SHELL CRUDE TANK REPLACEMENT PROJECT

Draft Environmental Impact Report
SCH No. 2010022034
County File No. LP10-2006

Contra Costa County
Department of Conservation
and Development

July 2011

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Draft Environmental Impact Report

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ACRONYMS AND ABBREVIATIONS
Used in this EIR

AADT	Annual Average Daily Traffic
AASs	Allision Avoidance Systems
ABAG	Association of Bay Area Governments
AB 32	Assembly Bill 32
ACHP	Advisory Council on Historic Preservation
amsl	Above Mean Sea Level
APH	Air Preheater
API	American Petroleum Institute
APSA	California Aboveground Petroleum Storage Act
ARRA	American Recovery and Reinvestment Act of 2009
ASTM	American Society for Testing and Materials
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
bbl	Barrel
BCDC	Bay Conservation and Development Commission
bgs	Below Ground Surface
BMPs	Best Management Practices
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standard
CalARP	California Accidental Release Prevention
CALFED	California Bay-Delta Program
CAL FIRE	California Department of Forestry and Fire Protection
Cal/OSHA	California Occupational Safety and Health
CalRecycle	California Department of Resources Recycling and Recovery
Caltrans	California Department of Transportation
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CAT	Climate Action Team
CBC	California Building Code

CCC	California Coastal Commission
CCCHS	Contra Costa County Health Services
CCCTA	Central Contra Costa Transit Authority
CCCWP	Contra Costa Countywide Clean Water Program
CCFPD	Contra Costa Fire Protection District
CCR	California Code of Regulations
CCRMC	Contra Costa Regional Medical Center
CCTA	Contra Costa Transportation Authority
CCU	Catalytic Cracking Unit
CCWD	Contra Costa Water District
CCWG	Climate Change Working Group
CDFG	California Department of Fish and Game
CEC	California Energy Commissions
CEMS	Continuous Emissions Monitor
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	California Endangered Species Act
CFC	California Fire Code
CFEP	ConocoPhillips Clean Fuels Expansion Project
CFR	Code of Federal Regulations
CGS	California Geological Survey
CNDDB	California National Diversity Data Base
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO	Carbon Monoxide
CO	Commercial
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
CRFS	California Recreational Fisheries Survey
CRU	Catalytic Reformer Unit
CSLC	California State Lands Commission
CSMP	Construction Stormwater Management Plan
CTP	2009 Contra Costa Countywide Comprehensive Transportation Plan
CTRP	Crude Tank Replacement Project
CUPA	Certified Unified Program Agency

CWA	Clean Water Act
CZMA	Federal Coastal Zone Management Act of 1972
dB	Decibels
dBA	A-weighted decibels
DHT	Distillates Hydrotreater
DNL	Day-Night Noise Level
DTSC	Department of Toxic Substances Control
DWR	California Department of Water Resources
DWT	Dead Weight Tonnage
EBRPD	East Bay Regional Park District
EIR	Environmental Impact Report
EPCRA	Emergency Planning & Community Right -To-Know Act
ERM	Environmental Resource Management
ERM	Excludable Recyclable Material
ESA	Environmental Science Associates
ESA	Endangered Species Act
ESI	Environmental Sensitivity Index
ETP	Effluent Treatment Plant
EVP	Enhanced Vapor Recovery
FEMA	Federal Emergency Management Agency
FESA	Federal Endangered Species Act
FMMP	Farmland Mapping and Monitoring Program
FMPs	Fishery Management Plans
FSP	Facility Security Plan
ºF	Degrees Fahrenheit
GHG	Greenhouse Gas Emissions
GWP	Global Warming Potential
HAPC	Habitat Area of Particular Concern
HCA	High Consequence Areas
HCM	Highway Capacity Manual
HEOK	Herring Eggs on Kelp
HFCs	Hydrofluorocarbons
HI	Hazard Index
HI	Heavy Industrial
hp	Horsepower

