEISMICITY

Being located in southern California, the SOCTIIP study area is within a seismically active area, and will be subject to seismically related geologic hazards. These hazards are related to the principal active faults in the region, which include the San Andreas, Elsinore, San Jacinto, and Newport-Inglewood Faults, as shown on Figure 5-3.

As shown on Figure 5-1a, the alignments of the SOCTIIP alternatives cross several bedrock faults. However, none of these faults is known to be active (i.e., have experienced displacement) within Holocene geologic time (approximately the most recent 11,000 years). The Mission Viejo Fault has been classified as potentially active, based on displacements of materials of Quaternary geologic age. However, it is not considered to be capable of generating ground shaking as strong as the active regional faults noted above.

In addition to the known, mapped faults, recent studies (Grant et al, 1999; and Rivero et al, 2000) have suggested the possibility of blind thrust faults beneath the San Joaquin Hills (i.e., the hypothesized San Joaquin Hills Blind Thrust) and offshore (i.e., the hypothesized Oceanside and Thirtymile Bank Detachments). The existence of these thrust faults remains speculative. However, further studies may provide more definitive evidence for their existence. In addition to answering questions regarding whether these blind thrust faults actually exist, additional studies are needed to define their recency of activity, and capability to generate large earthquakes.

The following Sections provide general characterizations of the known, regional active faults, as well as some discussion regarding the hypothesized blind thrust faults.

5.2.5.1 San Andreas Fault

The San Andreas Fault is the dominant active fault in California. At its closest approach, it passes approximately 64 km (40 miles) northeast of the SOCTIIP study area. As the main element of the boundary between the Pacific and the North American tectonic plates, this fault extends from Cape Mendocino to the Salton Sea, a distance of about 1,000 km (625 miles) (Ziony and Yerkes, 1985). In southern California, the Carrizo, Mojave and Coachella Valley segments of this fault are potential sources of future earthquakes that could result in strong ground shaking along the alignments of the SOCTIIP alternatives. This fault has generated the largest known earthquakes in California, and is considered capable of generating earthquakes up to about magnitude 7 ½ to 8 range.

5.2.5.2 San Jacinto Fault Zone

The San Jacinto Fault Zone is historically the most seismically active fault zone in California and passes as close as about 50 km (31 miles) from the study area. Segments of the San Jacinto Fault Zone extend from near San Bernardino southeast more than 300 km (190 miles) through the Imperial Valley and into northern Baja California, Mexico (Ziony and Yerkes, 1985). At its northern end, the zone appears to merge with the San Andreas Fault. Over the past century, the San Jacinto Fault Zone has produced at least 10 earthquakes of about magnitude 6 or greater. Geologic, geodetic and seismologic observations generally point to an average slip rate of 8 to 12 millimeters (0.3 to 0.5 inch) per year during late Quaternary time. This fault zone is generally considered capable of generating earthquakes in the magnitude 7 to 7 ¼ range.

5.2.5.3 Whittier-Elsinore Fault Zone

The northwest-trending Whittier-Elsinore Fault Zone extends nearly 250 km (150 miles), from the Mexican border to the northern edge of the Santa Ana Mountains and comes as close as about 16 km (10 miles) to the alignments of the SOCTIIP build alternatives (Ziony and Yerkes, 1985). The predominant sense of displacement across this fault zone is thought to be right-lateral. From geomorphic evidence, the Elsinore Fault is considered capable of coseismic offsets of up to about 7 meters (20 feet). Rockwell et al. (1985) suggest offset sediments exposed in trenches to indicate a 200- to 300-year recurrence interval for ground rupturing earthquakes. This fault zone is generally considered capable of generating earthquakes in the magnitude 7 to 7¼ range.

5.2.5.4 Newport-Inglewood Fault Zone

The Newport-Inglewood Fault Zone is a broad zone of discontinuous faults and folds striking southeastward from near Santa Monica across the Los Angeles basin to Newport Beach and comes as close as about 8 km (5 miles) to the alignments of the SOCTIIP build alternatives. Faults having similar traces and projections occur offshore (i.e. the Offshore Zone of Deformation) off San Clemente and extend south to San Diego (the Rose Canyon Fault). These various faults constitute a system more than 240 km (150 miles) long. The Newport-Inglewood Fault was the source of the destructive 1933 Long Beach earthquake. This fault zone represents a major hazard to the densely populated Los Angeles basin, including Orange County. Generally, this fault is considered capable of earthquakes up to about magnitude 7.

5.2.5.5 Palos Verdes Fault

According to Wesnousky (1986), the Palos Verdes Fault strikes southeast, across and offshore of Palos Verdes Peninsula and comes as close as about 38 km (24 miles) to the SOCTIIP study area. The onshore extent of this fault is assumed to be the central portion of the fault, and the fault is believed to extend offshore, both northwest and southeast of the peninsula. Depending on the length of rupture, the fault is probably capable of earthquakes in the magnitude 7 to 7¼ range.

5.2.5.6 Hypothesized Blind Thrust Faults

As discussed above, blind thrust faults such as the San Joaquin Hills Blind Thrust, the Oceanside Thrust and the Thirtymile Bank Thrust, have been suggested to exist in the vicinity of the SOCTIIP study area. The evidence for these structures, and whether they are capable of generating large earthquakes, remains equivocal. It has been suggested (Grant et al, 1999) that, if present and active, the San Joaquin Hills Thrust could generate an earthquake on the order of magnitude 7. Rivero et al (2000) suggest that, if present and seismogenic, the Oceanside Thrust could generate earthquakes in the magnitude 7 to 7 ½ range.

5.2.5.7 Design Ground Motions

Preliminary studies completed for the TCA provide an initial basis for design. These studies used both probabilistic and deterministic techniques to estimate design ground accelerations for the SOCTIIP build alternatives (Leighton and Associates 2001a, b; 2002a, b, c, d, e, f).

5.2.6 MINERAL RESOURCES AND CONSTRUCTION MATERIALS

As shown on Figure 5-1, mineral resources have been mined at various locations in the vicinity of the SOCTIIP build alternatives. Previous extraction of mineral resources along or in the immediate vicinity of the alignments is described in the following sections.

5.2.6.1 Rock Aggregates

The alluvial sand and gravel deposits in San Juan Creek have been mined for construction aggregate materials in the vicinity of where the alignments of the SOCTIIP build alternatives cross San Juan Creek. Refer to location 132 on Figure 5-1, west of the Far East Corridor alignments.

5.2.6.2 Petroleum

Petroleum exploration in the general area of the SOCTIIP build alternatives continued as late as the 1950s, as described by the California Division of Mines and Geology (CDMG, 1974). As shown on Figure 5-1, two abandoned oil fields are near the alignments: 1) the San Clemente field, immediately east of the Alternative 7 Corridor alignments and crossed by the Central Corridor alignments, north of Avenida Pico, and 2) the Cristianitos Creek field, west of the Far East Corridor alignments and the San Diego/Orange County boundary, and south of the present eastern terminus of Avenida La Pata. No production was recorded from these fields, although the CDMG (1974) indicated that good possibilities for productive wells may exist in these and adjacent areas, from structural traps associated with the Cristianitos and Mission Viejo Faults.

5.2.6.3 Silica Sand

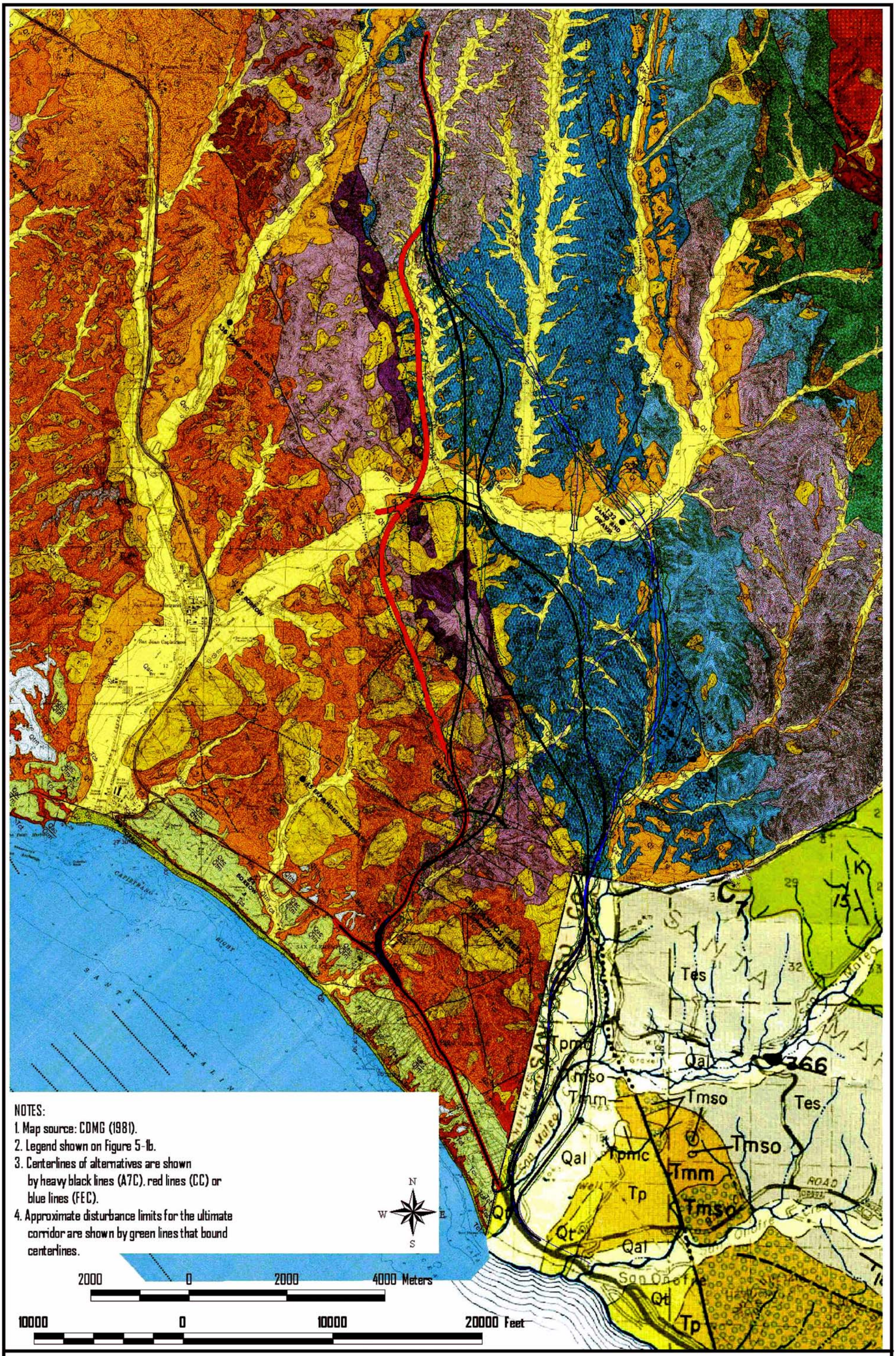
Owens-Illinois (now Oglebay Norton Industrial Sand) has produced silica sand from the lower beds of the Santiago Formation in Trampas Canyon, south of Ortega Highway about midway between the Far East Corridor and the Central Corridor alignments.

5.2.6.4 Clay

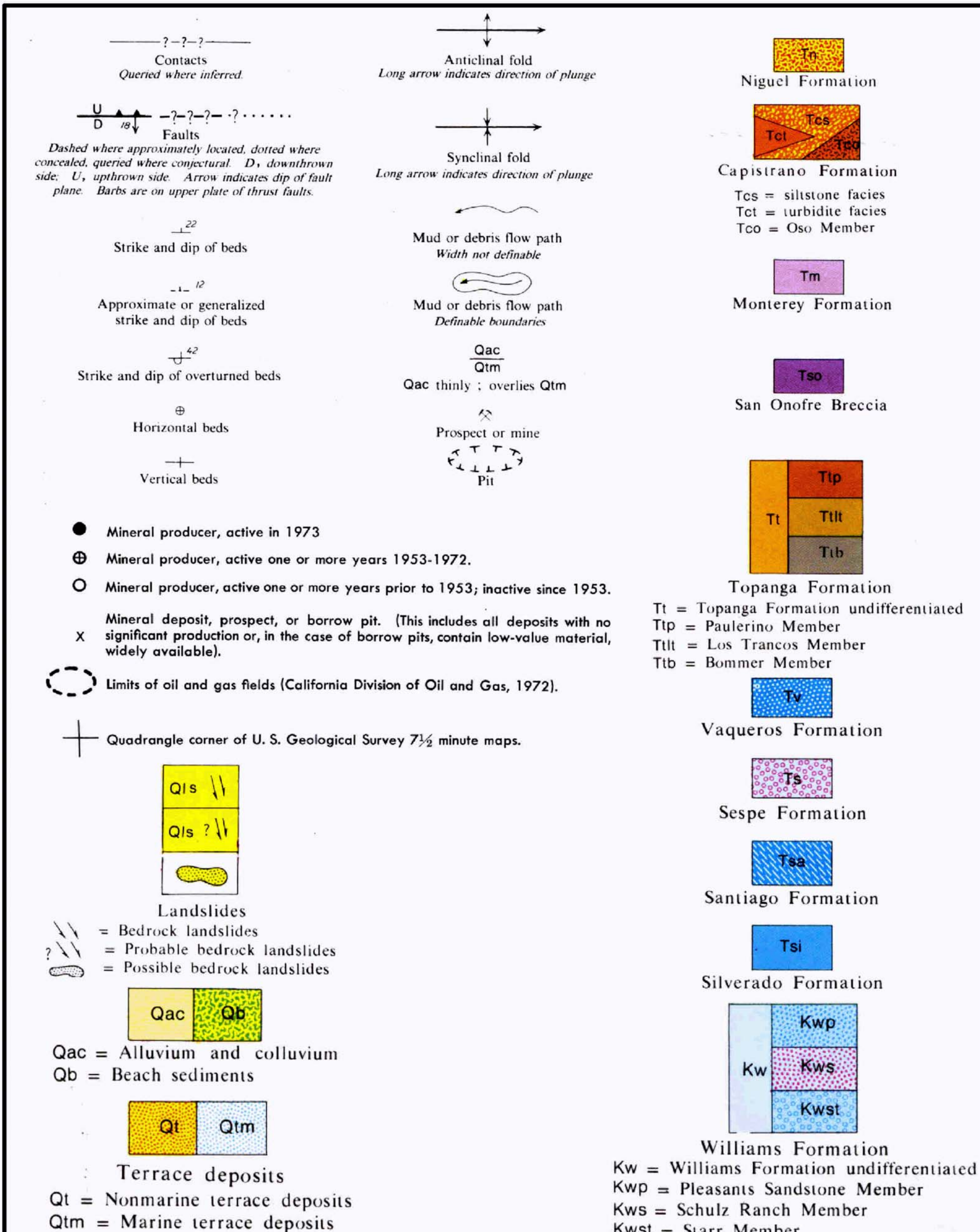
Past clay mining excavations, prospecting pits and short tunnel excavations exist in the Claymont Clay bed of the Silverado Formation, immediately adjacent to and near the Far East Corridor Alignments in Cristianitos Canyon, south of Ortega Highway.

5.2.6.5 Expanded Aggregate

Light-weight aggregate was produced in the 1960s from the Capistrano Formation, on the west side of Prima Deshecha about 3.2 km (2 miles) west of the Alternative 7 Corridor alignments.