HVDC	High Voltage Direct Current
Hz	Hertz
H_2S	Hydrogen Sulfide
ICLEI	International Council for Local Environmental Initiatives
IEP	Interagency Ecological Program
ISO	Industrial Safety Ordinance
I-680	Interstate 680
KOP	Key Observation Point
lb/day	Pounds per Day
L_{dn}	Day-Night Noise Level
LEA	Local Enforcement Agency
LEPC	Local Emergency Preparedness Committee
LOS	Level of Service
LPG	Liquefied Petroleum Gas
LUP	Land Use Permit
MBbl	Thousand Barrels
MBbl/d	Thousand Barrels per Day
MBbl/y	Thousand Barrels per Year
MBTA	Migratory Bird Treaty Act
MEIR	Maximum Exposed Individual Residence
MEIW	Maximum Exposed Individual Worker
MFD	Marine Facilities Division
mgd	Million Gallons per Day
ML	Multiple Family Residential Light
MLD	Most Likely Descendent
MLMA	Marine Life Management Act
MM	Modified Mercalli
MMBtu	Million British Thermal Units
MMPA	Marine Mammal Protection Act
mm/yr	Millimeters per Year
MOTEMS	Marine Oil Terminal Engineering and Maintenance Standards
mph	Mile per Hour
MRZ	Mineral Resources Zone
MSDS	Material Safety Data Sheets
MT	Shell Marine Terminal

MTC	Metropolitan Transportation Commission
MUSD	Martinez Unified School District
MW	Megawatt
Mw	Moment Magnitude
MW-hr	Megawatt-Hour
NA	Not Applicable
NAAQS	National Ambient Air Quality Standards
NAHC	California Native American Heritage Commission
NFPA	National Fire Protection Association
NHPA	National Historic Preservation Act
NISA	National Invasive Species Act
NMFS	National Marine Fisheries Service
NO	Nitric Oxide
NOAA	National Oceanic and Atmospheric Administration
NOP	Notice of Preparation
NO_x	Nitrogen Oxides
NO_2	Nitrogen Dioxide
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
NRDA	Natural Resource Damage Assessment
NRHP	National Register of Historic Places
NWIC	Northwest Information Center
N_2O	Nitrous Oxide
OES	Office of Emergency Services
OHP	California Office of Historic Preservation
OPC	California Ocean Protection Council
OS	Open Space
OSPR	Office of Oil Spill Prevention and Response
PAWSA	Port and Waterways Safety Assessment
PCEs	Primary Constituent Elements
PFC	Perfluorocarbons
PGA	Peak Ground Acceleration
PG&E	Pacific Gas & Electric Company
PHA	Process Hazard Analysis
PHMSA	U.S. Department of Transportation Pipeline and Hazardous Materials Administration

PMAO	Petrochemical Mutual Aid Organization
PM2.5	Particulate Matter less than 2.5 microns in size
PM10	Particulate Matter less than 10 microns in size
POC	Precursor Organic Compounds
ppb	Parts per Billion
ppm	Parts per Million
PPV	Peak Particle Velocity
PRC	Public Resources Code
PS	Public Lands
PSHA	Probabilistic Seismic Hazard Assessment
PSM	Process Safety Management
PSMFC	Pacific States Marine Fisheries Commission
RCRA	Resource Conservation and Recovery Act
RecFIN	Pacific Recreational Fishing Information Network
RFG	Refinery Fuel Gas
RHA	Rivers and Harbors Appropriations Act of 1899
RMP	Risk Management Plan or Regional Monitoring Program
RMS	Root Mean Square
RWQCB	Regional Water Quality Control Board
SAV	Submerged Aquatic Vegetation
SCC	California State Coastal Conservancy
SCH	California State Clearinghouse
SERC	State Emergency Response Commission
SFEP	San Francisco Estuary Partnership
SF_6	Sulfur Hexafluoride
SH	Single Family Residential Heavy
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SJV	San Joaquin Valley
SMARA	California Surface Mining and Reclamation Act
SMP	Suisun Marsh Habitat Management, Preservation, and Restoration Plan
SO_2	Sulfur Dioxide
SPCC	Spill Prevention Control and Countermeasures
SRRE	Source Reduction and Recycling Element
SR-4	State Route 4