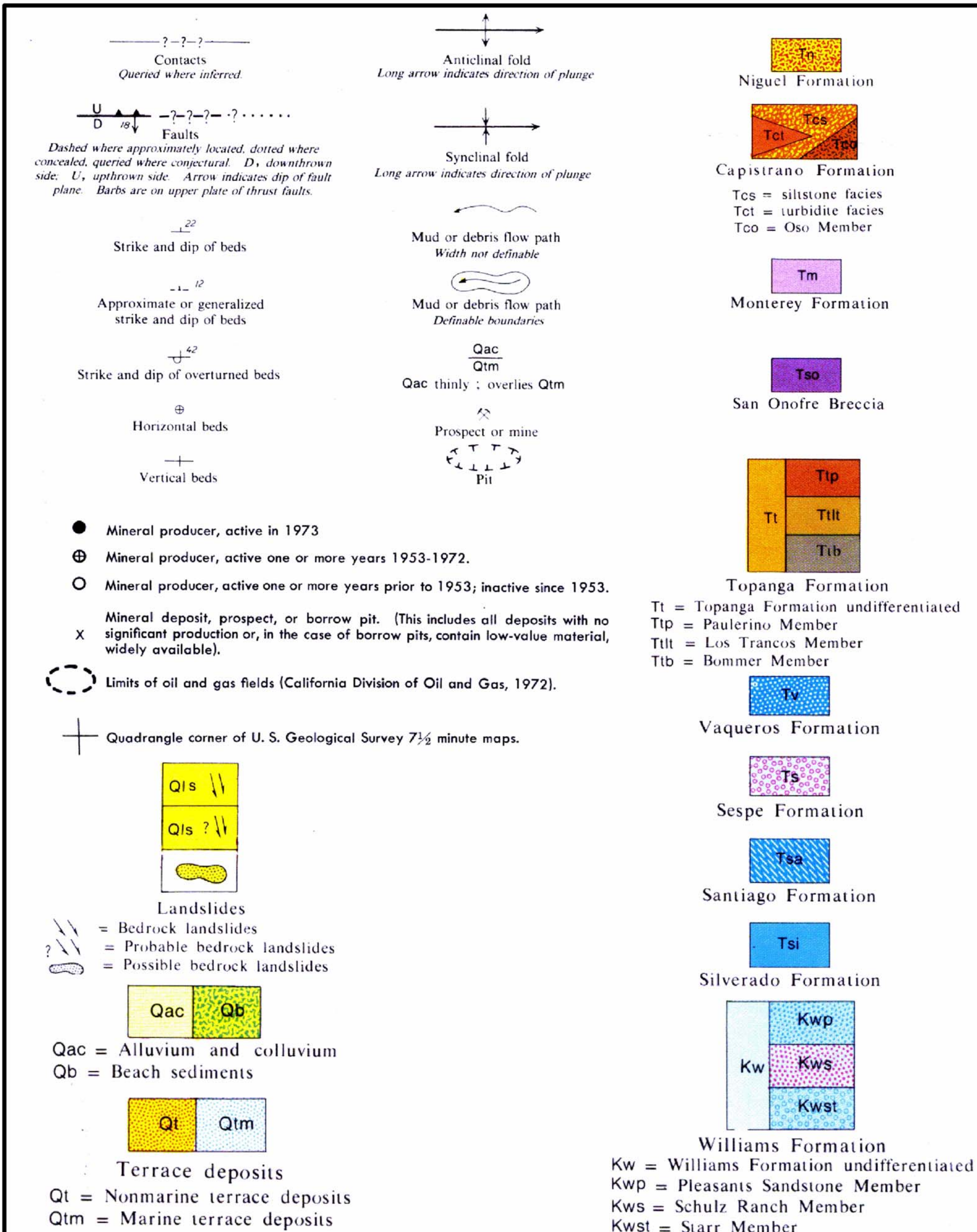
REGIONAL GEOLOGIC MAP



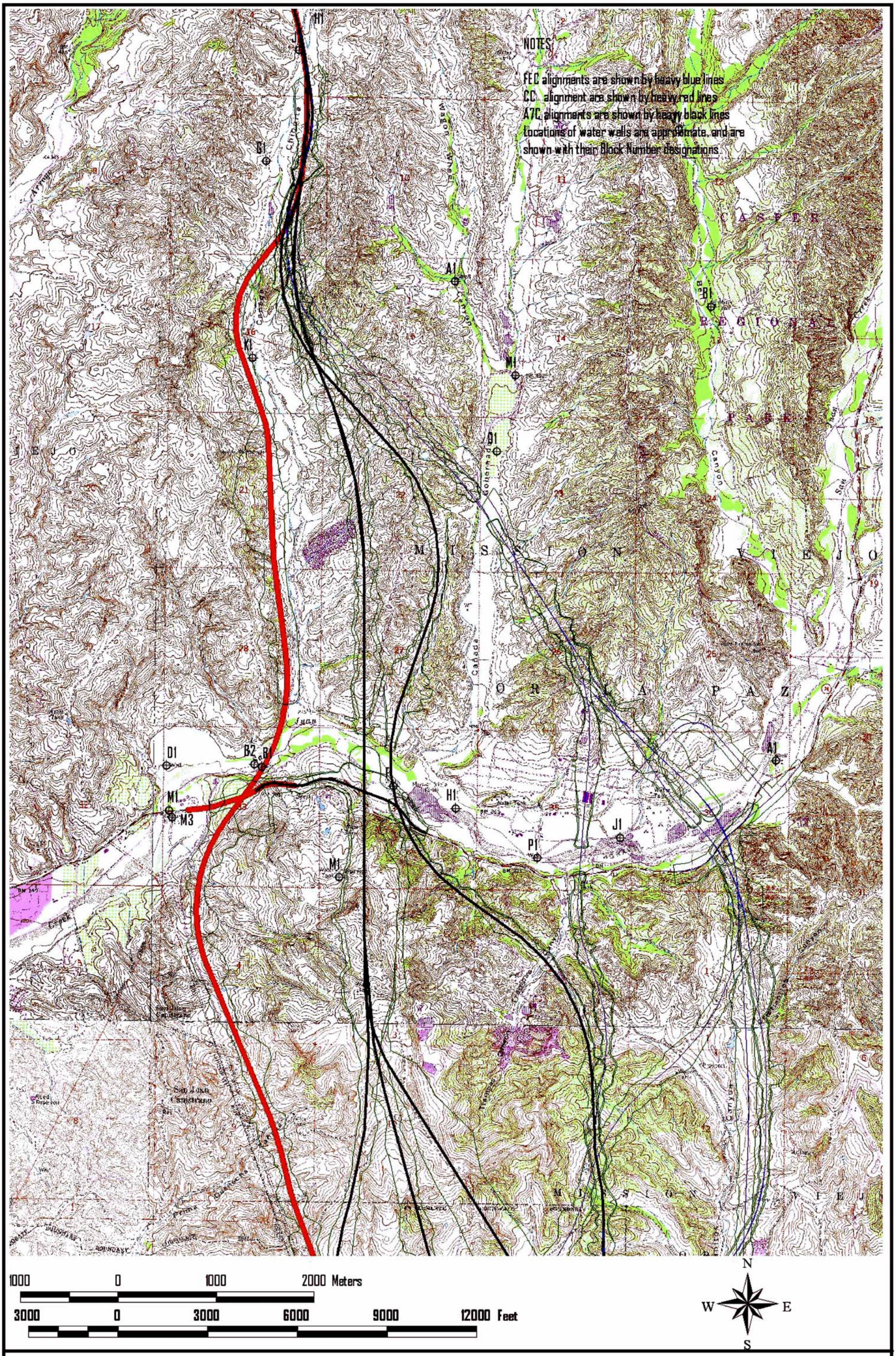
LEGEND OF SYMBOLS AND GEOLOGIC UNITS FOR REGIONAL GEOLOGIC MAP

SOCTIIP EIS/SEIR *Geotechnical, Geology and Soils Technical Report*	Figure 5-1b

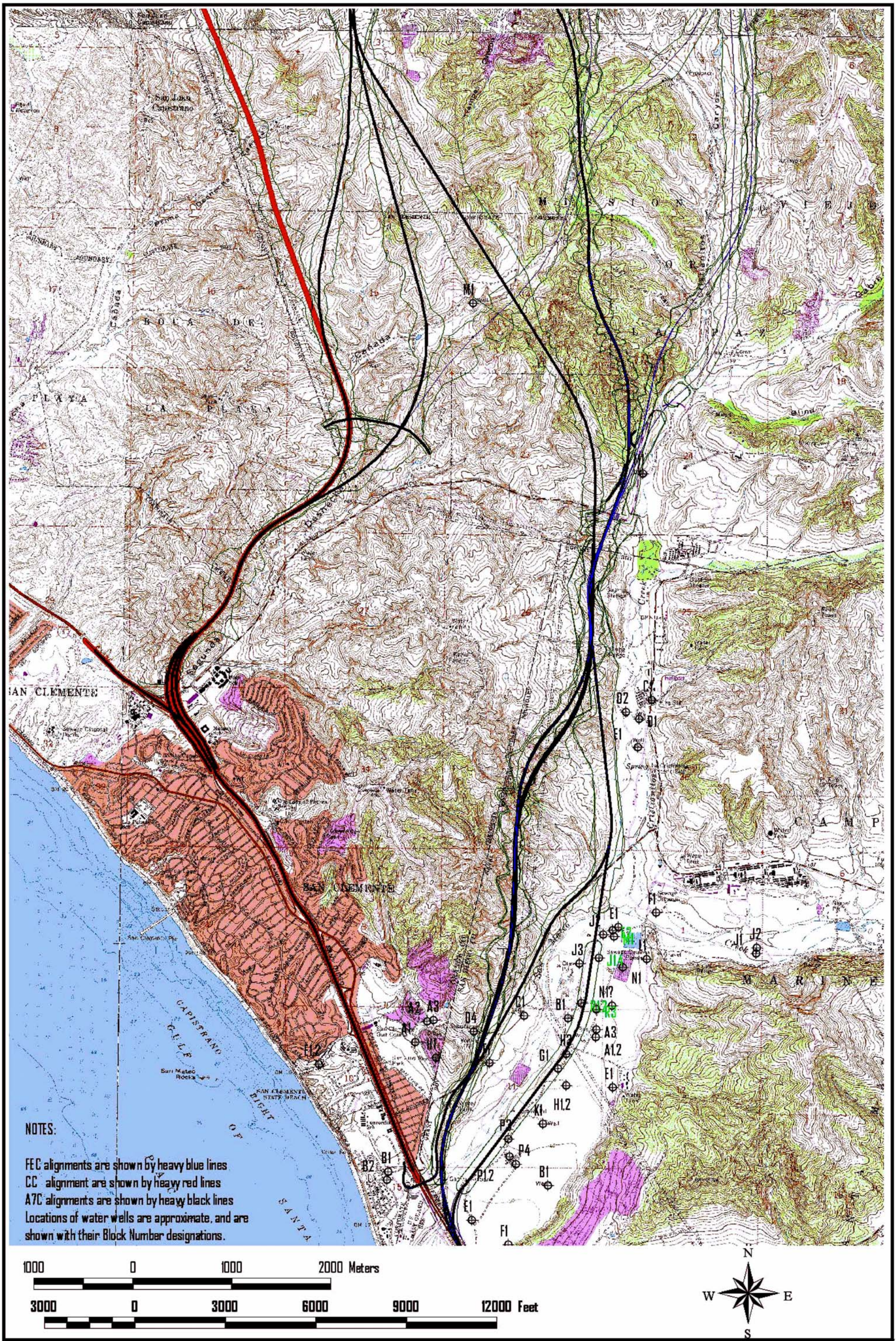
File: Figure 5-1b.grf



LEGEND OF SYMBOLS AND GEOLOGIC UNITS FOR REGIONAL GEOLOGIC MAP



LOCATION OF LOCAL GROUNDWATER WELLS - NORTH HALF OF STUDY AREA



LOCATION OF LOCAL GROUNDWATER WELLS - SOUTH HALF OF STUDY AREA

SECTION 6.0
METHODOLOGY

This effort was completed in a seven-step process, as outlined below:

1. **Baseline Characterization** – A baseline characterization of the existing geotechnical, geology and soils in the project area was prepared, including an update of the previous characterization. This characterization is discussed in Section 5.0.
2. **Methodology Development** – A methodology for evaluating the South Orange County Transportation Infrastructure Improvement Project (SOCTIIP) alternatives, relative to the geotechnical, geology and soils characteristics, was developed. This methodology is discussed in this Section.
3. **Impacts Analysis** – The impacts of the SOCTIIP alternatives related to geotechnical, geology and soils issues were evaluated. The results of this evaluation are discussed in Section 7.0.
4. **Identification of Mitigation Measures** – For identified adverse impacts, mitigation measures were identified. These mitigation measures are discussed in Section 8.0.
5. **Evaluation of CEQA Significance** – Thresholds of significance were developed, and the significance of the impacts was assessed, before mitigation. Then, considering that the identified mitigation measures would be implemented, the residual impacts and level of significance after mitigation were evaluated. This evaluation is discussed in Section 9.0.
6. **Evaluation of Cumulative Impacts** – Cumulative impacts of the SOCTIIP alternatives and other projects in the SOCTIIP study area, considering the implementation of mitigation measures, were evaluated. This evaluation is discussed in Section 10.0.
7. **Evaluation of Growth Inducing Impacts** – An evaluation of growth inducing impacts was made. This evaluation is discussed in Section 11.0.

6.1 DATA SOURCES

The 1996 report by Goffman, McCormick & Urban provided basic geotechnical, geology and soils data for the previous two primary alignments considered (the BX and CP alignments). The data available in that report were supplemented, using more recently published information, and specifically, the site-specific studies recently performed by the TCA for the various SOCTIIP build Alternatives (Leighton and Associates 2001a, b; 2002a, b, c, d, e, f). A list of references used for preparing this report is provided in Section 12.0.

6.2 IDENTIFICATION OF GEOTECHNICAL, GEOLOGY AND SOILS ISSUES

The State of California, Division of Mines and Geology (CDMG) [now known as the California Geological Survey – CGS] provides guidance in preparing geologic input to environmental reports. For this report, that checklist, titled *Guidelines for Geologic/Seismic Considerations in Environmental Impact Reports* (Note 46, 1975) was used. A summary of that checklist of geotechnical, geology and soils issues is provided below:

Earthquake Damage - Fault movement (ground rupture), liquefaction, landslides, differential compaction/seismic settlement, ground rupture, ground shaking, tsunami, seiche, and seismically induced flooding.
Loss of Mineral Resources - Loss of access, deposits covered by changed land use and zoning restrictions.
Waste Disposal Problems - Change in groundwater levels, disposal of excavated material and percolation of waste material.
Slope and/or Foundation Instability - Landslides and mudflows, unstable cut and fill slopes and collapsible and expansive soils, trench wall stability.
Erosion, Sedimentation and Flooding - Erosion of graded areas, alteration of runoff, unprotected drainage ways and increased impervious surfaces.
Land Subsidence - Extraction of Groundwater, Gas, Oil and Geothermal Energy; Hydrocompaction and Peat Oxidation
Volcanic Hazards – Lava Flow and Ash Fall

For the SOCTIIP alternatives, these issues were evaluated relative to the potential for the environment to adversely impact the proposed project, and the project's potential impact on the environment. Table 6-1 provides a list of the basic considerations used in reviewing/evaluating these issues. These issues are discussed in the remainder of this Section.

6.3 DISCUSSION OF POTENTIAL GEOLOGIC AND GEOTECHNICAL ISSUES

6.3.1 EARTHQUAKE DAMAGE

There are several categories of potential hazards related to earthquakes, ranging from the primary hazard of fault movement, to several potential secondary hazards related to strong seismic shaking, as discussed in the following Sections.

Fault Movement

The hazard of fault movement would be considered relatively high if a SOCTIP alternative were crossed by an active fault (i.e., a fault that has experienced movement within Holocene geologic time – within about the last 11,000 years). Faults classified as potentially active or inactive would be considered to present a low, to very low level of hazard, if they were to cross a SOCTIIP alternative.

Liquefaction

Liquefaction is the loss of soil strength or stiffness due to a buildup of pore-water pressure during a shaking event, and is associated primarily with relatively loose, saturated fine- to medium-grained cohesionless soils. As the shaking action of an earthquake progresses, the soil grains are rearranged and the soil densifies. Densification of the soil results in a buildup of pore-water pressure. When the pore-water pressure reaches the total overburden pressure, soil strength becomes near zero and liquefaction occurs. Surface manifestations of liquefaction include sand boils, settlement and bearing capacity failures below structural foundations.

Liquefiable soil conditions are not uncommon in deposits of alluvium in moderate to large canyons, and may be present in other areas of alluvial soils where the groundwater level is shallow. Bedrock units are unlikely to present a liquefaction hazard.

Landslides

If subjected to strong seismic shaking, existing landslide masses and slopes composed of weak materials are subject to downhill movement. The susceptibility of existing weak materials on hillsides to movement during strong seismic shaking can be estimated based on field investigation, and laboratory testing. In general, considering the types of materials and topography present along the alignments of the SOCTIIP build alternatives, it is considered unlikely that triggered landslide movements would be catastrophic. Rather, if landslide movement were to be triggered by strong seismic shaking, the downhill movement would likely be limited to on the order of a few meters (several feet) or less.

Differential Compaction and Seismic Settlement

Where groundwater levels may be relatively low, strong seismic shaking can induce compaction, leading to surface settlement, in soils that are sufficiently loose. The type of materials that would be more likely to exhibit this behavior would be deposits of alluvium and colluvium, and possibly poorly constructed man-made fills. If structures were to be built on such soils, settlement damage could result in the event of strong seismic shaking.

Ground Rupture

Lurching or lateral spreading is the relative displacement of adjacent land surfaces during an earthquake. Lurching may be caused by liquefaction of a zone beneath the otherwise intact surface. Visible evidence of lurching includes surface cracks not related to a fault rupture. For lateral spreading to occur, the ground must be able to move toward a “free face.” For example, soft or liquefaction prone soils adjacent to a creek bank could move toward the creek, if subjected to strong seismic shaking.

Ground Shaking

The potential for strong ground shaking affects most of California, and like all other similar facilities, the SOCTIIP build alternatives would be subject to strong ground shaking. Like other projects, the SOCTIIP build alternatives will include design and engineering considerations to accommodate estimated ground motions. Preliminary deterministic and probabilistic analyses have been performed for the SOCTIIP build alternatives, and these analyses provide design recommendations to mitigate catastrophic damage during future seismic shaking events.

Tsunami

A tsunami is a seismic sea wave, which is caused by vertical displacement of the sea floor, induced by an earthquake or a sub-sea landslide. In either case, rapid movement of the sea floor typically causes a low, long period wave to travel across the ocean away from the source area. When the wave approaches land, it slows and increases in height, and eventually breaks like other waves. However, depending on several factors, such as the source parameters, travel path, travel distance and angle of incidence, a seismic sea wave can be very large and very damaging. The potential for damage from a tsunami is limited to low elevation areas near the coastline. Inland areas are not at risk.

Seiches

Seiches occur when a body of water, such as a lake, is subjected to strong seismic shaking that can cause the water to "slosh" back and forth, creating damage and flooding in proximity to the shoreline.

Flooding

Seismically induced flooding may occur if strong seismic shaking causes the failure of a dam with a reservoir behind it. Some dams are only used for flood control, and typically do not retain water year round. Therefore, the downstream hazard of seismically induced flooding is very low, that is, the probability is very low that strong seismic shaking would occur during the limited time when a flood control dam would be retaining water. For dams built for water storage reservoirs, seismically induced flooding is a potential hazard, but one that is typically low because of stringent seismic design regulations for dams.

For sites that are downstream of an existing reservoir, the level of hazard for seismically induced flooding is typically judged by evaluating the design and potential seismic exposure (i.e., seismic safety) of the dam.

6.3.2 LOSS OF MINERAL RESOURCES

There is a continued need for natural resources, such as petroleum products for fuels, and building materials for roads and structures. With time, existing resources are depleted and new sources must be identified and mined to support continued needs. As more and more land is developed, additional pressure is placed on assuring an adequate supply of natural resources. Therefore, it is important that each new project be evaluated, to determine whether it might preclude access to an important resource, change the land use so that a resource can no longer be removed or create zoning restrictions so that access to the resource is no longer allowed.

6.3.3 WASTE DISPOSAL PROBLEMS

Change in Groundwater Level

Occasionally, projects require dewatering during construction. For example, where an excavation is required for a wall or bridge foundation, and where the excavation is below the groundwater level, a shallow pumping well(s) might be installed and operated to temporarily lower the water level until the foundation can be constructed. Although a temporary operation, construction dewatering can cause undesirable impacts on neighboring areas. For example, under certain conditions, construction dewatering can cause settlement of the ground surface. If there are structures nearby, such settlement could be damaging. Another potential adverse effect is the potential for water level lowering in nearby water wells, if present.

Disposal of Excavated Material

Typically, if possible, earthmoving projects are designed so that there is a balance between the amount of material that is excavated (i.e., to create a cut slope), and the amount of material that is placed as fill (i.e., to create an embankment). In some cases, the desired balance between cut and fill cannot be met, and there is excess excavated material, which must be disposed. Depending on location, the disposal of excess material can be quite easy, such as if a nearby landfill is in need of additional soil for cover material. In other cases, the disposal of excess material can be difficult and expensive. This can be the case if there is no nearby area for soil disposal, or if the soil to be disposed is undesirable in character, or perhaps contaminated in some way.

Percolation of Waste Material

In some cases, a project may generate waste material, such as contaminated water, sewage or mine wastes that can leach undesirable constituents into the ground. The potential for contaminated water to percolate into the ground could be particularly adverse if local water supply wells are present.

6.3.4 SLOPE AND/OR FOUNDATION INSTABILITY

Slope and foundation instability is a condition that can be pre-existing, and can pose a negative condition for a proposed project. On the other hand, construction of a project could trigger foundation failure or slope instability. These types of potential instabilities can take several forms, as discussed in the following Sections.

Landslides

Landslides often occur along pre-existing zones of weakness within bedrock (i.e., previous failure surfaces). They may also occur on over-steepened slopes, especially where weak layers (i.e., thin clay layers) are present and dip out-of-slope. Landslides can also occur on antidip slopes, along other planes of weakness such as faults or joints. Local folding of bedrock or fracturing due to faulting can add to the potential for slope failure. Groundwater is very important in contributing to slope instability and landsliding. Other factors that contribute to slope failure include undercutting by stream action and subsequent erosion, and mass movement of slopes caused by seepage or cyclical wetting and drying.

Most of the landslides present along the alignments of the SOCTIIP build alternatives probably occurred as bedding plane failures, which have moved along a zone of weakness such as a clay bed. Fewer antidip slope failures have occurred but, where present, are generally associated with steeply inclined bedding, pre-existing structural weaknesses and/or oversteepened slopes. Several of the existing landslides are along branches of the Cristianitos and Mission Viejo Faults where folding and fracturing have apparently weakened the rock or resulted in adverse geologic structure.

Shallow Failures/Surficial Slumps

Shallow failures and surficial slumps are common on steep slopes. These failures occur in the topsoil (colluvial zone) and sometimes within the upper weathered zone of bedrock. The soils become saturated and typically fail during or shortly after periods of intense rainfall. Transport distances are typically short.

Mudflows

The potential for mudflows depends primarily on the presence of colluvial deposits upslope, the slope gradient and the rapid increase in soil moisture content due to heavy rainfall. Mudflows most often occur when soils, already saturated, are subjected to a rainstorm of high intensity and short duration. Mudflows are similar to shallow failures and slumps, but are capable of transport over considerable distances.

Unstable Cut and Fill Slopes

The stability of cut and fill slopes is primarily a function of the steepness of the slope, the character of the material (including its discontinuities) that the slope is composed of, and the groundwater conditions. In general, these conditions can be readily investigated and analyzed, and slopes with favorable stability can be designed and constructed.

Collapsible and Expansive Soil

The bedrock along the alignments of the SOCTIIP build alternatives is generally only slightly compressible and is expected to adequately support fill and/or highway loads. The topsoil, colluvium, alluvium, upper parts of older alluvium, highly weathered bedrock or terrace deposits, and fractured landslide materials are typically more compressible and may be collapsible. As a result, these materials may not be suitable for support of fill and/or structural loads in their natural state. Collapsible soils are those soils that hydroconsolidate when wetted. Collapsible soils are typically loose to very loose, porous, low-density soils with a clay or silt cementing agent, which makes the soil relatively strong when dry. However, when these soils become wet from infiltration of water due to natural runoff or irrigation, the fine-grained cementing agent weakens and the soil grains collapse into the internal voids, thus, the term hydroconsolidation. Collapsible soils can produce damaging settlement when wetted. These materials, however, can be suitable for support of the planned improvements after excavation and replacement as compacted fill.

Expansive soils generally result from having high percentages of expansive clay minerals, such as montmorillonite. If not adequately addressed, expansive soils can cause extensive damage to structures and paving. Expansive soils can be placed in areas where they are unlikely to have damaging effects, or they can be treated to reduce their potential for expansion. Structures can also be designed to accommodate some forces from soil expansion.

Trench-Wall Stability

The stability of trench walls depends largely on the character of the material to be excavated, and the size and shape of the excavation. In most cases, intact bedrock will tend to be stable, requiring less support, whereas the softer materials, such as alluvium and colluvium, will tend to be unstable and will require more support. The presence of groundwater is also a very important factor, and excavations below the groundwater level may require temporary dewatering to achieve stability.

6.3.5 EROSION, SEDIMENTATION AND FLOODING

Erosion of Graded Areas

Most of the geologic materials that may be exposed in cut slopes along the SOCTIIP build alternatives would be subject to erosion due to their poorly cemented nature and the typical short duration, but intense, rainfalls common to the winter season in southern California. Nearly all the fill slopes would also be subject to erosion due to the granular, silty or expansive nature of soil materials derived from the sedimentary formations. The granular and poorly cemented sandstone of the Sespe, Santiago and Silverado Formations would be particularly susceptible to sheet erosion or gullying, where exposed in cuts and where used to create fill slopes. Fill slopes created by expansive soils derived from Capistrano or Monterey Formation materials would probably be more subject to soil creep and shallow slumping after undergoing cycles of seasonal changes in moisture content.

Alteration of Runoff

Flooding and/or erosion problems could be triggered if grading re-directs flows, or results in higher surface water flows than currently exist. If berms or embankments are constructed across waterways, water ponding and sedimentation would occur. These types of problems can be avoided through the design process by evaluating grading plans and making adjustments to avoid such problems.

Unprotected Drainage Ways

Where flow velocities may be relatively high, unlined drainage ditches may suffer substantial erosion, and may require maintenance. Undesirable erosion can be avoided by evaluating flow velocities relative to the existing material properties and specifying appropriate lining requirements or velocity-reducing structures.

Increased Impervious Surfaces

As more and more of the land surface is covered with impervious surfaces, such as concrete and asphalt paving, there is less surface area available for water infiltration, and a greater potential for erosion and/or flooding. The potential effects of a proposed project can be evaluated by considering the relative change in natural surface area, relative to other factors, and drainage control measures to determine the need for additional erosion control measures.

6.3.6 LAND SUBSIDENCE

Extraction of Groundwater, Gas, Oil and Geothermal Energy

If a project involves extraction of fluids or gas, there is the potential for causing subsidence. For example, in the area of Wilmington, California, years of oil extraction with no mitigation resulted in many meters of subsidence. Similarly, in the San Joaquin Valley, many years of groundwater extraction have resulted in many meters of subsidence. Depending on whether the area is developed, subsidence can cause extensive problems, which can be very costly to mitigate. If a project is located in an area of on-going subsidence, design features might be needed to avoid or mitigate potential damage.

Hydrocompaction and Peat Oxidation

Consolidation of compacted fills and of relatively dense underlying soil and rock materials is typically minimal after placement of the major embankments is complete, assuming that all topsoil and low-density colluvium, alluvium or landslide debris are removed prior to placement of the fill. Substantial consolidation could occur, however, if it is not possible to remove such compressible material due to the presence of groundwater, existing improvements or other such constraints. The results of detailed exploration, testing and analysis can provide a basis for evaluating the potential for fill settlement and the feasibility of overfilling to accelerate the settlement process, or postponement of construction until settlement is nearly complete. The feasibility of using dynamic pre-consolidation or vertical sand or wick drains could also be considered. If not properly identified during design and mitigated during construction, long-term consolidation could be a problem in the major valley-bottom areas, with particular regard to the support of bridge foundation and abutment fills.

Where peat may be present in the subsurface, in layers of substantial thickness, its decomposition can result in damaging settlements. Such deposits are more often encountered within the alluvial deposits of major drainages. The feasibility of various options to mitigate potentially damaging settlements will be addressed by the final design geotechnical investigations. Depending on site conditions, mitigation options may include using dynamic pre-consolidation or vertical sand or wick drains, or using light weight fill.

6.3.7 VOLCANIC HAZARDS

If a project were located in proximity to an active volcano, there would be the potential for damage from a lava flow, if the facility were located downhill and in a topographically unprotected location. The area that is subject to ash fall from a volcanic event would be much more extensive, but the potential for damage to structures is not nearly as great. However, there are no active volcanoes in the region that could present a lava flow hazard, or substantial ash fall along the alignments of the SOCTIIP build alternatives.

TABLE 6-1
CRITERIA FOR GEOTECHNICAL, GEOLOGY AND SOILS IMPACTS

Geologic Hazard/ Resource	Issue	Impact Identification Criteria	
		Geologic / Soils Impact on the SOCTIIP Alternatives	**Impact of the SOCTIIP Alternatives on Geology / Soils**
Earthquake Damage	Fault Movement (including ground rupture, tsunami, and seiche)	Could the project be substantially adversely affected by movement along local or regional faults (i.e., lateral or vertical shifts)?	Would project development substantially alter the local / regional stress regime and possibly trigger fault movement?
	Liquefaction	Is the project located on deposits that are prone to liquefaction?	Would project development alter subsurface conditions and result in a potential for liquefaction?
	Landslides	Is the project located on deposits that are prone to landsliding in the event of seismic shaking?	Would project development create or induce a potential for landsliding?
	Differential Compaction/Seismic Settlement	Is the project located on deposits that are prone to settlement in the event of seismic shaking and could this condition lead to a structural collapse or hazardous release?	Would project development alter subsurface conditions and create a potential for settlement during seismic shaking?
	Ground Shaking	Can the project be designed to survive estimated maximum ground acceleration without collapse or hazardous release?	Would project development alter the local / regional stress regime and possibly trigger seismicity?
	Seismically-Induced Flooding (failure of dams and levees)	Is the project located in the flood zone of a reservoir that could undergo an uncontrolled release in the event of seismic shaking?	Does the project include the construction of a dam or levee that would have the potential to undergo an uncontrolled release as a result of seismic shaking, or would the project alter conditions at an existing reservoir and result in a potential for an uncontrolled release as a result of seismic shaking?
Loss of Mineral Resources	Loss of Access	Not applicable.	Would project development result in the loss of access to a mineral resource?
	Deposits Covered by Changed Land Use Conditions	Not applicable.	Would project development cover an extractable mineral resource?
	Zoning Restrictions	Not applicable.	Is the project located within an area zoned for mineral extraction?
Waste Disposal Problems	Change in Groundwater Levels	Not applicable.	Would project development result in lowering of groundwater levels?
	Disposal of Excavated Material Percolation of Waste Material	Not applicable. Not applicable.	Would project development require the disposal of excavated material at environmentally sensitive areas? Would project development result in the percolation of waste material?

TABLE 6-1
CRITERIA FOR GEOTECHNICAL, GEOLOGY AND SOILS IMPACTS

Geologic Hazard/ Resource	**Issue**	**Impact Identification Criteria**	
		Geologic / Soils Impact on the SOCTIIP Alternatives	**Impact of the SOCTIIP Alternatives on Geology / Soils**
Slope and/or Foundation Instability	Landslides and Mudflows	Is the project located on or downhill of an area that is prone to landslides or mudflows?	Would project development promote the occurrence of landslides or mudflows?
	Unstable Cut and Fill Slopes (including trench wall stability)	Is the project on or adjacent to unstable cut or fill slopes?	Would project development adversely alter existing cut and / or fill slopes, making them potentially unstable?
	Collapsible and Expansive Soil	Is the project located on collapsible or expansive soil and could this condition lead to a structural collapse or hazardous release?	Would project development trigger collapse or expansive soil behavior that would lead to a structural collapse or hazardous release?
Erosion, Sedimentation, Flooding	Erosion of Graded Areas	Not applicable.	Would project development expose areas to erosion, and create potential impacts to other areas / projects?
	Alteration of Runoff	Not applicable.	Would project development negatively alter existing runoff patterns?
	Unprotected Drainage Ways	Not applicable.	Would project development include the creation of unprotected drainage ways?
	Increased Impervious Surfaces	Not applicable.	Would project development result in a significant increase in impervious surfaces?
Land Subsidence	Extraction of Groundwater, Gas, Oil, Geothermal Energy	Is the project located in areas where subsidence is an on-going or anticipated problem?	Could the project cause significant settlement?
	Hydrocompaction, Peat Oxidation	Is the project located on soils containing significant amounts of peat, or soils that are subject to hydrocollapse?	Would the project induce collapse behavior in peat-bearing soils or soils subject to hydrocollapse?
Volcanic Hazards	Lava Flow	Is the project subject to a lava flow hazard?	Could the project trigger a lava flow?
	Ash Fall	I s the project subject to an ash fall hazard?	Could the project trigger an ash fall?

NOTE: This list of geologic hazards and issues is from California Division of Mines and Geology, 1975, *Note 46*.

SECTION 7.0

IMPACTS ANALYSIS

This Section discusses geologic/geotechnical issues that could potentially affect or be affected by the South Orange County Transportation Infrastructure Improvement Project (SOCTIIP) alternatives. These issues are reproduced from the California Division of Mines and Geology (CDMG) checklist on issues to be discussed in geology reports for Environmental Impact Reports (EIRs). Included in this discussion are the potential issues related to: earthquake damage; loss of mineral resources; waste disposal problems; slope or foundation instability; erosion, sedimentation and flooding; land subsidence; and volcanic hazards. The impacts are first presented for the Far East Corridor Alternatives. Differences for the other alternatives are presented in separate sections that follow.

7.1 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACTS UNDER THE FEC-INITIAL AND ULTIMATE ALTERNATIVES

The FEC Initial and Ultimate Alternatives share the same alignment, and therefore share the same potential impacts related to earth resources, as discussed in the following Sections. Although the Initial and Ultimate Alternatives share the same type of impacts, the geographic extent of the impacts would differ.

7.1.1 EARTHQUAKE DAMAGE

7.1.1.1 Fault Movement

No active faults are known to cross the alignment of the FEC Initial and Ultimate Alternatives, and no Earthquake Fault Zones have been mapped along the bedrock faults in the study area. Therefore, the potential for a fault rupture hazard associated with the construction and/or operation of these alternatives is considered remote.

7.1.1.2 Liquefaction

Regional studies by the California Division of Mines and Geology (now the California Geological Survey (CDMG, 2001; CGS, 2002) have identified deposits that are potentially liquefiable within the study area. These deposits are located within the major drainages, including Cañada Chiquita, Cañada Gobernadora, San Juan Creek, and Segunda Deshecha, and Cristianitos Creek. In addition, site specific preliminary studies (Leighton and Associates, 2002b) have identified subsurface conditions that indicate a potential for liquefaction along the FEC-Initial and Ultimate Alternatives at the following locations: the I-5 Connector and San Mateo Creek; Blind/Gabino Creeks; the upper reaches of Cristianitos Creek, San Juan Creek, Cañada Gobernadora, Chiquita Woods, and Cañada Chiquita at Oso Parkway. The geotechnical reports prepared for the SOCTIIP (Leighton and Associates; 2002b) provide estimated potential settlements associated with liquefiable deposits along the alternatives, and typically recommend that additional studies be completed during final design to more specifically define the aerial extent of the liquefiable deposits and develop remedial measures to avoid liquefaction in these areas. Because the final design and construction of these alternatives will incorporate these recommendations, the potential for liquefaction related damage along the FEC-Initial and Ultimate Alternatives would be remote.

7.1.1.3 Landslides

Regional landslide hazard studies by the California Division of Mines and Geology (now the California Geological Survey (CDMG, 2001; CGS, 2002) have identified landslide prone areas along the FEC Alternatives. More detailed, site-specific preliminary studies (Leighton and Associates, 2002b) have identified many existing landslides and potentially unstable slopes along the FEC-Initial and Ultimate Alternatives. Left untreated, these areas could be subject to movement triggered by changed groundwater conditions or strong seismic shaking and thus, an adverse condition could exist. However, project design will consider these areas in further detail, and will develop remedial grading options to stabilize these areas. Final design and construction of slopes and embankments under the FEC-Initial and Ultimate Alternatives will include the recommended remedial grading. Therefore, the potential for earthquake-triggered movements would be remote.

7.1.1.4 Differential Compaction and Seismic Settlement

Preliminary geotechnical studies (Leighton and Associates; 2002b) address seismic settlement associated with liquefaction, but not for non-liquefiable soils that may also undergo settlement due to seismic shaking. Final design geotechnical studies will evaluate for this potential, and provide design and construction recommendations to mitigate this potential hazard. Thus, at completion of construction, the potential for damage related to differential compaction/seismic settlement would be remote.

7.1.1.5 Ground Rupture

Preliminary studies (Leighton and Associates; 2002b) have not identified subsurface conditions that indicate a potential for ground rupture associated with lurching or lateral spreading. Geotechnical studies for final design and construction for the FEC-Initial and Ultimate Alternatives will either confirm that no such hazards exist, or provide recommendations for their mitigation. Thus, at completion of construction of these Alternatives, the potential for ground rupture due to lurching or lateral spreading would be remote.

7.1.1.6 Ground Shaking

The potential for strong ground shaking cannot be reduced, but the damage potential can be mitigated through incorporation of appropriate design and construction techniques. Final design and construction of the FEC-Initial and Ultimate Alternatives will incorporate geotechnical recommendations and current codes and practices relative to ground motions. Therefore, the potential for damage due to seismic shaking under these Alternatives will not be precluded, but will be reduced to normal levels for this type of project.

7.1.1.7 Tsunami

The alignment of the FEC-Initial and Ultimate Alternatives is sufficiently inland from the coast, and/or at a sufficiently high elevation, so that there is no tsunami hazard. However there may be a potential hazard at the south end of the alignment where it ties into I-5. To evaluate the potential hazard requires review of the elevation of the Alternative and the existing I-5 embankment, which would provide some protection from a tsunami, and a comparison of that information to wave height estimates. According to the Office of Emergency Services, there is no published data that specifically addresses the site area at San Mateo Creek. However, information for other areas along the California coast suggests that wave heights from tsunami may range from about 3 to 12 meters (10 to 40 feet). The existing I-5 embankment across much of San Mateo Creek is at an elevation of approximately 20 meters (65 feet), and therefore, the embankment would provide effective protection to the south end of the FEC Alternatives. There is, however, a potential for wave run-up to travel under the existing bridge over San Mateo Creek, and up the creek toward the road. Considering that wave height and energy would be subdued after crossing under the bridge and then spreading out across the valley floor, and that the road would be at an elevation on the order of 20 meters (65 feet), the potential hazard due to tsunami is judged to be small.

7.1.1.8 Seiches

There are no lakes of sufficient size adjacent to the FEC-Initial and Ultimate Alternatives to pose a hazard due to seiche under these Alternatives.

7.1.1.9 Flooding

Because there are no water retention dams located upstream of the FEC Initial and Ultimate Alternatives, there is no potential hazard of seismically-induced dam failure and flooding.

7.1.2 LOSS OF MINERAL RESOURCES

7.1.2.1 Loss of Access

Construction of the FEC-Initial and Ultimate Alternatives would not preclude access to known or currently operational mineral resources. Therefore there are no impacts associated with access to mineral resources under these Alternatives.

7.1.2.2 Deposits Covered by Changed Land Use Conditions

The FEC-Initial and Ultimate Alternatives extend across San Juan Creek, where there are known, and previously mined, aggregate resources. Where embankments and/or bridge footings would be constructed, direct access to the deposits would be precluded. In addition, depending on the configuration of bridge foundations (i.e., whether foundations extend to bedrock), the FEC-Initial and Ultimate Alternatives could be adversely affected by future downstream mining activities, if such mining were to be permitted. Therefore, the FEC-Initial and Ultimate Alternatives would reduce, by a relatively small amount, the availability of aggregate resources in the San Juan Creek area. No other known mineral resources would be impacted by the FEC-Initial and Ultimate Alternatives.

7.1.2.3 Zoning Restrictions

The FEC-Initial and Ultimate Alternatives do not include zoning changes that would limit access or availability of known mineral resources. Therefore, there are no impacts on mineral resources related to changes in zoning restrictions under these Alternatives.

7.1.3 WASTE DISPOSAL PROBLEMS

7.1.3.1 Change in Groundwater Level

Locally, construction dewatering may be required for the FEC-Initial and Ultimate Alternatives. However, no long term groundwater pumping is planned. Therefore, there is a potential for temporary impacts (lowering of water levels) at local groundwater wells, but no permanent impacts are anticipated related to dewatering. The known wells in the vicinity of the alignment of these Alternatives are shown on Figures 5-2a and 5-2b. As shown on Figures 5-2a and 5-2b, there are a few nearby wells, but no wells appear to fall within the project footprint. If any currently unknown active wells are discovered within the disturbance limits, it is assumed that they would be abandoned properly, but would be replaced as part of project construction, and therefore no long-term adverse impacts to groundwater levels are anticipated under these Alternatives. Final design level geotechnical studies will identify any potential hazards associated with ground settlements (i.e. foundation settlement and structural distress) that may occur due to dewatering, and provide recommendations for mitigating potential damage, such as grouting or supplemental or deepened foundations. Therefore, no impacts associated with dewatering-induced settlement are anticipated.