SSMs	Stationary Source Measures
SWCP	Stormwater Control Plan
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board (State Board)
TAC	Toxic Air Contaminants
TAPII	Trajectory Analysis Planner II
TCP	Traffic Control Plan
TK	Tank
TMDL	Total Maximum Daily Loads
TMSs	Tension Monitoring Systems
tpy	Tons per Year
UBC	Uniform Building Code
UCMP	University of California Museum of Paleontology
ULL	Urban Limit Line
ULSD	Ultra-Low-Sulfur Diesel
UPRR	Union Pacific Railroad Company
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	US Fish and Wildlife Service
USGS	U.S. Geological Service
V/C	Volume-to-Capacity ratio
VdB	Vibration Decibel Notation
VOC	Volatile Organic Compounds
VSP	Vessel Security Plan
VTS	Vessel Traffic Service Tracking System
$\mu g/m^3$	Micrograms per Cubic Meter
2010 CAP	Bay Area 2010 Clean Air Plan

EXECUTIVE SUMMARY

ES-1 Introduction

This Environmental Impact Report (EIR) is an informational document intended to disclose to the public and decision-makers the environmental effects of the Shell Crude Tank Replacement Project (CTRP or the Project) proposed by Equilon Enterprises, LLC, a Delaware limited liability company, doing business as Shell Oil Products U.S. (Shell). This Executive Summary includes the following sections:

- Introduction (ES-1);
- Project Objectives (ES-2);
- Project Setting and Location (ES-3);
- Project Description (ES-4);
- Alternatives (ES-5);
- Environmentally Superior Alternative (ES-6);
- Areas of Controversy and Issues to be Resolved (ES-7); and
- Summary of Impacts and Mitigation Measures (ES-8).

A summary of the impacts of the Project is provided in Table ES-1. The EIR assesses the direct, indirect, and cumulative environmental impacts that could occur as a result of the construction, operation, and maintenance of the Project. The analysis in this document is based upon information contained in the Applicant's Land Use Permit (LUP) application to the Contra Costa County Department of Conservation & Development, Community Development Division (County), as supplemented by data requests and supplemental submissions by Shell.

ES-2 Project Objectives

The Project would increase crude oil storage capacity at the Refinery in order to maintain current production levels as San Joaquin Valley (SJV) crude oil feed stocks continue to diminish. In summary, the objectives of the Project are:

1. Increase crude oil storage capacity at the Refinery to facilitate future operations at current production levels despite anticipated changes in the source of crude oil feed stocks with no increases in crude oil throughput at the Refinery;

2. Maintain current operation and production levels of California Air Resources Board (CARB) mandated cleaner-burning gasoline and ultra low sulfur diesel (ULSD) fuels at the Refinery substituting imported crude oil by vessel for diminishing SJV crude by pipeline;

3. Make no modifications to Refinery process equipment and operations, other than to provide criteria pollutant and greenhouse gas emission reduction measures; and

4. Coordinate with the California State Lands Commission on the recently approved lease renewal for the Shell Marine Terminal (MT) to insure consistency between the CTRP LUP conditions and the conditions of the new MT lease.

ES-3 Project Setting and Location

Shell's Martinez Refinery (Refinery) is located approximately 25 miles northeast of San Francisco adjacent to the community of Martinez. The Refinery is primarily bounded by Pacheco Boulevard to the south and Interstate 680 to the north, except for portions of the Refinery that border the Carquinez Strait north of Marina Vista. Shell Avenue bisects the plant from north to south and Marina Vista runs east-west along the northern portion of the Refinery. The primary processing area of the Refinery is between Pacheco Boulevard and Marina Vista, and the wastewater treatment plant and wharf operations are between Marina Vista and the Carquinez Strait. Approximately 20 percent of the Refinery is located within the corporate limits of the City of Martinez. The remainder of the Refinery is in an unincorporated area of the County. All of the Project components would be constructed within the unincorporated area of the County.