7.1.3.2 Disposal of Excavated Material

As listed in Table 2-1, it is estimated that the earthwork for the FEC-Initial and Ultimate Alternatives will generate about 2.3 and 1.5 million cubic meters (about 3 and 2 million cubic yards) (respectively) of excess cut material, which will require off-site disposal unless final design studies can adjust project grading to accommodate this excess material. If not, a suitable off-site disposal area(s) will need to be identified. It is understood that the Prima Deshecha Landfill, located near the project alignment, may need soil for cover material and therefore the potential exists for the landfill to accept the excess soil that may be generated from the project. However, the timing of construction of the two projects may not sufficiently coincide so that the excess soil may be utilized. As a result, the generation of this excess material may be a adverse impact. The potential impacts of the build alternatives related to disposal of excess soil are discussed in detail in the Public Services and Utilities Technical Report.

In the case that excess soil is generated and requires disposal, those soils will require adequate characterization (according to applicable Caltrans, FHWA, and/or EPA standards), to identify potential contamination, so that they may be properly handled and disposed.

7.1.3.3 Percolation of Waste Material

Based on the Hazardous Materials Technical Report (P&D Consultants, 2003) construction of the FEC Initial and Ultimate Alternatives may involve contaminated soils but is not anticipated to involve contaminated groundwater. Any construction in areas of contaminated soils would be conducted consistent with all applicable federal, state, and local regulations as discussed in that Technical Report. Therefore, there would be no adverse impacts under these Alternatives related to the percolation of contaminated water, nor water leaching undesirable constituents from fill soils and then percolating into the subsurface.

7.1.4 SLOPE AND/OR FOUNDATION INSTABILITY

7.1.4.1 Landslides and Mudflows

As discussed in the preliminary geotechnical/geologic report (Leighton and Associates; 2002b) for the FEC-Initial and Ultimate Alternatives, many landslides have been identified along these alignments. Preliminary recommendations for remedial grading, such as removal of existing unstable soil/rock deposits and then replacement as engineered fill, are provided for these areas to provide stable slopes at completion of construction. Therefore, at completion of construction of the FEC-Initial and Ultimate Alternatives, the potential for damage related to landslides and mudflows would be remote.

7.1.4.2 Unstable Cut and Fill Slopes

In the preliminary geotechnical/geologic report (Leighton and Associates; 2002b) for the FEC-Initial and Ultimate Alternatives, many potentially unstable cut slopes have been identified along these alignments. Remedial grading is recommended for these areas to provide stable slopes at completion of construction. Therefore, at completion of construction, the potential for damage related to slope stability under the FEC-Initial and Ultimate Alternatives would be remote. For all other cut and fill slopes, final design and construction will incorporate standard design practices to avoid unstable conditions. Therefore, the potential for unstable conditions at completion of construction of the FEC-Initial and Ultimate Alternatives is considered remote.

7.1.4.3 Collapsible and Expansive Soil

Preliminary studies (Leighton and Associates; 2002b) have identified locations where existing soils have the potential for collapse or expansion that could damage structures of the FEC-Initial and Ultimate Alternatives, and have identified some conceptual remedial measures for these areas. Final design studies will further locate, evaluate, and provide design requirements to mitigate these soils so that at completion of construction the potential for damage related to soil collapse or expansion under these Alternatives would be remote.

7.1.4.4 Trench Wall Stability

Recommendations regarding trench wall stability will be provided in final design studies. These recommendations, together with standard construction safety requirements will be adhered to during construction of the Alternative. Therefore, potential hazards associated with trench wall stability will be avoided.

7.1.5 EROSION, SEDIMENTATION, FLOODING

7.1.5.1 Erosion of Graded Areas

The FEC-Initial and Ultimate Alternatives will create many new cut and fill slopes and other graded areas, which would be subject to erosion if not adequately controlled. Project design and construction will include measures to protect slopes from erosion, so that at completion of construction, there would be no net increase in erosion over natural conditions under these Alternatives.

7.1.5.2 Alteration of Runoff

The FEC-Initial and Ultimate Alternatives will be designed and constructed so that runoff will be appropriately controlled and directed to be consistent with natural conditions. Therefore, there would be no impacts related to alteration of runoff. Runoff management is evaluated in detail in the Runoff Management Plan.

7.1.5.3 Unprotected Drainage Ways

The FEC Initial and Ultimate Alternatives will be designed and constructed to include/incorporate evaluations and recommendations regarding flow in all drainage ways, and protective measures would be constructed where needed. As a result, there would be no adverse impacts under these Alternatives related to drainage ways.

7.1.5.4 Increased Impervious Surfaces

The FEC-Initial and Ultimate Alternatives will include the construction of 26 km of new pavement and various related structures, which will reduce the amount of natural ground surface over which percolation of rainfall and other surface water can occur. The total area of new pavement for the FEC-Initial and Ultimate Alternatives is a relatively small fraction of the total surface area of the drainage basins crossed by the project. Thus, the FEC-Initial and Ultimate Alternatives will have a minor adverse impact with respect to an increase in impervious surfaces.

7.1.6 LAND SUBSIDENCE

7.1.6.1 Extraction of Groundwater, Gas, Oil and Geothermal Energy

There are no known ongoing or planned large-scale extractions of groundwater, gas, oil or geothermal energy that could cause subsidence in the SOCTIIP project area. Therefore, there is no known hazard related to land subsidence along the proposed alignment of the FEC-Initial and Ultimate Alternatives.

7.1.6.2 Hydrocompaction and Peat Oxidation

Final design and construction of the FEC-Initial and Ultimate Alternatives will provide for the removal and replacement of soils that are subject to hydrocompaction or that have substantial quantities of peat. Therefore, at completion of construction, the potential for ground surface settlement due to hydrocompaction or peat oxidation under these Alternatives would be remote.

7.1.7 VOLCANIC HAZARDS

7.1.7.1 Lava Flow

There are no active or potentially active volcanoes in the region of the FEC-Initial and Ultimate Alternatives. Therefore, there is no potential for a hazard due to lava flow under these Alternatives.

7.1.7.2 Ash Fall

Potentially active volcanoes are sufficiently distant from the alignments of the FEC-Initial and Ultimate Alternatives so that there is not a hazard due to ash fall.

7.2 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE FEC-TV INITIAL AND ULTIMATE ALTERNATIVES

Considering the geologic conditions present, and the same design and construction assumptions regarding the project, the FEC–TV-Initial and Ultimate Alternatives share the same potential impacts as described earlier for the FEC-Initial and Ultimate Alternatives, as follows:

- A minor impact related to the availability of mineral resources in San Juan Creek.
- Potential need for disposal of 3.4 to 7.7 million cubic meters excess soil from earthwork, substantially more excess soils than for the FEC-Initial and Ultimate Alternatives.
- An increase in impermeable surfaces associated with about 21 km of new pavement, which is less than for the FEC-Initial and Ultimate Alternatives.

7.3 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE FEC-CV-INITIAL AND ULTIMATE ALTERNATIVES

Considering the geologic conditions present, and the same design and construction assumptions regarding the project, the FEC–CV-Initial and Ultimate Alternatives share the same potential impacts as described earlier for the FEC-Initial and Ultimate Alternatives, as follows:

- A minor impact related to the availability of mineral resources in San Juan Creek.
- Potential need for disposal of 3.8 to 2.3 million cubic meters excess soil from earthwork, slightly more excess soils than for the FEC-Initial and Ultimate Alternatives.
- An increase in impermeable surfaces associated with about 22 km of new pavement, which is less than the FEC-Initial and Ultimate Alternatives.

7.4 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE FEC-AFV – INITIAL AND ULTIMATE ALTERNATIVES

Considering the geologic conditions present, and the same design and construction assumptions regarding the project, the FEC–AFV-Initial and Ultimate Alternatives share the same potential impacts as described earlier for the FEC-Initial and Ultimate Alternatives, as follows:

- A minor impact related to the availability of mineral resources in San Juan Creek.
- A potential need for disposal of 0.9 million cubic meters excess soil to import of 0.5 million cubic meters of soil for earthwork.
- An increase in impermeable surfaces related to about 26 km of new pavement, approximately the same as for the FEC-Initial and Ultimate Alternatives.

In addition, the FEC–AFV-Initial and Ultimate Alternatives would have potential impacts to 5 existing wells in the agricultural fields area. These impacts may require replacement of the wells, and/or temporary groundwater level lowering effects during construction.

7.5 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE FEC-OHV – INITIAL AND ULTIMATE ALTERNATIVES

Considering the geologic conditions present, and the same design and construction assumptions regarding the project, the FEC–OHV-Initial and Ultimate Alternatives share the same potential impacts as described earlier for the FEC-Initial and Ultimate Alternatives, as follows:

- A minor impact related to the availability of mineral resources in San Juan Creek.
- A potential need for disposal of 0.2 to 2.5 million cubic meters of excess soil from earthwork..
- An increase in impermeable surfaces related to about 9 km of new pavement, less than half of that for the FEC Alternatives.

7.6 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE FEC-APV – INITIAL AND ULTIMATE ALTERNATIVES

Considering the geologic conditions present, and the same design and construction assumptions regarding the project, the FEC–APV-Initial and Ultimate Alternatives share the same potential impacts as described earlier for the FEC-Initial and Ultimate Alternatives, as follows:

- A minor impact related to the availability of mineral resources in San Juan Creek
- A potential need for disposal of 1.4 million cubic meters of excess soil from earthwork to a need for 0.3 million cubic meters of soil for the Initial Alternative.
- An increase in impermeable surfaces related to about 17 km of new pavement, less than for the FEC Alternatives.

7.7 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE FEC-W – INITIAL AND ULTIMATE ALTERNATIVES

Considering the geologic conditions present, and the same design and construction assumptions regarding the project, the FEC–W Initial and Ultimate Alternatives share the same potential impacts as described earlier for the FEC-Initial and Ultimate Alternatives, as follows:

- A minor impact related to the availability of mineral resources in San Juan Creek
- A potential need for disposal of 0.3 to 0.9 million cubic meters of excess soil from earthwork.
- An increase in impermeable surfaces related to about 26 km of new pavement, approximately the same as for the FEC Alternatives.

7.8 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE FEC-M – INITIAL AND ULTIMATE ALTERNATIVES

Considering the geologic conditions present, and the same design and construction assumptions regarding the project, the FEC–M Initial and Ultimate Alternatives share the same potential impacts as described earlier for the FEC-Initial and Ultimate Alternatives, as follows:

- A minor impact related to the availability of mineral resources in San Juan Creek
- A potential need for disposal of 3.3 to 3.0 million cubic meters of excess soil from earthwork.
- An increase in impermeable surfaces related to about 26 km of new pavement, approximately the same as for the FEC Alternatives.

7.9 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE CC-INITIAL AND ULTIMATE ALTERNATIVES

Considering the geologic conditions present, and the same design and construction assumptions regarding the project, the CC-Initial and Ultimate Alternatives share the same potential impacts as described earlier for the FEC-Initial and Ultimate Alternatives, as follows:

- A minor impact related to the availability of mineral resources in San Juan Creek
- A potential need for disposal of 2.7 to 4.8 million cubic meters excess soil from earthwork, greater than that for the FEC Alternatives.
- An increase in impermeable surfaces related to 19 km of new pavement, less than for the FEC Alternatives.

In addition, these Alternatives would have the potential for temporary groundwater level lowering impacts at 2 wells in the San Juan Creek area, during construction.

7.10 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE CC-ALPV-INITIAL AND ULTIMATE ALTERNATIVES

Considering the geologic conditions present, and the same design and construction assumptions regarding the project, the CC-ALPV-Initial and Ultimate Alternatives share the same potential impacts as described earlier for the FEC-Initial and Ultimate Alternatives, except for disposal of excess material, as follows:

- A minor impact related to the availability of mineral resources in San Juan Creek.
- An increase in impermeable surfaces related to about 14 km of new pavement, less than for the FEC Alternatives.

In addition, these Alternatives would have the potential for temporary groundwater level lowering impacts at 2 wells in the San Juan Creek area, during construction and may require import of about 0.3 million cubic meters of soil for construction.

7.11 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE CC-OHV-INITIAL AND ULTIMATE ALTERNATIVES

Considering the geologic conditions present, and the same design and construction assumptions regarding the project, the CC-OHV-Initial and Ultimate Alternatives share the same potential impacts as described earlier for the FEC-Initial and Ultimate Alternatives, as follows:

- A minor impact related to the availability of mineral resources in San Juan Creek
- A potential need for to import 0.2 million cubic meters of soil or disposal of 0.8 million cubic meters of excess soil from earthwork.
- An increase in impermeable surfaces related to about 8 km of new pavement, less than half of that required for the FEC Alternatives.

In addition, these Alternatives would have the potential for temporary groundwater level lowering impacts at 2 wells in the San Juan Creek area, during construction.

7.12 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE A7C-INITIAL AND ULTIMATE ALTERNATIVES

Considering the geologic conditions present, and the same design and construction assumptions regarding the project, the A7C-Initial and Ultimate Alternatives share the same potential impacts as described earlier for the FEC-Initial and Ultimate Alternatives, as follows:

- A minor impact related to the availability of mineral resources in San Juan Creek.
- A potential need for disposal of 2.3 to 5.4 million cubic meters of excess soil from earthwork for the Ultimate Alternative.

- An increase in impermeable surfaces related to 19 km of new pavement, less than for the FEC Alternatives.

In addition, these Alternatives would have the potential for impacts, including the need for replacement and/or temporary groundwater level lowering during construction, at 1 well in the San Juan Creek area. These Alternatives would also have the potential for permanent groundwater level lowering at a mapped spring located about ¾ km (½ mile) south of Ortega Highway.

7.13 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE A7C-7SV INITIAL AND ULTIMATE ALTERNATIVES

Considering the geologic conditions present, and the same design and construction assumptions regarding the project, the A7C-7SV-Initial and Ultimate Alternatives share the same potential impacts as described earlier for the FEC-Initial and Ultimate Alternatives, as follows:

- A minor impact related to the availability of mineral resources in San Juan Creek.
- A potential need for disposal of 10.2 to 14.6 million cubic meters of excess soil from earthwork, the largest excess of materials for all the build alternatives.
- An increase in impermeable surfaces related to about 18 km of new pavement, less than for the FEC Alternatives.

In addition, these Alternatives would have the potential for impacts, including the need for replacement and/or temporary groundwater level lowering during construction, at 1 well in the San Juan Creek area. These Alternatives would also have the potential for permanent groundwater level lowering at a mapped spring located about ¾ km (½ mile) south of Ortega Highway.

7.14 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE A7C-FECV-INITIAL AND ULTIMATE ALTERNATIVES

Considering the geologic conditions present, and the same design and construction assumptions regarding the project, the A7C-FECV-Initial and Ultimate Alternatives share the same potential impacts as described earlier for the FEC-Initial and Ultimate Alternatives, as follows:

- A minor impact related to the availability of mineral resources in San Juan Creek.
- A potential need for disposal of 9.9 to 6.8 million cubic meters of excess soil from earthwork, more excess soil than for the FEC Alternatives.
- An increase in impermeable surfaces related to about 25 km of new pavement, slightly less than for the FEC Alternatives.

In addition, these Alternatives would have the potential for impacts, including the need for replacement and/or temporary groundwater level lowering during construction, at 1 well in the San Juan Creek area. These Alternatives would also have the potential for permanent groundwater level lowering at a mapped spring located about ¾ km (½ mile) south of Ortega Highway.

7.15 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE A7C-FECV-C-INITIAL AND ULTIMATE ALTERNATIVES

Considering the geologic conditions present, and the same design and construction assumptions regarding the project, the A7C-FECV-C-Initial and Ultimate Alternatives share the same potential impacts as described earlier for the FEC-Initial and Ultimate Alternatives, as follows:

- A minor impact related to the availability of mineral resources in San Juan Creek
- A potential need for disposal of 11.4 to 6.7 million cubic meters of excess soil from earthwork, more excess soil than for the FEC Alternatives.
- An increase in impermeable surfaces related to about 23 km of new pavement, slightly less than for the FEC Alternatives.

In addition, these Alternatives would have the potential for impacts, including the need for replacement and/or temporary groundwater level lowering during construction, at 1 well in the San Juan Creek area. These Alternatives would also have the potential for permanent groundwater level lowering at a mapped spring located about ¾ km (½ mile) south of Ortega Highway.

7.16 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE A7C-FECV-AF INITIAL AND ULTIMATE ALTERNATIVES

Considering the geologic conditions present, and the same design and construction assumptions regarding the project, the A7C-FECV-AF-Initial and Ultimate Alternatives share the same potential impacts as described earlier for the FEC-Initial and Ultimate Alternatives, as follows:

- A minor impact related to the availability of mineral resources in San Juan Creek.
- A potential need for disposal of 8.8 to 5.1 million cubic meters of excess soil from earthwork, more excess soil than for the FEC Alternatives.
- An increase in impermeable surfaces related to about 25 km of new pavement, slightly less than for the FEC Alternatives.

In addition, these Alternatives would have the potential for impacts to 1 well in the San Juan Creek area and 5 existing wells in the agricultural fields area. These impacts may require replacement of the wells, and/or temporary groundwater level lowering effects during construction. These Alternatives would also have the potential for permanent groundwater level lowering at a mapped spring located about ¾ km (½ mile) south of Ortega Highway.

7.17 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE A7C-OHV-INITIAL AND ULTIMATE ALTERNATIVES

Considering the geologic conditions present, and the same design and construction assumptions regarding the project, the A7C-OHV-Initial and Ultimate Alternatives share the same potential impacts as described earlier for the FEC-Initial and Ultimate Alternatives, except for the potential for disposal of excess material, as follows:

- A minor impact related to the availability of mineral resources in San Juan Creek
- An increase in impermeable surfaces related to about 7 km of new pavement, less than half of that for the FEC Alternatives.

These Alternatives do not appear to have the potential need to dispose of excess materials. However, according to preliminary information, they would require large amounts of imported material for construction, approximately 4.2 to 7.7 million cubic meters of soil.

7.18 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE A7C-ALPV-INITIAL AND ULTIMATE ALTERNATIVES

Considering the geologic conditions present, and the same design and construction assumptions regarding the project, the A7C-OHV-Initial and Ultimate Alternatives share the same potential impacts as described earlier for the FEC-Initial and Ultimate Alternatives, except for the potential need to dispose of excess material, as follows:

- A minor impact related to the availability of mineral resources in San Juan Creek.
- An increase in impermeable surfaces related to about 14 km of new pavement, less than for the FEC Alternatives.

In addition, these Alternatives would have the potential for impact to 1 well in the San Juan Creek area. The impact may require replacement of the well, and/or temporary groundwater level lowering effects during construction. These Alternatives would also have the potential for permanent groundwater level lowering at a mapped spring located about ¾ km (½ mile) south of Ortega Highway. These Alternatives would also require the import of 0.5 to 1.7 million cubic meters of soil for earthwork.

7.19 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE A7C-FEC-M – INITIAL AND ULTIMATE ALTERNATIVES

Considering the geologic conditions present, and the same design and construction assumptions regarding the project, the A7C-FEC–M Initial and Ultimate Alternatives share the same potential impacts as described earlier for the FEC-Initial and Ultimate Alternatives, as follows:

- A minor impact related to the availability of mineral resources in San Juan Creek
- Potential impact to one groundwater well in San Juan Creek
- An increase in impermeable surfaces related to about 26 km of new pavement, approximately the same as for the FEC Alternatives.

There is also a potential need to import 1.4 to 2.3 million cubic meters of soil for earthwork. It is noted that these alignments cross near the existing Olgebay Norton quarry operations in Trampas Canyon. Based on discussions with Olgebay Norton staff, we understand that it is very unlikely that the project would adversely impact their operations, which are permitted through the year 2013. Quarry operations could continue beyond 2013, if the existing lease from the property owner (RMV) is extended or a new lease is granted. Additional sand resources may exist beyond the limits of the currently-permitted mining operation. However, such resources have not been investigated and proven. As a result, project construction is not considered to be an impact to the available mineral resource.

7.20 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE ARTERIAL IMPROVEMENTS AND I-5 ALTERNATIVES

As described in Section 2, the arterial improvement alternatives include the Arterial Improvements Only (AIO) Alternative, the Arterial Improvements Plus HOV and Mixed Spot Lanes on I-5 (AIP) Alternative, and an I-5 Widening Alternative (I-5 Alternative). Under the same design and construction assumptions as for the other build alternatives, these Alternatives are anticipated to present the following geotechnical, geologic or soils related impacts:

- A need for disposal of excess soil from earthwork, with the AIO Alternative generating about 1.1 million cubic meters excess soil, the AIP Alternative generating about 4.7 million cubic meters of excess soil, and the I-5 widening Alternative generating about 4.3 million cubic meters of excess soil.
- A slight increase in impervious surfaces.

7.21 POTENTIAL GEOTECHNICAL AND GEOLOGIC IMPACT ISSUES UNDER THE NO ACTION ALTERNATIVES

The two No Action Alternatives would include no construction and therefore, would not be subject to any new geotechnical/geologic impacts.

SECTION 8.0
MITIGATION MEASURES

As discussed in Section 4.0, it is understood that standard investigation, design and construction practices will be conducted and implemented for the selected alternative, if a build alternative is selected for implementation. Indeed, much preliminary work has been done by the Transportation Corridor Agency (TCA), in part, to support the preparation of environmental documentation for the project. As a result of the initial studies and designs, many potential impacts have already been identified and would be mitigated based on incorporating standard design and construction techniques in the description of each Alternative. For example, existing landslides or potentially unstable slopes have been identified, and recommendations have been provided for their treatment to obtain adequate stability when construction is complete.

The Mitigation Monitoring Report for TCA's Final Environmental Impact Report No. 3 identified three specific mitigation measures (G-1 through G-3) for geotechnical, geology and soils issues (see Monitoring Report, revised mitigation measures, pg. 3-1 to 3-2). These measures are described below, with minor modifications to address the build alternatives for the South Orange County Transportation Infrastructure Improvement Project (SOCTIIP). In addition to these, Measure G-4 is an added measure that addresses the typical construction phase quality assurance/quality control practice for similar projects, and which TCA has employed on its prior projects.

Measure G-1: Prior to final design for the selected alternative, a geotechnical report will be prepared. This report will document potential soil-related constraints and hazards such as slope instability, settlement, liquefaction or related secondary seismic impacts that may be present.. Acceptance of the report will be subject to approval by the TCA and other agencies that may have jurisdiction. A minimum factor of safety of 1.5 shall be used to determine the final slope configuration. The report shall also include:

- Evaluation of potentially expansive soils and recommendations regarding construction procedures and/or design criteria to minimize the effect of these soils on the development of the corridor.

- Subsurface exploration and analysis in areas likely to have liquefaction potential, and recommendations for engineering solutions.

Measure G-2: In conjunction with final design, it will be demonstrated that side slopes shall be designed and graded so that the potential for surface erosion of the engineered fill is not increased from natural conditions.

Measure G-3: In conjunction with construction activity, vegetation with good soil-binding characteristics and low water requirements will be planted on engineered slopes to reduce erosion and slope instability.

Measure G-4: A quality assurance/quality control plan will be maintained during construction. This will include observing, monitoring and testing by a geotechnical engineer and/or geologist during construction to confirm that geotechnical/geologic recommendations are fulfilled, or if different site conditions are encountered, appropriate changes are made to accommodate such issues.

Measure G-5: Once a final project alignment has been selected, a detailed review will be made to locate all groundwater wells within the project footprint. Any groundwater wells that occur within the project footprint will be abandoned properly during project construction. As may be required, (i.e., for active wells), the water supply provided by the well will be replaced. Replacement water may be provided by a variety of means, such as installing a new well or a connection to municipal supply.

Measures G-1 through G-5 would apply to all the SOCTIIP build alternatives. The No Action Alternatives would result in no adverse impacts related to geotechnical, geology and soils, and no mitigation is required.

SECTION 9.0

CEQA SIGNIFICANCE

The California Environmental Quality Act (CEQA) requires that each significant impact be identified in the Environmental Impact Report (EIR) (Public Resources Code Section 21082.2). In this Section, references to significant adverse impacts of the South Orange County Transportation Infrastructure Improvement Project (SOCTIIP) alternatives related to geotechnical, geology and soils impacts are made to fulfill the requirements of CEQA. No representation as to significance made in this section represents an assessment of the magnitude of such an impact under the requirements of Federal law. Under the National Environmental Policy Act (NEPA), no determination need be made for each environmental effect. The Council on Environmental Quality (CEQ) regulations implementing NEPA state that "significantly" as used in NEPA requires consideration of both context and severity/intensity. The CEQ regulations recognize that the significance of an action must be analyzed in several contexts such as the society as a whole, the affected region, the affected interests and the locality. Significance varies with the setting of the proposed action (40 CFR Section 1508.27). Table 9-1 summarizes the significance thresholds that were adopted for this study.

The significance factors in Table 9-1 were reviewed relative to the existing conditions along the alignments of the SOCTIIP build alternatives, and considering the assumptions listed in Section 4.0. Based on a review of these factors, it is judged that:

- None of the SOCTIIP alternatives present significant adverse impacts relative to earthquake damage.

- None of the SOCTIIP alternatives is known to destroy a unique geologic feature.

- The alignments of the Far East Corridor, Central Corridor and Alignment 7 Corridor Alternatives all cross San Juan Creek, and may pose slight limitations on future mining of sand and gravel deposits in the project vicinity. Considering that the affected areas are small, relative to the area of the creek, and the low likelihood that future mining could be permitted in San Juan Creek, this is not considered a significant adverse impact.

- Construction of some of the SOCTIIP Alternatives may require the replacement of local wells that may occur within the disturbance areas. Replacement of any affected well with a well of equal production capacity will result in no impacts. The construction may also cause temporary groundwater level lowering effects at nearby wells during construction. Because they are not anticipated to be permanent, these effects are not considered significant adverse impacts. Construction of the Alignment 7 Alternatives, with the exception of the A7C-OHV Alternative, would likely result in permanent adverse impacts to a mapped groundwater spring located about ¾ km (½ mi) south of Ortega Highway.

- Under the assumption that final design studies will refine the alternatives so that the volume of earthwork balances (volume of cut will equal the volume of fill), or alternatively, the design studies will identify disposal areas that would not result in adverse impacts, the

SOCTIIP build Alternatives are not anticipated to result in adverse impacts related to the disposal of excavated material, sewage, or wastewater.

- Because they will have the benefit of appropriate investigation, design and construction, the SOCTIIP build Alternatives are not anticipated to expose people or structures to an increased hazard of landslide or mudslide.

- Because they will have the benefit of appropriate investigation, design and construction, the SOCTIIP build Alternatives are not anticipated to expose structures to potential damage from expansive or collapsible soil.

- Because they will have the benefit of appropriate investigation, design and construction, the SOCTIIP build Alternatives are not anticipated to result in increased soil erosion, above natural conditions.

- Because they will have the benefit of appropriate investigation, design and construction, the SOCTIIP build Alternatives are not anticipated to expose structures to a potential for distress due to foundation settlement or subsidence.

- The SOCTIIP build Alternatives will result in an increase of impermeable surfaces, which is not considered a significant adverse impact.

TABLE 9-1

THRESHOLDS OF SIGNIFICANCE FOR THE SOCTIIP TECHNICAL ANALYSIS FOR GEOTECHNICAL, GEOLOGY, AND SOILS ISSUES

A SOCTIIP alternative was considered to result in a significant adverse impact related to geotechnical, geology and soils if it:

Exposes people or structures to the risk of loss, injury, or death, involving: o Surface rupture of a known earthquake fault, as delineated on the most recent Earthquake Fault Zones map issued by the State Geologist for the area, or confirmed evidence of a newly identified earthquake fault. Refer to the California Division of Mines and Geology (CDMG) Special Publication 42. o Seismic shaking hazards that exceed those inherent to similar contemporary facilities o Seismic-related ground failure, including liquefaction. o Landslides o Seismically induced flooding
Directly or indirectly destroys a unique geologic feature.
Results in loss of mineral resources that are of value to the region or the residents of the State of California, or which are locally important for recovery.
Results in permanent adverse effects to groundwater resources.
Results in adverse effects related to the disposal of excavated material, sewage, or wastewater.
Exposes people or structures to an increased hazard of landslide or mudslide.
Exposes structures to potential damage from expansive or collapsible soil.
Results in an increase in the potential for soil erosion.
Exposes structures to a potential for distress due to foundation settlement or subsidence.

SECTION 10.0

CUMULATIVE IMPACTS

10.1 CUMULATIVE PROJECTS

Other projects in the South Orange County Transportation Infrastructure Improvements Project (SOCTIIP) study area were identified for consideration in the cumulative impacts assessment. Recently constructed, approved and planned projects in the area of the SOCTIIP are described briefly in Table 10-1, based on existing environmental and planning documents for these projects. Table 10-2 includes additional projects, which were described in the Environmental Impact Report (EIR) for the Prima Deshecha Sanitary Landfill General Development Plan (GDP). Those additional projects were summarized in the GDP EIR and that summary was used in this current analysis for describing those other cumulative projects.

Table 10-3 lists the cumulative projects in the SOCTIIP study area, the potential impacts of those projects related to geotechnical, geology and soils issues, and mitigation measures incorporated in those projects to avoid or substantially reduce identified adverse impacts. Table 10-4 summarizes the projects in the committed master plan of arterial highways/regional transportation plan facilities and improvements. Table 10-5 summarizes the projects in the non-committed master plan of arterial highways/regional transportation plan facilities and improvements. Table 10-6 summarizes the Caltrans improvement projects.

Figure 10-1 shows the general locations of these cumulative projects in the SOCTIIP study area.

10.2 POTENTIAL FOR CUMULATIVE IMPACTS RELATED TO GEOTECHNICAL, GEOLOGY AND SOILS ISSUES

As described earlier in Section 7.0 (Impacts), the SOCTIIP build alternatives would result in minor impacts related to mineral resources, temporary groundwater level lowering effects for some Alternatives, a permanent impact to a mapped spring for all but one of the A7C Alternatives, potential need for excess soil disposal and increased impermeable surfaces. Therefore, cumulative impacts that would result from implementation of the SOCTIIP build alternatives would be relative these issues that may be part of other projects in the area.

Of the projects listed in Table 10-3, the only project that has also identified impacts to mineral resources is the Arroyo Trabuco Golf Course. That project would result in a significant adverse impact related to mineral resources. The minor impacts of the SOCTIIP build Alternatives related to mineral resources, combined with the significant adverse impacts of the Golf Course, would be a significant, cumulative adverse impact on mineral resources.

The other projects have not identified other impacts that are the same as for the SOCTIIP build Alternatives, so no other cumulative impacts are anticipated.

The Prima Deshecha Sanitary Landfill GDP suggests that there is a demand for soil to be used as cover material. Considering the proximity of some of the SOCTIIP build alternatives to the landfill, and the potential for excess soil to be generated from construction of most of the build alternatives, it would appear possible that there is a potential for the two projects to coordinate and therefore make use of excess soil that may be available during construction of the SOCTIIP Alternatives.

TABLE 10-1
DESCRIPTION OF MAJOR CUMULATIVE PROJECTS

Description of Project Land Uses	Source/Reference
ROLLING HILLS PLANNED COMMUNITY (THE PART OF THE TALEGA DEVELOPMENT IN UNINCORPORATED ORANGE COUNTY)	
772 ha (1,906 ac). 2,700 dus. Business and commercial uses. Public facilities.	"Final Environmental Impact Report Zone Change ZC 86-31P, Planned Community District Regulations, Feature Plan FP 88-1P, Rolling Hills, EIR No. 482" (County of Orange Environmental Management Agency, May 4, 1988).
TALEGA VALLEY SPECIFIC PLAN (CHAMPION HILLS; THE PART OF THE TALEGA DEVELOPMENT IN THE CITY OF SAN CLEMENTE)	
6,496 ha (1,604 ac). 2,265 dus. 357 ha (822 ac) open space. 66.8 ha (165 ac) golf course. 70.9 ha (175 ac) Rancho Mission Viejo Land Conservancy. Business and commercial uses. Public facilities.	"Draft Environmental Impact Report Talega Valley Specific Plan" (City of San Clemente, November 24, 2001).
CHIQUITA CANYON HIGH SCHOOL (NOW REFERRED TO AS TESORO HIGH SCHOOL)	
16.2 ha (40 ac). 18,600 square meters (sm) (200,000 square feet (sf) of buildings with 85 classrooms. Design capacity of 3,100 students.	"Final Environmental Impact Report for Chiquita Canyon High School" (Capistrano Unified School District, March 25, 1996).
PRIMA DESHECHA SANITARY LANDFILL GENERAL DEVELOPMENT PLAN (GDP)	
The GDP calls for continued landfilling through 2050 and the development of a regional park after the landfilling is terminated.	"Draft Environmental Impact Report No. 575 2001 Prima Deshecha General Development Plan: Landfill Component, Circulation Component and Recreation Component" (Orange County Integrated Waste Management Department, January 31, 2001).
WHISPERING HILLS PLANNED COMMUNITY	
High school on 70.9 ha (175 ac). 193 single family dus and 73.3 ha (181 ac) open space.	Whispering Hills Revised Draft EIR (City of San Juan Capistrano, November 2001). Project was approved April 2002. Residential/open space component was repealed by residents (November 2002 election). School District passed exemptions from City zoning and is proceeding with development of school.
FORSTER RANCH SPECIFIC PLAN AMENDMENT	
1,617 dus on 218.3 ha (538.9 ac). 5.6 ha (14 ac) civic center. 2.8 ha (7 ac) commercial. 77.8 ha (192 ac) institutional. 15.6 ha (38.5 ac) public and roads. 154.7 ha (382 ac) open space and greenbelt.	"Subsequent Environmental Impact Report Forster Ranch Specific Plan Amendment" (City of San Clemente, September 23, 1997).
MARBLEHEAD COASTAL	

TABLE 10-1
DESCRIPTION OF MAJOR CUMULATIVE PROJECTS

Description of Project Land Uses	Source/Reference
Revised Proposal: 101.5 ha (250.6 ac) site. 313 du on 25.1 ha (61.9 ac). 62,797.6 square meters (675,243 sf) commercial. 36.4 ha (89.8 ac) parks and open space. 4.2 ha (10.4 ac) roads.	Revised proposal approved by the California Coastal Commission (CCC) on April 9, 2003 (Los Angeles Times, April 10, 2003).. Revised documents will need to be prepared by the City of San Clemente consistent with the project approved by the CCC. Previous environmental documentation: "Final Environmental Impact Report for Marblehead Coastal General Plan Amendment 96-01, Specific 95-02 and Tentative Tract Map" (City of San Clemente, August 5, 1998).
PACIFIC POINT/SAN JUAN MEADOWS	
617 dus on 71.3 ha (176 ac). 10.2 ha (25 ac) research and development. 3.2 ha (7.8 ac) public and institutional. 32.4 ha (80 ac) open space, recreation and parks.	"Final Environmental Impact Report Pacific Point Amendment to Coastal Development Permit 81-1 (RZ 89-07) and General Plan Amendment GP 90-08" (City of San Juan Capistrano, August 1, 1991).
ANTONIO PARKWAY ROADWAY ALIGNMENT AND LAND USE PLAN (LADERA PLANNED COMMUNITY)	
Roadway Alignment Alignment of Antonio Parkway between Oso Parkway and Ortega Highway. Addition of a secondary arterial from Crown Valley Parkway to Antonio Parkway. Deletions of extensions of Avery Parkway and Trabuco Creek Parkway from the MPAH. Deletion of a Class II bikeway on Avery Parkway from the Bikeways Master Plan. Redesignation of Avery Parkway as a landscape corridor in the Master Plan of Scenic Highways (MPSH). Deletion of Trabuco Creek Road from the MPSH. Land Uses 968 ha (2,390 ac). 8,100 dus. 45 ha (111 ac) urban activity centers. 23.9 ha (59 ac) parks and public facilities. 10.1 ha (25 ac) commercial uses. 243 ha (600 ac) open space.	"Draft Environmental Impact Report No. 555 Antonio Parkway Roadway Alignment and Land Use Plan: Land Use Element Amendment 95-4, Transportation Element Amendment 95-3, Community Profile Amendment 95-2 and Zone Change 94-5" (County of Orange Environmental Management Agency, May 1995).
ARROYO TRABUCO GOLF COURSE	
17.4 ha (43 ac). 18 hole golf course and accessory facilities. 25.5 ha (63 ac) ungraded natural land.	"Draft Environmental Impact Report Arroyo Trabuco Golf Course" (County of Orange Planning and Development Services Department, May 2001).
RANCHO MISSION VIEJO DEVELOPMENT ENTITLEMENTS GENERAL PLAN AMENDMENT (GPA)/ZONE CHANGE (ZC)	

TABLE 10-1
DESCRIPTION OF MAJOR CUMULATIVE PROJECTS

Description of Project Land Uses	Source/Reference
Approximately 9,254 ha (22,850 ac) site, up to 14,000 dus, 52.7 ha (130 ac) of urban activity center, 104.5 ha (258 ac) of business park, 15.8 ha (39 ac) neighborhood center uses, up to four golf courses, a 437 ha (1,079 ac) regional park and 5,330.2 ha (13,161 ac) of open space of which 170 ha (420 ac) would be 100 residential sites, a golf course with attached dus, equestrian facilities and ranching activities. Amendments to the Land Use, Transportation, Resources and Recreation Elements of the General Plan and Zone Change from A-1 (General Agriculture and Sand and Gravel) to PC (Planned Community). Being processed concurrently with the SAMP and the NCCP.	Draft Rancho Mission Viejo Development Application (County of Orange Planning and Development Services Department, November 8, 2001). Notice of Preparation to Prepare a Draft Environmental Impact Report for the Rancho Mission Viejo General Plan Amendment/Zone Change (PA 01-114), the Ranch Plan, County of Orange, February 24, 2003.
RANCHO MISSION VIEJO ORANGE COUNTY PROJECTIONS (OCP) - 2000	
21,000 dus projected for Rancho Mission Viejo buildout in 2025.	OCP-2000 (Orange County Council of Governments, June 2000). No environmental documents available.
SOUTH SUBREGION NATURAL COMMUNITY CONSERVATION PLAN/ HABITAT CONSERVATION PLAN (NCCP/HCP)	
Undefined Actions. Undefined NCCP and SAMP.	Federal Register Notice of Intent to prepare an Environmental Impact Statement (United States Fish and Wildlife Service, August 23, 2001). No environmental documents are available.
MCB CAMP PENDLETON	
HOLF mitigation area: conversion of approximately 15 ha (36 ac) of agricultural land to coastal sage scrub. Project is underway, with completion anticipated in 2003.	L. Rannals (01/03).
Refer to Table 10-2 for a listing of other minor improvement projects on Camp Pendleton.	"Marine Corps Base Camp Pendleton, California Master Plan" (Southwest Division Naval Facilities Engineering Command, September 1992).
San Onofre State Beach Outlease <u>Existing Land Uses</u>: campgrounds, beach trails. <u>Proposed Land Uses</u>: 18-hole golf course, primitive trails, secondary access from Avenida La Pata and tourist commercial.	San Onofre State Beach General Plan (1988), Mitigation from San Onofre Nuclear Generating Station Parking Lot Mitigation and Marine Corps Base Camp Pendleton, California Mater Plan (September 1992).