The Refinery property is designated for industrial use in the County and City of Martinez general plans, and its zoning is heavy industrial. Present land uses at the locations where Project components would be installed are petroleum refining and chemical manufacturing. Construction and operation of equipment associated with the Project would be within the current Refinery property boundaries.

ES-4 Project Description

The Project includes the following three components: Crude Oil Storage Tanks Replacement; Increased Crude Oil Shipments Received at the Marine Terminal; and Emission Reductions Measures. Below are summaries of each of the three Project components:

- **Crude Oil Storage Tanks Replacement** – Replacement of two existing crude oil storage tanks and the existing crude oil mix tank with three new, larger crude oil storage tanks, and construction of a new crude oil mix tank. The CTRP would also include refurbishment of an existing storage tank for crude oil service. The CTRP would result in an increase in storage capacity at the facility of approximately 800 thousand barrels (MBbl);
- **Increased Crude Oil Shipments Received at the Marine Terminal** – Increase the volume of crude oil shipments received at the marine terminal by approximately one ship per week to maintain production levels as crude oil delivered by vessel replaces SJV crude oil received by pipeline; and
- **Emission Reductions Measures** – Implementation of criteria pollutant and greenhouse gas emission reduction components as proposed measures to reduce Project emissions to or below applicable CEQA thresholds.

ES-5 Alternatives

Several alternatives were considered, but dismissed from further consideration in this EIR, including pipeline delivery of crude oil from other sources, other locations for the crude oil replacement tanks, and development of fewer and/or smaller tanks. Below are descriptions of alternatives that were analyzed in this EIR.

No Project Alternative

Under the No Project Alternative, the CTRP would not be implemented. The existing crude oil storage tanks would not be replaced, and crude oil storage capacity at the Refinery would be unchanged. Subject to the storage limitations discussed below, MT activity would increase as authorized under existing and future permits. As SJV crude oil diminishes, more crude oil would be received at the MT. If the existing storage tank capacity remains unchanged, crude oil receipt would be constrained by storage capacity.

The existing crude oil storage capacity can accommodate a sustained volume of approximately 80,000 barrels per day of crude oil shipments across the MT, or approximately half of the Refinery's permitted capacity, and significantly less than normal operating levels. As SJV crude oil supply is diminished, crude oil deliveries by ship would increase until the 80,000 barrels per day capacity is reached. As pipeline deliveries would continue to decline, the Refinery would not be able to operate near its normal or permitted capacity. The drop in available crude oil feed would reduce the operating capacity of the Refinery, and could ultimately result in eventual closure of some or all of the Refinery facilities. However, per CEQA Guidelines Section 15145, closure of the Refinery is too speculative to be analyzed as part of the No Project Alternative.

Alternative 1 – Crude Oil Storage at Other Bay Area Facilities

Under this alternative, Shell would use pipeline connections from other Bay Area marine terminals to transfer crude oil to the Refinery from other facilities (i.e., refineries and/or bulk storage plants). This alternative would allow for the Refinery to receive increased water borne crude oil without modifying the existing tanks and without receiving all of the crude oil supply across the MT.

This alternative would include:

- No modifications to existing Refinery crude oil storage tanks;
- Continued delivery of crude oil to the Refinery through the MT as it is currently; and
- Pipeline transfers of water borne crude oil from other Bay Area marine terminals and/or bulk storage plants to replace SJV crude oil supply as it declines.

This alternative could occur under the following scenarios:

1. Shell currently transfers some petroleum through the nearby Pacific Atlantic (formerly Shore) Terminal (a storage only facility) via pipeline. There may be some ability to increase storage capacity at the Pacific Atlantic facility and transfer petroleum to the Refinery.

2. Shell has two San Joaquin Valley pipelines that it leases capacity for transfers from other Bay Area refiners. Shell may be able to increase the Refinery's use of these pipelines, and/or increase the capacity of the pipelines.