TABLE 10-1
DESCRIPTION OF MAJOR CUMULATIVE PROJECTS

Description of Project Land Uses	Source/Reference
REUSE OF THE MARINE CORPS AIR STATION (MCAS) EL TORO (NOW REFERRED TO AS ORANGE COUNTY GREAT PARK)	
Civilian international airport, park/open space, residential, commercial, industrial and public uses on approximately 1,900.1 ha (4,693 ac). This land use plan was rejected by the voters in 2002. Orange County "Great Park" since passage of Measure W which includes parks museums, open space and tourist uses. Private sale may change use. This land use plan was accepted by the voters in 2002. The proposed project includes annexation, General Plan and Zoning Amendments to accommodate a comprehensive land use plan occupying 35.9 ha (3,856,500 sf) including residential (225 dus), educational, cultural and institutional, transportation facilities, research and development, retail, office, auto center, agricultural, a variety of open space and road uses.	"Draft Environmental Impact Report No. 573 for the Civilian Reuse of MCAS El Toro and the Airport System Master Plan for John Wayne Airport and Proposed Orange County International Airport" (County of Orange, December 1999). File Nos. 47782-GA and 47785-ZC. Draft Environmental Impact Report (SCH No. 2002101020) City of Irvine, February 2003.
PROPOSED SADDLE CREEK/SADDLE CREST (FOOTHILL/TRABUCO AREA OF UNINCORPORATED ORANGE COUNTY)	
Zone change 99-02 to amend the Foothill/Trabuco Specific Plan to allow Area Plans 99-03 and 99-07 for Saddle Creek: 127dus on 196 ha (484 ac). Saddle Crest: 35 dus on 46 ha (113.5 ac).	Zone change 99-02 for Area Plans 99-03 and 99-07. EIR No. 578 certified and Area Plans approved on January 28, 2003.
SADDLEBACK MEADOWS (FOOTHILL AREA OF UNINCORPORATED ORANGE COUNTY)	
Site is 90 ha (222 ac). Proposed: 299 single family dus on 29.6 ha (73.1 ac) and open space on 60.3 ha (148.9 ac).	Saddleback Meadows Subsequent EIR 566 (County of Orange EIR 566 (1999) and Draft Subsequent EIR 566, April 2002).
RANCHO POTRERO LEADERSHIP ACADEMY (FOOTHILL/TRABUCO AREA OF UNINCORPORATED ORANGE COUNTY)	
Zone Change for a 90-bed juvenile detention facility (16,117 sm (173,300 sf) and a new approximately 5 km (3.2) mile access road. The County has abandoned plans to locate this facility in the foothill area in favor of locating the facility at the Juvenile Hall Facility in Orange.	Rancho Potrero Leadership Academy EIR No. 576 (November 2000) and revised Draft EIR No. 576 (Certified December 2001). The County has since abandoned plans to build this facility in this location. Therefore this project is no longer considered a cumulative project.

TABLE 10-1
DESCRIPTION OF MAJOR CUMULATIVE PROJECTS

Description of Project Land Uses	Source/Reference
DANA POINT HEADLANDS	
Proposed (49 ha/121 ac site): 125 single family dus. 40,000 sf commercial site. 65-room inn. 12.3 ha (30.3 ac) conservation open space. 12.9 ha (31.7 ac) recreation open space with 790 sm (8,500 sf) visitor serving recreation facilities. Project has been approved by City of Dana Point and is awaiting evaluation by the California Coastal Commission.	Project approved and Final EIR were certified January 22, 2002. (Source: City of Dana Point website www.danapoint.org/commdevelopment/ Headlands.htm. and personal communication with the City.)
HONEYMAN RANCH PROPOSED RESIDENTIAL DEVLOPMENT - SAN JUAN CAPISTRANO	
Proposed project: 129 du on 13.2 ha (32.4 ac) Open space 16.1 ha (39.8 ac) Private streets 1.9 ha (4.62 ac) Public streets 0.7 ha (1.79 ac)	Honeyman Ranch Final Draft EIR circulated November 12, 2002 (City of San Juan Capistrano, 2002).
OTHER DEVEOPMENT PROJECTS LISTED IN THE STUDY AREA	
These include commercial and residential projects as summarized in Table 10-**3**.	Various.
MASTER PLAN OF ARTERIAL HIGHWAYS/REGIONAL TRANSPORTION PLAN FACILITIES AND IMPROVEMENTS	
Refer to Tables 10-4 and 10-5 for MPAH/RTP committed improvements and non-committed improvements.	SOCTIIP Traffic Study.
CALTRANS IMPROVEMENTS	
Refer to Table 10-6 for individual listing of Caltrans projects.	Various.
IRVINE RANCH WATER DISTRICT SAN DIEGO CREEK WATERSHED NATURAL TREATMENT SYSTEM PROGRAM	
Watershed treatment program for San Diego Creek with installation of BMPs and detention basins within the watershed to reduce non-point source pollutants in runoff, water courses and beaches.	Irvine Ranch Water District Notice of Preparation (February 20, 2002). Project includes areas of Irvine, Lake Forest, Tustin between the Lomas de Santiago Ridge and the coastal bluffs of Newport Coast.

TABLE 10-2
OTHER CUMULATIVE PROJECTS

CITY OF SAN JUAN CAPISTRANO			
Reference No.	**Development**	**Quantity**	**Units**
1	Home Depot [1]		
	Hardware Center	106.7	TSF
	Garden Center	24.225	TSF
	Retail Building	35.062	TSF
2	Valle Road Self Storage	107.358	TSF
3	Capistrano Ford Dealership Site 2 - Auto Sales	4.9	Acres
4	San Juan Meadows		
	Single Family Residential	275	DU
	Senior Housing	165	DU
	Office	61.0	TSF
5	Glendale Federal parcels "C" and "D"		
	Single Family Residential	52	DU
	Condominiums	286	DU
6	Glendale Federal Area "H" (TT 13726)		
	Single Family Residential	63	DU
7	Concorde Development - Single Family Residential	79	DU
8	Pacific Point		
	Single Family Residential	617	DU
	R&D Office	25.0	Acres
9	Fluidmaster Manufacturing Facility	183.046	TSF
10	Calle Perfecto Business Park - Industrial	82.7	TSF
11	Calle Perfecto Business Park II		
	Industrial Development	133.685	TSF
12	TT 15771 - Single Family Residential	28	DU
13	Capistrano Volkswagen (Valle Rd. San Juan Creek Rd.)		
	Auto Sales	16.8	TSF
14	San Juan Meadows Equestrian Stables	3	TSF
15	El Parador Hotel (San Juan Creek at Valle Rd.)	300	Rms
16	Alipaz Village - Residential	150	DU
17	Weseloh Chevrolet/Honda (Camino Capistrano)		
	Auto Sales	23.4	TSF
18	Serra Plaza Offices (Del Obispo at Paseo Adelanto)	45.5	TSF
CITY OF DANA POINT			
19	Hillside Village South (PCH south of Crown Valley Parkway) Residential	48	DU
20	Capo by the Sea - Residential	48	DU
21	Holtz Hill - Residential	13	DU
22	Dana Point Harbor Expansion		
	Office	28.5	TSF
	Hotel	42	Rms
	Quasi Institutional (Marine Institute)	50,700	TSF
	Boat Storage (dry)	471	Stalls
	Boat Storage (docked)	18	Slips
23	St. Regis Hotel Offices (Monarch Beach)	70	TSF

TABLE 10-2
OTHER CUMULATIVE PROJECTS

24	South Coast Water District Business Park Office Research and Development Research and Development-Multi-use Tenant Storage	 83.1 164.221 275.734 142.758	 TSF TSF TSF TSF
CITY OF SAN CLEMENTE			
25	Plaza Pacifica Commercial Site (Rancho San Clemente)	460	TSF
26	Avenida Vista Hermosa Interchange	n/a	
27	Talega Subdivisions (269.1 gross acres) TT 16148 Area B-1A Village 3 Single Family Multiple Family TT 16216 Area B-1B "Z" Lot - Single Family TT 16215 Area B-1B Triplex - Multiple Family TT 16252 Area A-2 Hammerhead - Single Family	 245 2 91 144 76	 DU Lots DU DU DU
MCB CAMP PENDLETON			
28	San Mateo Point Housing	120	DU
29	Talega Substation Expansion of existing SDG&E Substation	Minor	--
30	Amtrak/Caltrans EIS underway for second mainline track.	Unknown	--
31	Home Base (3la) and Vehicle Primary Training Area (31b)	Introduction of a tracked vehicle in training exercises; based in 62 Area northwest of the agricultural lease area; potential for training in that lease area.	--

Sources:
1. Draft Program Environmental Impact Report" (Orange County IWMD, January 31, 2001). This project was rejected by the voters in 2002.
2. Updated with information from the Home Depot Project Draft EIR (September 20, 2001).
3. Updated with information from City of San Clemente City Council Agendas from 2002.
4. L. Rannals, Camp Pendleton (2002 and 2003).

TSF: Thousand square feet
DU: Dwelling Units

Notes:

[1] This project was voted down in an advisory vote in the City of San Juan Capistrano. Project status is pending City Council action.

TABLE 10-3
SUMMARY OF IMPACTS FOR CUMULATIVE PROJECTS RELATED TO EARTH RESOURCES

ROLLING HILLS PLANNED COMMUNITY (THE PART OF THE TALEGA DEVELOPMENT IN UNINCORPORATED ORANGE COUNTY)	
Summary of Impacts	**Summary of Mitigation**
Significant and permanent alteration of existing landforms. 15 to 18 million cubic yards of earthwork for mass grading.	Prior to approval of Site Development Permit, conceptual grading plan to be submitted for approval with haul routes included.
	All slopes designed at 2-horizontal to 1-vertical or flatter.
	77 percent of property to be in some form of open space and recreation.
	Incorporated open space and scenic easements for ridgeline/view protection.
	Prominent natural features to be maintained in a natural state and incorporated into the landscape concept.
Potential hazards to property and life from possible future slope failures.	Conform to general recommendations presented in the geotechnical studies.
	Mitigation to be assessed and recommended by a qualified Engineering Geologist.
	Prior to recordation of the final tract map, rough grading plans to be approved.
	Prior to grading permit issuance, a precise grading plan will be approved.
	Prior to approval of Site Development Permit, conceptual grading plan to be submitted for approval including erosion, salutation and dust control plans included.
	All slopes designed at 2-horizontal to 1-vertical or flatter.
Site subject to seismic hazards.	Conform to general recommendations presented in the geotechnical studies.
	Prior to recordation of the final tract map, rough grading plans to be approved.
	Prior to grading permit issuance, a precise grading plan will be approved.
	Prior to approval of Site Development Permit, conceptual grading plans to be submitted for approval.
Potential increase in on site groundwater levels.	Conform to general recommendations presented in the geotechnical studies.
	Mitigation to be assessed and recommended by a qualified Engineering Geologist.
TALEGA VALLEY SPECIFIC PLAN (CHAMPION HILLS; THE PART OF THE TALEGA DEVELOPMENT IN THE CITY OF SAN CLEMENTE)	
Summary of Impacts	**Summary of Mitigation**
Potential constraints and impacts include slope instability, problematic soil conditions, seismic activity, poor rippability of bedrock materials and erosion.	Conform to general recommendations presented in the geotechnical studies.
	Submittal of conceptual grading plan prior to approval of a tentative map.

TABLE 10-3
SUMMARY OF IMPACTS FOR CUMULATIVE PROJECTS RELATED TO EARTH RESOURCES

	Approval of rough grading plan prior to approval of the final tract map. Rough grading plans to include erosion, siltation and dust control plan to be approved by the Community Development Department of the City and the County.
	Approval of precise grading plan prior to building permit issuance.
	All grading plans to conform to City Hillside Development Ordinance.
CHIQUITA CANYON HIGH SCHOOL (NOW REFERRED TO AS TESORO HIGH SCHOOL)	
Summary of Impacts	**Summary of Mitigation**
Subjection to erosion, landslides and runoff impacts.	Prior to commencement of grading, a final project design plan to be prepared.
	Compliance with National Discharge Elimination System requirements of the California Regional Water Quality Control Board.
PRIMA DESHECHA SANITARY LANDFILL GENERAL DEVELOPMENT PLAN (GDP)	
Summary of Impacts	**Summary of Mitigation**
Landslide and mudslide activity during excavation period.	Geotechnical investigation to be done prior to designing each phased landfill plan.
	For each phased grading plan, the excavation and grading plan shall ensure the stability of all cut, fill and lined slopes.
	Ensure that the final design incorporates removal of all highly disturbed landslide debris prior to placement of fill.
Exposure to seismic activity.	Demonstration that landfill design plans comply with the state and federal seismic requirements.
	Prior to commencement of daily excavations for borrow material, grading plans shall be prepared, analyzed for slope stability and submitted for approval.
	Assumptions, methods and calculations used to demonstrate seismic safety to be presented.
Differential settlement associated with compression and decompression.	Assumptions, methods and calculations used to demonstrate that differential settlement of the site will not result in future environmental impacts is to be presented.
Demand for soil to be used as cover material.	Assumptions, methods and calculations used to demonstrate that the excavation plans provide for sufficient quantities and sources of suitable soils or alternative cover systems are identified.
Leachate migration into groundwater.	Continued leachate control operation.
	Continued groundwater monitoring operation.
	Presentation of assumptions, methods and calculations used to predict leachate generation and sizing of the components of the leachate collection system.

TABLE 10-3
SUMMARY OF IMPACTS FOR CUMULATIVE PROJECTS RELATED TO EARTH RESOURCES

OTHER PROJECTS LISTED IN THE LANDFILL GDP EIR	
Summary of Impacts	**Summary of Mitigation**
No information provided.	--
WHISPERING HILLS PLANNED COMMUNITY	
Summary of Impacts	**Summary of Mitigation**
Proposed Project/356 DU Moderate or high risk potential for expansive/erosive soils, seismic ground shaking, liquefaction and landslides.	Implementation of all recommendation in Leighton 2001 and the Third Party Geotechnical Review.
Grading within a General Plan-designated ridgeline.	Incorporate design techniques into finish grading consistent with the requirement of the San Juan Capistrano General Plan and Land Use Code.
High School/193 DU Alternative Same as Proposed Project/356 DU Impact.	Same as Proposed Project/356 DU Mitigation Measures with addition subsequent design-level geotechnical studies.
FORSTER RANCH SPECIFIC PLAN AMENDMENT	
Summary of Impacts	**Summary of Mitigation**
No information provided.	--
MARBLEHEAD COASTAL	
Summary of Impacts	**Summary of Mitigation**
Significant geotechnical impacts.	Recommendations in the geotechnical report to serve as definitive guide to specific site planning.
PACIFIC POINT/SAN JUAN MEADOWS	
Summary of Impacts	**Summary of Mitigation**
Elimination of some prime agricultural soils.	Property is not presently in an agricultural use and loss of these soils is not considered to be significant.
High potential for soil failure.	Grading to be performed in accordance with geotechnical report.
	Preparation of geotechnical grading plan.
	Site stabilization prior to development.
	Measures to minimize erosion.
	Cut and fill slope gradient consistent with geotechnical investigation recommendations.
	Cut and fill ratio required to minimize the amount of imported/exported soil to be determined prior to issuance of a grading permit.
	Soils subject to settlement to be removed prior to fill placement or compacted in place.
	Conformance with the Uniform Building Code (UBC) and appropriate City codes and standards.
Potential seismic activity.	Analysis of potential seismic effects on site to be prepared and submitted.

TABLE 10-3
SUMMARY OF IMPACTS FOR CUMULATIVE PROJECTS RELATED TO EARTH RESOURCES

ANTONIO PARKWAY ROADWAY ALIGNMENT AND LAND USE PLAN (LADERA PLANNED COMMUNITY)	
Summary of Impacts	**Summary of Mitigation**
Significant impacts to landform alterations. Landslide and erosion hazards. Areas non-suitable for the support of compacted fill, roadway improvements, or structures. Location within seismically active region.	Prior to issuance of grading permits, a geotechnical report to be reviewed and approved. Engineering geologist to make recommendations to provide adequate vertical and lateral support for Antonio Parkway alignment.
ARROYO TRABUCO GOLF COURSE	
Summary of Impacts	**Summary of Mitigation**
Reduction in the long term availability of sand and gravel resources.	No mitigation recommended, impact remains significant.
DANA POINT HEADLANDS	
Summary of Impacts	**Summary of Mitigation**
Soil subsidence may result from inadequate preparation and compaction of soils prior construction of building and facility foundations.	Implementation of Project Condition 5-1 and any specific recommendations by project geotechnical consultant regarding grading, soil compaction and site preparation will ensure that no potential impacts to facilities from soil subsidence will occur. No mitigation required.
Potential impacts resulting from seismic induced ground shaking.	Implementation of Project Conditions 5-1, 5-2, 5-3 and 5-4 will reduce the potential impact of seismic induced ground shaking to below a level of significance. No mitigation required.
The high, steep cliff faces that rim the Dana Point Headland present a relatively high potential for seismically induced rockfall and possibly local shallow landsliding of the bluff.	Implementation of Project Design Feature 5-1 and Project Conditions 5-1, 5-2, 5-3, 5-4, 5-5 and 5-6 will reduce the potential impact of seismically induced ground failure to below a level of significance. No mitigation required.
Local areas of loose sand are present on site and subject to liquefaction if these materials become submerged or exposed to strong ground shaking. Near surface soils and undocumented fill, present in some areas, may potentially be subject to seismically induced ground settlement.	Remove unconsolidated soil and unknown fill and replace with compacted fill and incorporate appropriate subsurface drainage system.
Strong ground shaking could potentially induce landslides.	Redistribute the mass/forces acting on the landslide, lower and maintain the groundwater/pore pressure at levels that enhance the stability conditions with the installation of subdrain system and remove and replace appropriate portions of the landslide deposits with higher strength compacted fill.
Graded areas may be subject to erosion during construction and operation.	Surficial stability/erosion potential will be evaluated by a geotechnical consultant. Best Management Practices will be employed during construction to minimize potential for erosion. Landscaping shall be installed particularly in the graded slopes.

TABLE 10-3
SUMMARY OF IMPACTS FOR CUMULATIVE PROJECTS RELATED TO EARTH RESOURCES

The project may be subject to: slope and/or foundation instability due to landslides; slope and/or foundation instability due to grading of cut slopes; slope and/or foundation instability due to the proposed grading of fill slopes; and slope and/or foundation instability due to compressible soils.	Temporary cut slopes shall not exceed a gradient of 1:1 and shall be reviewed by the Project Geotechnical Consultant during excavation. Temporary cut slopes associated with remedial grading in the Strand Beach area, landslide removals, shall not exceed a gradient of 1.5:1 and shall more typically maintain a maximum gradient of 2:1. Local groundwater or other geologic conditions may require flattening, dewatering or installation of appropriate slope reinforcement. Additional geotechnical review shall be performed as part of the final design process. The cut and fill slope at the southeastern perimeter of the Upper Headlands area shall be specifically evaluated for possible overexcavation and construction of a fill blanket and/or a "loffel-type" landscaping wall.
	Unreinforced fill slopes shall not exceed a gradient of 2:1. Proposed fill slopes steeper than 2:1, including MSE walls/slopes, shall require site specific reinforcement design. Appropriate subdrain provisions shall be incorporated into slope designs. Additional geotechnical review shall be performed as part of the final design process.
	All existing undocumented fill within the proposed development area shall be removed and replaced as compacted fill. Additional geotechnical review shall be performed as part of the final design process.
Possible moisture/surface seepage related problems may occur. Possible slope and/or foundation instability may occur due to presence o uncontrolled groundwater levels/flows.	Install appropriate subdrains behind fill slopes and retaining walls as determined in the final geotechnical report.
Expansive soils exist on site that may produce slope and/or foundation instability.	Grading will strive to construct relatively uniform soil conditions in the upper portion of the building areas and incorporate recommended moisture levels. Moderate level of moisture shall be maintained in the fill/foundations soils to minimize future volume changes.

TABLE 10-3
SUMMARY OF IMPACTS FOR CUMULATIVE PROJECTS RELATED TO EARTH RESOURCES

SADDLEBACK MEADOWS	
Summary of Impacts	**Summary of Mitigation**
Impacts are limited to the following site specific issues: **Grading/Landform Alteration** Substantial grading, remedial grading and landform alteration. **Seismic** Project site includes unstable landslides, expansive soils, bedrock, unconsolidated alluvium and groundwater. No cumulative impacts to earth resources would occur.	Remedial grading plan to address slope stability and landslides. Project includes 36 mitigation measures addressing grading, compaction, fill material selection, fill shrinkage/subsidence, excavating conditions, fill expansion potential, utility trenching, surface drainage, sulphate content, engineering monitoring, slab specification, foundation specification, long term fill settlement and earthwork phasing.

ORANGE COUNTY GREAT PARK (formerly MCAS El Toro)	
Summary of Impacts	**Summary of Mitigation**
Exposure of people or structures to strong seismic ground shaking.	Prior to issuance of a building permits, the City of Irvine shall require that all development be designed in accordance with the seismic design provisions outlined in future proposed development geotechnical reports and specified in the latest City Building Codes.
Expansive soils may be present in localized areas within the project area.	Prior to issuance of a building permits, geotechnical reports shall be prepared for specific development projects.
The existing building on the former MCAS El Toro site my not have been constructed in a manner that is acceptable for its intended use. Temporary or permanent reuse of these facilities could expose people to greater seismic risks.	Prior to the issuance of building permits for the occupancy of any existing structure at the former MCAS El Toro, or occupancy of any existing if a building permit is not issued, a seismic evaluation of the structure including recommendations for seismic improvements required for compliance with current
Potential for soil erosion impacts. The presence of expansive soils could create risks to people or property.	Prior to issuance of grading permits, detailed geotechnical and hydrology reports shall be prepared prior to any development approval or grading activities.

TABLE 10-3
SUMMARY OF IMPACTS FOR CUMULATIVE PROJECTS RELATED TO EARTH RESOURCES

RANCHO MISSION VIEJO	
Summary of Impacts	**Summary of Mitigation**
Potentially significant impact. Will be analyzed in the Draft Environmental Impact Report (EIR) #589.	If necessary, will be provided in Draft EIR #589.
SADDLE CREEK/SADDLE CREST	
Summary of Impacts	**Summary of Mitigation**
Grading/Landform Alteration - 1,715,960 cubic yards (cy) cut and 1,586,890 cy fill (combined Saddle Creek & Saddle Crest) - The surplus of 34,490 cy of earthwork (after adjustment) is nominal, and therefore the project cut and fill is considered balanced. - Maximum 24-foot (Saddle Creek) and 30-foot (Saddle Crest) manufactured slope heights for building sites and driveways serving one building site. - Maximum 40-foot and 75-foot manufactured slopes for Saddle Crest and Saddle Creek, respectively, for roads or driveways accessing five or more dwelling units.	If locally unstable slopes are encountered they shall be stabilized by partial slope reconstructions (i.e., stability fills). Stabilization fill may also be required to accommodate landscaping where cut slopes expose bedrock.
Seismic Hazards - Site situated in seismically active area (peak ground acceleration of maximum credible event of 0.27 g and a maximum probable event of 0.202g). - Site underlain with potentially liquefiable materials. - Potential for differential compaction.	Combination fill slopes (consisting of two steeped wall portions and 2:1 slope portions) shall be constructed in accordance with the recommendations presented in the project's Geotechnical Report.
Soil-Related Impacts - Localized materials (e.g., Serrano Clay) with high to very high expansion potential. - Surficial stability analyses indicate that the planned cut and fill slopes will generally have an adequate factor of safety against surficial failures.	A base key 15 feet wide by 2 feet in depth shall be excavated prior to construction of fill slopes to be placed directly on natural ground. Benching into existing firm materials shall be performed as the fill is placed. Where depths of removals are deeper than that of the recommended key, no key will be required.
Slope Stability Proposed cut and fill and combined fill/natural and cut/natural slopes will generally be stable against deep-seated slope failures.	Subdrains may be needed for some of the fill slopes.

TABLE 10-3
SUMMARY OF IMPACTS FOR CUMULATIVE PROJECTS RELATED TO EARTH RESOURCES

Landslides and Movement - Two landslides within the project site (one in Saddle Crest, one in Saddle Creek) will require total removal to achieve stability. - Where steep natural slopes (gradient steeper than a 2:1 inclination) are above proposed development areas, there is a potential for debris flow impacts.	During construction, conventional compaction procedures will be necessary in order that compaction can be achieved out to the slope face. To reduce the potential for surficial failure, cohesionless materials should not be used for the near-slope face zone. If cohesionless materials are used, then it is recommended that fill slopes be covered with a protective covering.
	All cut and fill slopes more than 30 feet in height shall be provided with drainage and terraces.
	Structural setbacks varying from 0 to 40 feet from the daylight edge may be required for lots created by cutting above natural slopes.
	A structural setback from the toe of the slope may be required in some cases where development is proposed at the base of relatively steep natural slopes.
	Additional mitigation measures may be necessary to minimize the damaging effects of debris flows.
	To reduce the potential for surficial failure, cohesionless materials should not be used for the near-slope face zone. If cohesionless materials are used, then it is recommended that fill slopes be covered with a protective covering.
	The relatively level area of proposed Pads 27 through 30 at the rear (southern portion) of the lots may not be utilized for permanent structures such as buildings or swimming pools
	Temporary cut slope failures shall be reduced by a combination of the following: 1) keeping the time between cutting and filling operations to a minimum; 2) limiting the maximum length of a cut slope exposed at any one time; and 3) cutting at no steeper than a 1.5:1 inclination. For into-slope bedding conditions, based on ingrading observations, steeper backcuts may be allowed but should not be steeper than 1:1.
	Removals Complete removals should be performed to a 1:1 projection of buildable/structural areas. Where complete removals cannot be performed to a 1:1 projection, then structures may be built on competent materials by use of a deep foundation system (i.e., piles).
	Lot Capping/Overexcavation It is recommended that all cut and cut/fill transition pads exposing either unsuitable or dissimilar earth materials be overexcavated and capped with a minimum of 5 feet of compacted fill.

TABLE 10-3
SUMMARY OF IMPACTS FOR CUMULATIVE PROJECTS RELATED TO EARTH RESOURCES

	Subdrainage All canyon bottoms, reentrants, and stabilization/buttress fills shall be provided with subdrainage systems. Additional subdrains may be needed in areas of heavy seepage or deep fills. Subdrain outlets should be protected from blockage or damage.
	General Earthwork and Grading Specifications Prior to commencement of grading operations, all vegetation and organic topsoil shall be cleared and disposed of off-site. Once removals are completed, areas that will receive fill must be scarified, moisture-conditioned, and recompacted to a minimum of 90 percent relative compaction.
	Surface Drainage *Surface runoffs shall be directed away from the tops of slopes and into storm drains. The potential for surficial failures or excessive erosion. Ponding of water on pads shall be avoided and roof gutters and area drains may be advisable.*
	Expansion Potential *Removal and recompaction of highly expansive materials with relatively low expansive material to a depth of 5 feet below pad grade is recommended. Additional testing should be performed at the completion of grading to further evaluate the corrosivity of the site's earth materials to concrete and metals.*
HONEYMAN RANCH PROPOSED RESIDENTIAL DEVELOPMENT - SAN JUAN CAPISTRANO	
Summary of Impacts	**Summary of Mitigation**
No impacts.	Standard conditions regarding grading and geotechnical study.

Note: The following projects did not have any environmental documentation available for evaluation at the time of preparation of this report and were not included in the table.

1. Talega Development Feature Plan.
2. Rancho Mission Viejo (RMV) Development Entitlements, General Plan Amendment (GPA)/Zone Change (ZC).
3. Rancho Mission Viejo (RMV) proposed development plans, de facto zoning of 600 residential units or OCP-2000 projections or 21,000 residential units for RMV.
4. South Subregion Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP).
5. MCB Camp Pendleton.

TABLE 10-4
COMMITTED MASTER PLAN OF ARTERIAL HIGHWAYS/REGIONAL TRANSPORTATION PLAN FACILITIES AND IMPROVMENTS

Facility	**Jurisdiction**	*Improvement*	**Source**
Alipaz St (north of Cm Del Avion)	San Juan Capistrano	Widen to four lanes	8
Antonio Pkwy (Oso Pkwy to southern boundary of Ladera Ranch)	County	Widen to six lanes	1
Avd La Pata (Avd Pico to Avd Vista Hermosa)	San Clemente	Construct as a six-lane major arterial	2
Avd Talega (east of Avd Vista Hermosa)	San Clemente	Extend as a four-lane secondary arterial	3
Avd Vista Hermosa (Cm Vera Cruz to north of Avd La Pata)	San Clemente	Construct as a four-lane primary arterial	2
Avd Vista Hermosa (Calle Frontera to I-5)	Caltrans/San Clemente	Construct as a four-lane primary arterial with an interchange at I-5	4
Cm Capistrano (south of Oso Rd to San Juan Capistrano city limits)	San Juan Capistrano	Widen to four lanes	8
Cm Capistrano (south of San Juan Creek Rd)	San Juan Capistrano	Widen to four lanes	8
Cm Vera Cruz (west of Avd Vista Hermosa)	San Clemente	Construct as a four-lane secondary arterial	2
Crown Valley Pkwy (I-5 to east of Trabuco Creek bridge)	County/Mission Viejo	Widen to eight lanes	5
Del Obispo St (Aguacate Rd to Paseo De La Paz)	San Juan Capistrano	Widen to four lanes	8
I-5 (Oso Pkwy to Crown Valley Pkwy)	Caltrans	Construct northbound auxiliary lane	6
Junipero Serra Rd (Cm Capistrano to Rancho Viejo Rd)	San Juan Capistrano	Widen to four lanes	8
Ortega Hwy (Via Cordova to San Juan Capistrano city limits)	San Juan Capistrano	Widen to four lanes	7,8
Ortega Hwy (San Juan Capistrano city limits to Antonio Pkwy)	County	Widen to four lanes	6,7
Rancho Viejo Rd (south of Junipero Serra Rd)	San Juan Capistrano	Widen to four lanes	8

TABLE 10-4
COMMITTED MASTER PLAN OF ARTERIAL HIGHWAYS/REGIONAL TRANSPORTATION PLAN FACILITIES AND IMPROVMENTS

SR-73 (north of I-5)	TCA/Caltrans	Widen to provide four general purpose lanes in each direction and one high occupancy vehicle (HOV) lane in each direction	9
SR-241 (Oso Pkwy to Santa Margarita Pkwy)	TCA/Caltrans	Widen to provide three general purpose lanes in each direction and one HOV lane in each direction	9
SR-241 (north of Santa Margarita Pkwy)	TCA/Caltrans	Widen to provide four general purpose lanes in each direction and one HOV lane in each direction	9

Sources: 1 – Conditioned for implementation with development of Ladera Ranch
2 – Implemented through the City of San Clemente Regional Circulation Financing and Phasing Program (RCFPP)
3 – Conditioned for implementation with development of Talega
4 – Improvement under construction by Caltrans and the City of San Clemente
5 – Conditioned for implementation with development of Las Flores
6 – Caltrans improvement
7 – County of Orange improvement project
8 – Implemented through the City of San Juan Capistrano Reimbursement Agreement and Nexus Fee Program
9 – Transportation Corridor Agencies (TCA) Capital Improvement Plan (CIP)

(Note: From Austin-Foust Associates March 2002)

TABLE 10-5

NON COMMITTED MASTER PLAN OF ARTERIAL HIGHWAYS/REGIONAL TRANSPORTATION PLAN FACILITIES AND IMPROVMENTS

Facility	Jurisdiction	*Improvement*	Source
Alipaz St (north of Del Obispo St to Oso Rd)	San Juan Capistrano	Construct as four-lane secondary arterial	MPAH
Antonio Pkwy (south of Ladera Ranch to Ortega Hwy/SR-74)	County	Widen to six lanes	MPAH
Avd La Pata (south of Ortega Hwy/SR-74)	County	Widen to four lanes	MPAH
Avd La Pata (south of Ortega Hwy/SR-74 to San Clemente city limits)	County	Construct as a four-lane primary arterial	MPAH
Avd La Pata (San Clemente city limits to Avd Vista Hermosa)	San Clemente	Construct as a six-lane major arterial	MPAH
Cm De Los Mares (east of Cm Del Rio to Cm Las Ramblas)	San Clemente	Construct as four-lane secondary arterial	MPAH
Cm Del Rancho (I-5 to Avd Pico)	San Clemente	Construct as a four-lane primary arterial	MPAH
Cm Las Ramblas (current termination east to Avd La Pata)	San Juan Capistrano/ San Clemente	Construct as four-lane secondary arterial	MPAH
Cm Los Padres (east of St of the Golden Lantern to Cm Capistrano)	San Juan Capistrano	Construct as four-lane primary arterial	MPAH
Crown Valley Pkwy (Antonio Pkwy to Oso Pkwy)	County	Construct as six-lane major arterial east of Antonio Pkwy and as four-lane primary arterial west of Oso Pkwy	MPAH
I-5 (Oso Pkwy to Crown Valley Pkwy)	Caltrans	Add SB auxiliary lane	CT-RCR
I-5 (Pacific Coast Hwy/SR-1 to Avd Pico)	Caltrans	Add NB and SB HOV lanes	CT-RCR /RTP
I-5 (south of Basilone Rd)	Caltrans	Add NB and SB HOV lanes	Caltrans/ SANDAG
La Novia St (north of San Juan Creek Rd)	San Juan Capistrano	Widen to four lanes	MPAH

TABLE 10-5

NON COMMITTED MASTER PLAN OF ARTERIAL HIGHWAYS/REGIONAL TRANSPORTATION PLAN FACILITIES AND IMPROVMENTS

Facility	Jurisdiction	*Improvement*	Source
Marguerite Pkwy (Avery Pkwy to Mission Viejo city limits)	Mission Viejo	Widen to four lanes	MPAH
Olympiad Rd (Alicia Pkwy to La Paz Rd)	Mission Viejo	Widen to four lanes	MPAH
Ortega Hwy/SR-74 (east of Antonio Pkwy/Avd La Pata to Orange County line)	County	Widen to four lanes	MPAH
Oso Rd (Alipaz St to Cm Capistrano)	San Juan Capistrano	Widen to four lanes	MPAH
Pacific Coast Hwy/SR-1 (north of Doheny Park Rd to Selva Rd)	Dana Point	Widen to six lanes	MPAH
Rancho Viejo Rd (north of Junipero Serra Rd to San Juan Capistrano city limits)	San Juan Capistrano	Widen to four lanes	MPAH
San Juan Creek Rd (Cm Capistrano to San Juan Capistrano city limits)	San Juan Capistrano	Widen to four lanes	MPAH
San Juan Creek Rd (San Juan Capistrano city limits to Avd La Pata)	San Juan Capistrano	Construct as four-lane secondary arterial	MPAH
Crown Valley Parkway interchange at Foothill Transportation Corridor-South[1]	County	Add future interchange.	MPAH

TABLE 10-5

NON COMMITTED MASTER PLAN OF ARTERIAL HIGHWAYS/REGIONAL TRANSPORTATION PLAN FACILITIES AND IMPROVMENTS

	Facility	Jurisdiction	*Improvement*	Source

Abbreviations: MPAH – Master Plan of Arterial Highways
RTP – Regional Transportation Plan
CT-RCR – Caltrans Route Concept Report
SANDAG – San Diego Association of Governments
TCA – Transportation Corridor Agencies
HOV – high occupancy vehicle
NB – northbound
SB – southbound

(Source: From Austin-Foust Associates March 2002)

1. This interchange is not proposed as part of the FTC-S by the TCA and is considered to be part of the future build out of the MPAH. The potential future interchange of the FTC-S with Crown Valley Parkway is a possible interchange that could be incorporated into a built corridor alternative. The potential extension of the FTC-S as a SOCTIIP alternative will not automatically trigger the future interchange, and the TCA is not including the interchange as part of the project that they propose to build. The SOCTIIP can exist indefinitely without the Crown Valley Parkway interchange. The SOCTIIP project and the future interchange are not interdependent parts of a larger action and do not depend on a larger action for their justification. The potential Crown Valley interchange is not a connected action as defined by the CEQ NEPA Regulations (40 C.F.R. Section 1508.25(a)(1) and therefore, is not a federal action and does not require any federal funding or approval. Thus, it is not included in the EIS/SEIR.

TABLE 10-6
SUMMARY OF CALTRANS IMPROVEMENTS

CALTRANS INTERSTATE 5 IMPROVEMENTS			
Map Reference No.	**Description of Project**	**Status Of Project**	**Environmental Compliance**
1	EA# 0E6000 Avenida Mendocino On Ramp to NB 5 Improvements. This project proposes to add a lane to the existing on ramp, increase the lane drop taper length, and construct a retaining wall. The existing ramp alignment will be maintained. The proposed SOCTIIP project will relocate this on ramp.	Construction.	Categorical Exclusion issued on 9/18/00.
2	EA# 0A3900 Realign N/B Stonehill On Ramp to NB 5 This project will realign the existing on ramp to improve horizontal sight distance and add storage length. The existing ramp will be relocated to the east towards the existing slope which will require a retaining wall. The proposed SOCTIIP project will require realignment on this ramp.	Construction.	CE/CE issued on 11/15/00.
3	EA# 0A4000 Construct Separation Barrier between SB 5 and Camino Capistrano This safety project proposes to construct a concrete barrier that will provide separation between the frontage road (Camino Capistrano) and SB 5. The barrier will be constructed at the existing R/W line. The proposed SOCTIIP I-5 alignment will relocate the existing R/W line.	Completed.	CE issued on September 1999.
4	I-5/SR 74 Interchange Project This project in the PSR stage. Several alternatives have been proposed by the consultants (Parson) that will improve operations in the 5/74 interchange area. The ramps will be reconfigured concurrently with the realignment of Del Obispo. A roundabout at the intersection of Del Obispo and the 74 has also been proposed. The SOCTIIP proposal incorporates one of the original alternatives that was proposed by Parsons (cloverleaf ramp layout). This will probably not be selected. The are also proposing to add an off ramp at Camino Capistrano at Stonehill to divert some of the southbound traffic to Dana Point away from the 5/74 area. The proposed SOCTIIP project will realign I-5 at this location.	PSR in progress Environmental document will be prepared by the City of San Juan Capistrano which is the lead agency.	To be determined.
5	SB off-ramp Camino Capistrano (0E570K) - • Widen to 3 lanes hook ramp • Add auxiliary lane.	PSR COMPLETED. ANTICIPATED ENVIRONMENTAL DOCUMENT WOULD BE AN IS/EA PROBABLY LEADING TO AN ND/FONSI.	To be prepared.