3. Shell owns an existing pipeline that extends from the Richmond area to Antioch via Martinez. Currently, the end of the pipeline in Richmond goes to a demolished wharf facility. Hence, a portion of this pipeline, in combination with new pipelines, could be used for connections between other Bay Area terminals and the Refinery.

This alternative would require an agreement between Shell and another local terminal (or terminals) or bulk storage plant (or plants). Depending on condition and storage capacity at the other facility or facilities, this alternative could require new or upgraded pipeline infrastructure to provide safe transfer of crude oil to the Refinery. While this alternative would allow the Refinery to remain essentially unchanged because the future supply of crude oil would continue to be delivered by pipeline, the impacts of increased vessel calls and increased oil storage would be shifted from the MT and Refinery to other Bay Area locations. It is also unknown whether sufficient storage tank capacity exists at other locations and it is possible that additional storage tank capacity would be required at the other Bay Area location(s).

ES-6 Environmentally Superior Alternative

CEQA Guidelines Section 15126.6(e)(2) requires an EIR to identify an environmentally superior alternative. If the environmentally superior alternative is the No Project Alternative, the EIR also must identify an environmentally superior alternative from among the other alternatives. In general, the environmentally superior alternative is defined as that alternative with the least adverse impacts to the project area and its surrounding environment.

Based on the analysis presented in Chapters 4, 5, and 6 of this document, the No Project Alternative clearly presents the least amount of impacts to the environment; although it would not meet any of the CTRP objectives. Furthermore, although too speculative to consider in this CEQA review, the No Project Alternative could potentially result in the eventual shutdown or closure of the Refinery which may require a separate CEQA review.

Depending on whether or not sufficient storage tank capacity, pipeline capacity, and related infrastructure is available or has to be built, Alternative 1 would tend to reduce some of the local impacts associated with the CTRP (visual, noise, air quality, to name a few). However, these impacts would essentially be transferred from the vicinity of the Refinery to the vicinity of the nearby facility. It is likely that Alternative 1 would result in new impacts by virtue of the necessity to transport crude oil to the Refinery from longer distances than those from the MT under the CTRP. As Alternative 1 would also rely on crude oil transport by marine vessels, the same marine vessel-related impacts would likely occur. Consequently, the CTRP represents the Environmentally Superior Alternative by virtue of having less potential impacts than Alternative 1.

ES-7 Areas of Controversy and Issues to be Resolved

Areas of controversy known to lead agencies, including issues raised by agencies and the public, must be identified in the Executive Summary of an EIR (CEQA Guidelines § 15123). The scoping phase of the EIR, conducted between February 10, 2010, and March 11, 2010, identified the following key areas of concern for consideration in the EIR:

- Project compliance with the Health and Safety Code and the 2007 California Fire Code;
- Construction-related traffic impacts;
- Permit requirements for well and/or soil borings and well abandonment;
- Impacts to cultural resources;
- Impacts related to potential existing contamination at the site;
- Storm water runoff management;
- Impacts of increased MT vessel activity and/or size on the rate of sedimentation of the Martinez Marina; and
- Visual effects of the Project from locations within Martinez.

Issues to be resolved, including a choice among alternatives, and whether and how to mitigate potential significant impacts, also must be identified in an Executive Summary (CEQA Guidelines § 15123). The main issue to be resolved in this EIR is which of the alternatives would meet most of the basic Project objectives with the least environmental impact. Balancing sometimes competing environmental values can be challenging because it rests on assumptions of relative value. Decision-makers may elect to balance relative values of environmental resources and, thereby, resolve the issues considered in this EIR with a different conclusion than the one summarized in Section ES-6 and discussed in Section 6.6, *Environmentally Superior Alternative*.

ES-8 Summary of Impacts and Mitigation Measures

This section summarizes the resource areas evaluated in this EIR as well as the impacts described for the Project and alternatives.

Resource Areas Evaluated

The affected environment and the potential direct and indirect effects of the Project are described and evaluated in Chapter 4 of this EIR for the resource areas listed below. The cumulative impact analysis is presented in Chapter 5 and the alternatives analysis is presented in Chapter 6. Chapter 4 is organized into the following 18 environmental resource or issue areas:

4.1 Aesthetics
4.2 Agriculture and Forestry Resources
4.3 Air Quality
4.4 Biological Resources
4.5 Cultural Resources
4.6 Energy Conservation
4.7 Geology, Soils, and Seismicity
4.8 Greenhouse Gas Emissions
4.9 Hazards and Hazardous Materials
4.10 Hydrology and Water Quality
4.11 Land Use and Planning
4.12 Mineral Resources
4.13 Noise
4.14 Population and Housing
4.15 Public Services
4.16 Recreation
4.17 Transportation/Traffic
4.18 Utilities and Service Systems

Detailed analysis of impacts is contained in Chapters 4, 5, and 6.

Summary of Impacts

Implementing the Project could result in the potential for impacts to occur to the resources listed above. Where potentially significant impacts are identified, mitigation measures are identified to reduce the extent of the impacts. Impacts were found to be significant and unavoidable related to aesthetics, biological resources, hazards and hazardous materials, and hydrology and water quality. Table ES-1 includes the potential impacts that would be associated with the Project and the associated recommended mitigation measures.

TABLE ES-1
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Aesthetics			
Impact 4.1-1: A Project-related accidental crude oil spill would have an adverse effect on scenic vistas.	Significant and Unavoidable	Implement Mitigation Measures 4.4-2 and 4.9-1.	Significant and Unavoidable
Impact 4.1-2: The proposed tanks would have an adverse effect on scenic vistas.	Less than Significant	None required.	NA
Impact 4.1-3: A Project-related accidental crude oil spill would substantially damage scenic resources within view of a state scenic highway.	Significant and Unavoidable	Implement Mitigation Measures 4.4-2 and 4.9-1.	Significant and Unavoidable
Impact 4.1-4: The Project would degrade the existing visual character and quality of the site and its surroundings.	Less than Significant	None required.	NA
Impact 4.1-5: Night lighting required for operations could adversely affect nighttime views in the Project area.	Significant	**Mitigation Measure 4.1-5:** Reduce Glare Impacts from Night Lighting. At least 30 days prior to issuance of grading or building permits, the Project applicant shall submit a *Lighting Mitigation Plan* for the review and approval of the County Zoning Administrator. The applicant shall design and install all lighting at Project facilities, such that light sources including bulbs and reflectors generally are not visible from public viewing areas, specifically areas to the east of the Refinery, and that lighting does not cause reflected glare or any unnecessary illumination of the Project facilities and vicinity. The plan shall include, but not be limited to the following measures: • Lighting shall be hooded with lights directed downward or toward the area to be illuminated so that backscatter to the nighttime sky is minimized and the light sources are not visible offsite. The design of the lighting shall be such that the luminescence or light sources are shielded to minimize light trespass outside the Project boundary, and to reduce glare. • All lighting shall be of minimum necessary brightness consistent with worker safety. • High illumination areas not occupied on a continuous basis shall be equipped with switches or motion detectors to light the area only when occupied.	Less than Significant
Agriculture and Forestry Resources			
Implementation of the Project would result in no impact to agriculture and forestry resources.	NA	NA	NA
Air Quality			
Impact 4.3-1: The Project could conflict with or obstruct implementation of the 2010 Bay Area Clean Air Plan.	Less than Significant	None required.	NA