TABLE 10-6
SUMMARY OF CALTRANS IMPROVEMENTS

CALTRANS INTERSTATE 5 IMPROVEMENTS			
Map Reference No.	**Description of Project**	**Status Of Project**	**Environmental Compliance**
5a	Avenida Pico (0E740K)- • Widening SB off-ramp to 2 lanes and aux. lane. ($2 million) • Widen Pico and n/b off ramp.	PSR completed. Anticipated environmental document would be a CE/CE.	To be prepared.
6	I-5/SR-74 Interchange Improvements - major construction at the interchange. Parsons Transportation Group is doing the study of alternatives.	PSR in progress. Environmental document will be prepared by the City of San Juan Capistrano.	To be determined.
7	SB off-ramp Oso Parkway (EA 0E070K) • Widen to 2 lanes off and open to 4 lanes at the terminus. • Add auxiliary lanes and retaining wall.	PSR completed. Anticipated environmental document would be a CE/CE.	To be prepared.
8	I-5 at La Paz Road (EA 0A070K) • Major construction at the interchange • Alternatives study involves widening La Paz, reconstructing bridge and realigning ramps.	PSR in progress. Environmental document is not yet determined.	To be determined.
9	SB I-5 El Toro Road (EA 09800K) • Propose new 3 lanes off-ramp with retaining wall.	PSR in progress. Anticipated environmental document would be an IS/EA leading to a ND/FONSI.	To be prepared.
10	I-5 at El Toro Road (EA 09800K) • Two new hook ramps to the Laguna Hills Mall • New Intersection	PSR in progress. Anticipated environmental document would be an IS/EA leading to a ND/FONSI.	To be prepared.
11	I-5 San Mateo Creek Bridge • The bridge piers will be stabilized with cast in shell piles around the footings of piers 1-4. Permanent sheet piling will be placed around pier 5. Abatements have suffered moderate to severe erosion. They'll be cleared of vegetation compacted and have RSP with filter fabric placed on the surface.	ENVIRONMENTAL DOCUMENT WAS COMPLETED.	SE/CE was completed.
12	The project did not incorporate the proposed on/off ramps on I-5 at Avenida De La Carlota, north of Los Alisos Blvd. Furthermore; there are operational concerns on the proposed reconfigured El Toro Road on/off ramps and their connectivity with Bridger Road and Avenida De La Carlota.	PSR in progress. Anticipated environmental document would be an IS/EA leading to a ND/FONSI.	To be prepared.

TABLE 10-6
SUMMARY OF CALTRANS IMPROVEMENTS

CALTRANS INTERSTATE 5 IMPROVEMENTS			
Map Reference No.	**Description of Project**	**Status Of Project**	**Environmental Compliance**
13	San Clemente I-5 SB off ramp at Ave Pico • SB I-5 widen to two, construct auxiliary lane.	PSR completed. Anticipated environmental document would be a CE/CE.	To be prepared.
14	In San Clemente at Ave Pico • Widen Ave Pico and NB off ramp to 3 lanes (2 right turn lanes), widen curb returns SB off ramp, widen Pico and relocate signals.	PSR completed. Anticipated environmental document would be a CE/CE.	To be prepared.
15	In San Clemente and Dana Point (0F060K) • Widen S/B offramp and Bridge overpass at Camino De Estrella	Anticipated environmental document would be a CE/CE.	To be prepared.
16	In San Juan Capistrano (0E030K) • Dowel retrofit truck lanes both directions.	Completed.	CE
17	In San Juan Capistrano • Widening Route 5 S/B off ramp at Camino Capistrano and widen a segment of Camino Capistrano south of the I-5.	PSR completed. Anticipated environmental document would be an IS/EA probably leading to an ND/FONSI.	To be prepared.
18	In San Juan Capistrano on Route 5 at San Juan Creek Bridge • Scour mitigation	Environmental document is not yet determined.	To be determined.
19	Reconstruct undercrossing at Avery for local street widening.	PROJECT WILL BE COMPLETED BY THE CITY OF SAN JUAN CAPISTRANO. ENVIRONMENT AL DOCUMENT IS NOT YET DETERMINED.	To be determined.
20	In Irvine (0E020K) • Grind all lanes except HOV. Dowel retrofit #3 and #4 truck lanes both directions. Rehab ramps.	Environmental document prepared.	CE/CE issued on 8/25/00.
21	In Mission Viejo at Oso Parkway (0E070K) • Widen NB Oso Parkway Loop on ramp. SB off ramp and add auxiliary lane from La Paz to Oso.	PSR completed. Anticipated environmental document would be a CE/CE.	To be prepared.
22	In Laguna Hills and Mission Viejo on I-5 at La Paz Road • Reconstruct undercrossing at La Paz.	PSR in progress. Environmental document is not yet determined.	To be determined.

TABLE 10-6
SUMMARY OF CALTRANS IMPROVEMENTS

CALTRANS INTERSTATE 5 IMPROVEMENTS			
Map Reference No.	**Description of Project**	**Status Of Project**	**Environmental Compliance**
23	In Laguna Hills at Alicia (0E620K) • Add auxiliary lane from Alicia SB off ramp to SB on ramp.	PSR completed. Anticipated environmental document would be an IS/EA probably leading to an ND/FONSI.	To be prepared.
24	In Laguna Hills SB on & off ramps; El Toro Road RM 18.7; Avenue de La Carlota, Los Alisos • Relocate SB I-5 on & off ramps; realign Frontage Road; Install signal.	PSR completed. Anticipated environmental document would be an IS/EA probably leading to an ND/FONSI.	To be prepared.
25	In San Clemente at Avenue Mendocino NB on ramp. • Widen the NB Route 5 on ramp at Avenue Mendocino.	Construction.	Categorical Exclusion issued on 9/18/00.
26	In San Juan Capistrano • Construct outer barrier/separation barrier and retaining wall.	Completed.	CE issued on September 1999.
27	In San Juan Capistrano at Camino Capistrano on ramp. Realign ramp; extend ramp meter limits.	PSR completed. Anticipated environmental document would be an IS/EA probably leading to an ND/FONSI.	To be prepared.
28	At Avenida Vista Hermosa (Reeves Ranch Overcrossing.) • Construct interchange.	This project has been completed by the City of San Clemente.	CE was completed by City of San Clemente.
29	Camino de Estrella/Via California (00108K) • Soundwalls	Completed.	CE/CE issued on 7/10/00.
30	In Orange County in Laguna Niguel, Laguna Hills, Mission Viejo and Lake Forest • Construct HOV lanes.	Environmental document is not yet determined.	To be determined.
31	From Crown Valley Parkway Orange County to Oso Parkway Orange County • Construct NB auxiliary lane, widen CV on ramp, Oso Ramps and widen BR	Completed.	CE/CE was issued on 4/7/98.
32	On Route 5 from El Toro Road to Alton Parkway and on Route 405 form Route 5 to Irvine Center Drive (ORA 405 1.2/1.0) in Lake Forest • Widen and reconstruct Freeway.	Completed.	ND was approved on April 10, 1990 and FONSI on 5/29/90.
33	In Mission Viejo, Laguna Hills and Lake Forest • Restripe 1 of 2 HOV lanes to a mixed flow lane.	Completed.	ND/ Programmatic CE.
34	In San Clemente at Avenue Palizada • Widen the ramp and relocate the limit line of Avenue Palizada on ramp on the NB Route 5.	Construction.	CE/CE issued Aug 2002.

TABLE 10-6
SUMMARY OF CALTRANS IMPROVEMENTS

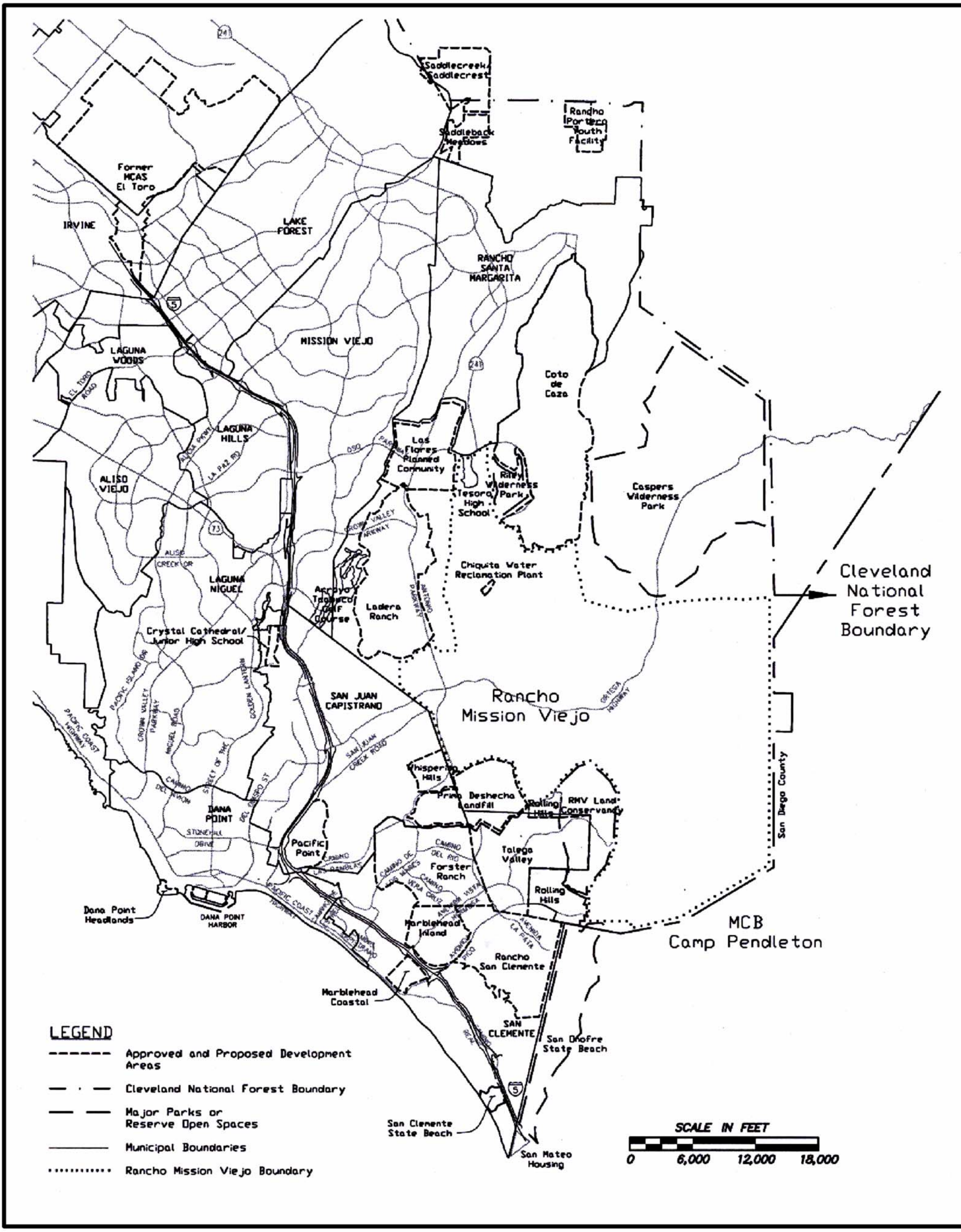
CALTRANS INTERSTATE 5 IMPROVEMENTS			
Map Reference No.	**Description of Project**	**Status Of Project**	**Environmental Compliance**
35	In Dana Point (0A4401) • Widen NB Camino De Estrella on ramp and convert to two-metered lanes and reconstruct metering system.	Construction.	CE/CE issued on 3/7/01.
36	On Route 5 at Junipero Serra NB & SB ramps. • Install traffic signals at the intersections of Junipero Serra Road and the I-5 NB and SB ramps. • Improve I-5 intersections at Junipero Serra and reconstruction curb and gutter (0A6400).	Construction.	Categorical Exclusion issued on 7/24/00.
37	In San Clemente Avenue Vista Hermosa • Remove dirt	This project is being completed by the City of San Clemente.	CE was prepared.
38	In Mission Viejo at La Paz • Widening La Paz off ramp terminal from three lanes to four lanes on SB Route 5.	PSR in progress. Environmental document is not yet determined.	To be determined.
39	On I-5 Irvine and Lake Forest • Convert EB El Toro, Tustin Road and NB Jeffrey on ramps to two metered (mixed flow lanes)	Environmental document was prepared.	CE/CE issued in July 2002.
40	In Mission Viejo at Alicia Parkway • Modify NB 5 Crown Valley Parkway & SB Alicia Parkway on ramps.	Environmental document not determined.	To be determined.
52	Relocate HOV lane star from Alicia Parkway to El Toro Road and realign existing general purpose lanes (0E6700).	Completed.	ND/Programmatic CE.
OTHER CALTRANS PROJECTS			
41	In San Juan Capistrano from I-5/East City limit (Ortega Highway). • Construct new interchange.	PSR in progress Environmental document will be prepared by the City of San Juan Capistrano.	To be determined.
42	On Route 74 from I-5 to Antonio Parkway (Ortega Highway). • Widen roadway	PSR completed. Anticipated environmental document is an IS/EA leading to a ND/FONSI (anticipated date Dec 2005).	To be prepared.
43	From Riverside County line to 4.8 km westerly (Ortega Highway). Project Study Report approved for alternatives (043200). • Widen roadway	PSR completed. Anticipated environmental document is an IS/EA July (anticipated date 2004).	To be prepared.

TABLE 10-6
SUMMARY OF CALTRANS IMPROVEMENTS

CALTRANS INTERSTATE 5 IMPROVEMENTS			
Map Reference No.	**Description of Project**	**Status Of Project**	**Environmental Compliance**
44	On Route 74 near Route 5/74 separation (Ortega Highway). • Extend right turn lanes.	In PSR stage. Environmental document not determined.	To be determined.
45	Near San Juan Capistrano from 0.5 mile east of Ave Siega to 0.1 mile east of La Pata (Ortega Highway) (031813). • Replace bridge/realign approaches.	Completed.	CE
FUTURE CALTRANS IMPROVEMENTS			
49	I-5 (Oso to Crown Valley) • Southbound auxiliary Lane.	Environmental document not determined.	To be determined.
50	I-5 (Pacific Coast Highway SR1 to Avenida Pico • North and southbound auxiliary HOV lanes.	Environmental document not determined.	To be determined.
51	I-5 (South of Basilone Road) • North and southbound auxiliary HOV lanes.	Environmental document not determined.	To be determined.

Source: Caltrans District 12 list of projects proposed by Caltrans, October 15, 2001 and status of environmental documents provided September 16, 2002.

PSR Project Study Report
FONSI Finding of no Significant Impact
EA Environmental Assessment
CE/CE Categorical Exemption/Categorical Exclusion
ND Negative Declaration
IS Initial Study
SE Statutory Exemption



LOCATION MAP FOR CUMULATIVE PROJECTS

SOCTIIP EIS/SEIR
Geotechnical, Geology and Soils Technical Report

Figure 10-1

File: Figure 10-1.grf

SECTION 11.0

GROWTH INDUCING IMPACTS

11.1 DEFINITION OF GROWTH INDUCING IMPACTS

The National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) require analysis of growth inducing impacts as a result of a proposed project. NEPA and CEQA have different but generally similar definitions of impacts that would be considered growth inducing.

Section 15126.2(d) of the CEQA Guidelines requires that growth inducing impacts be addressed as follows in an Environmental Impact Report (EIR):

"Discuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth (a major expansion of a wastewater treatment plant might, for example, allow for more construction in service areas). Increases in the population may tax existing community service facilities, requiring construction of new facilities that could cause significant environmental effects. Also discuss the characteristic of some projects which may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment." (Title 14, California Code of Regulations, Section 15125(d)).

The Caltrans Community Impact Assessment Handbook defines growth inducement as "…the relationship between the proposed transportation project and growth within an area." (Community Impact Assessment, Caltrans Environmental Handbook, Volume 4, June 1997, page 38). It further suggests that one of the following conclusions can be made about growth as a result of a proposed project:

- The project does not affect growth.
- It is not possible to determine the effect of the project on growth.
- The project may hasten or slow growth, or shift growth from elsewhere in the region.
- The project may induce growth. "Induce Growth" is described as "…when a larger amount of development would be expected to occur (area wide) during or after the project's construction than otherwise would have been expected in the foreseeable future." (Community Impact Assessment, Caltrans Environmental Handbook, Volume 4, June 1997, page 43).

The Federal Highway Administration (FHWA) requires discussion of growth inducing land use impacts in terms of:

- Future development trends and land use planning efforts.
- Indirect effects of the project on land use patterns, population density and growth rate.

- Identification of any development prohibited from proceeding unless the project is approved.

FHWA further suggests: "The secondary social, economic, and environmental impacts of any substantial, foreseeable, induced development should be presented for each alternative, including adverse effects on existing communities. Where possible, the distinction between planned and unplanned growth should be identified." (Federal Highway Administration California Division Environmental Checklist "Draft" Environmental Documents, Revised September 3, 1998, pages 12 and 13).

The primary questions the analysis required under these guidelines seek to answer are: "Does the project directly or indirectly intensify planned or facilitate new unplanned growth in the study area?" and, if so, "What are the foreseeable consequences of that growth?"

The potential for growth inducing impacts of the South Orange County Transportation Infrastructure Improvement Project (SOCTIIP) alternatives is discussed in detail in the Socioeconomics and Growth Inducing Impacts Technical Report. The discussion in this Section focuses on whether construction and/or operation activities under the SOCTIIP build alternatives related to geotechnical, geology and soils issues would result in an effect that would alter the amount (density/intensity), rate or location of growth in south Orange County.

11.2 POTENTIAL FOR GROWTH INDUCING IMPACTS

Construction of the Far East, Central and Alignment 7 Corridor Alternatives will involve large quantities of earthwork (cut and fill operations) and numerous bridge and other similar structures. The arterial and Interstate 5 (I-5) Alternatives would involve relatively little earthwork, but would include widened roadways, and many new structures. The proposed grading and new structures associated with these Alternatives are not expected to mitigate any regional geologic hazards, such that additional growth would be spurred. Further, the SOCTIIP Alternatives are not expected to make available any additional natural resources, such as sand and gravel that could support additional growth. Therefore, the construction and operation of the SOCTIIP build alternatives are not expected to result in growth inducing impacts related to geotechnical, geology and soils.

SECTION 12.0

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