TABLE ES-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Air Quality (cont.)			
Impact 4.3-2: The Project would result in short-term construction emissions of criteria pollutants that could contribute to existing air quality violations.	Significant	**Mitigation Measure 4.3-2: Implement BAAQMD Basic Mitigation Measures.** Shell and its construction contractors shall comply with the following applicable BAAQMD basic control measures: • All exposed unpaved surfaces (e.g., parking areas, staging areas, soil piles, and graded areas, and access roads) shall be watered two times a day. • All haul trucks transporting soil, sand, or other loose material off-site shall be covered. • All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited. • All vehicle speeds on unpaved roads shall be limited to 15 mph. • All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. • Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California Airborne Toxics Control Measure Tile 13, Section 2485 of California of Regulations). Clear signage shall be provided for construction workers at all access points. • All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation. • Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.	Less than Significant
Impact 4.3-3: The Project would result in long-term emissions of criteria pollutants.	Significant	**Mitigation Measure 4.3-3a: TK-967 Mass POC Emissions Limit.** Prior to commencement of any Project operations, Shell shall demonstrate to the County that it has accepted a new BAAQMD permit condition that identifies and limits annual TK-967 POC mass emissions to 0.4 tons per year. **Mitigation Measure 4.3-3b:** CCU Mass NOx Emissions Limit. Prior to commencement of any Project operations, Shell shall demonstrate to the County that it has accepted a new BAAQMD permit condition that limits annual average CCU NOx mass emissions to no more than 468 tons per year.	Less than Significant
Impact 4.3-4: The Project would result in increases in NOx, PM10, and PM2.5, which in the Bay Area are non-attainment of standards.	Significant	Implement Mitigation Measures 4.3-2, 4.3-3a, and 4.3-3b.	Less than Significant

TABLE ES-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Air Quality (cont.)			
Impact 4.3-5: The Project would expose sensitive receptors to emissions of Toxic Air Contaminants.	Less than Significant	None required.	NA
Impact 4.3-6: The Project could create an increase in objectionable odors in the Project area.	Less than Significant	None required.	NA
Biological Resources			
Impact 4.4-1: Potential impacts to biological resources from the introduction of invasive species from hull fouling or ballast water.	Significant and Unavoidable	**Mitigation Measures 4.4-1: Implementation of CSLC Invasive Species Mitigation Measures Notification**. Shell shall notify the Contra Costa County Department of Conservation & Development, Community Development Division in writing of implementation of the CSLC measures and any changes to the requirements contained within of CSLC mitigation measures WQ-2, WQ-4, and BIO-4b within 30 days of the change.	Significant and Unavoidable
Impact 4.4-2: Potential impact to biological resources from the accidental release of crude oil.	Significant and Unavoidable	**Mitigation Measure 4.4-2: Implementation of CSLC Oil Spill Mitigation Measures Notification.** Shell shall notify the Contra Costa County Department of Conservation & Development, Community Development Division in writing of implementation of the CSLC measures and any changes to the requirements contained within of CSLC mitigation measures BIO-6b, BIO-6c, BIO-6d, and BIO-7 within 30-days of the change.	Significant and Unavoidable
Cultural Resources			
Impact 4.5-1: Inadvertent discovery of a historical resource or unique archaeological resource.	Significant	**Mitigation Measure 4.5-1:** Project personnel shall be alerted to the possibility of encountering archaeological materials during ground-disturbing activities. If an inadvertent discovery is made of items of pre-contact or historic-period archaeological potential, all work activities shall immediately cease in the area of discovery. After cessation of ground-disturbing activity in the vicinity of the find, the contractor shall immediately contact the Project proponent. Archaeological resources inadvertently discovered during Project activities shall be evaluated by a cultural resources specialist that meets the Secretary of the Interior's standards in the appropriate discipline. If the find is determined to be potentially significant as either a historical resource or a unique archaeological resource, the archaeologist, in consultation with the Project proponent and appropriate Ohlone representatives or historical societies, shall develop a research design and treatment plan outlining management of the resource, analysis, and reporting of the find.	Less than Significant
Impact 4.5-2: Inadvertent discovery of a unique paleontological resource or site or unique geological feature.	Significant	**Mitigation Measure 4.5-2:** Project personnel shall be alerted to the possibility of encountering paleontological materials during ground-disturbing activities. If paleontological resources, such as fossilized bone, teeth, shell, tracks, trails, casts, molds, or impressions are discovered during ground-disturbing activities, all such activities within 50 feet of the find shall be halted until a qualified paleontologist can assess the significance of the find and, if necessary, develop appropriate salvage measures in conformance with Society of Vertebrate Paleontology Guidelines (SVP, 1995 and 1996).	Less than Significant

TABLE ES-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Cultural Resources (cont.)			
Impact 4.5-3: Inadvertent Discovery of Human Remains.	Significant	**Mitigation Measure 4.5-3:** The treatment of human remains and associated or unassociated funerary objects discovered during any ground-disturbing activity shall comply with applicable State law. Project personnel shall be alerted to the possibility of encountering human remains during Project implementation, and apprised of the proper procedures to follow in the event they are found. State law requires immediate notification of the County coroner, in the event of the coroner's determination that the human remains are Native American, notification of the California Native American Heritage Commission (NAHC), which would appoint a Most Likely Descendent (MLD) (PRC Section 5097.98). The MLD would make all reasonable efforts to develop an agreement for the treatment, with appropriate dignity, of human remains and associated or unassociated funerary objects (CEQA Guidelines Section 15064.5[d]). The agreement shall take into consideration the appropriate excavation, removal, recordation, analysis, custodianship, curation, and final disposition of the human remains and associated or unassociated funerary objects. The PRC allows 48 hours to reach agreement on these matters. If the MLD and the other parties do not agree on the treatment and disposition of the remains and funerary objects, Shell shall follow PRC Section 5097.98(b), which states that "the landowner or his or her authorized representative shall reinter the human remains and items associated with Native American burials with appropriate dignity on the property in a location not subject to further subsurface disturbance."	Less than Significant
Energy Conservation			
Impact 4.6-1: Construction and operation of the Project would result in consumption of energy.	Less than Significant	None required.	NA
Impact 4.6-2: Construction and operation of the Project would require use of transportation energy.	Less than Significant	None required.	NA
Geology and Soils			
Impact 4.7-1: Project facilities could be damaged by seismically induced ground shaking.	Significant	**Mitigation Measure 4.7-1:** Shell shall comply with and implement all of the following measures designed to reduce potential substantial adverse effects resulting from strong seismic ground shaking: (A) A California licensed geotechnical engineer or engineering geologist shall perform a comprehensive geotechnical investigation of all Project facilities based on adequate subsurface exploration, laboratory testing of selected samples, and engineering/geologic analysis of the data gathered. The information shall be compiled and presented as a geotechnical report that provides an evaluation of potential seismic and geologic hazards, and provides 2010 CBC seismic design parameters, along with providing specific standards and criteria for site grading, drainage, berm, and foundation design.	Less than Significant

TABLE ES-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Geology and Soils (cont.)			
Impact 4.7-1 (cont.)		(B) The Project geotechnical engineer or engineering geologist shall prepare an Original Geologic Map of the Project site and adjacent areas based on subsurface exploration, field geologic mapping and interpretation of historic aerial photographs. The map shall show the details of site geologic conditions, including lithologic units (i.e., bedrock units/stratigraphy), geologic structure, and the distribution of surficial deposits (e.g., colluvium, landslides, and artificial fill). (C) The information shall be compiled and presented as a geotechnical report that provides an evaluation of potential seismic hazards, including secondary seismic ground failures such as liquefaction and collapse, lateral spread and earthquake induced settlement, and other geologic hazards, such as landslides, expansive and corrosive soils, and provides 2010 CBC seismic design parameters, along with specific standards and criteria for site grading, drainage, and foundation design. (D) Where landslides are confirmed within or immediately adjacent to planned improvements, specific geotechnical design measures shall be used to achieve long-term stability. These shall include, but will not necessarily be limited to, corrective grading of landslides or colluvial wedges that present the potential to effect improvements. Additionally, standard practices such as minimizing the amount of grading required in areas that are deemed to be stable in their existing condition; installing adequate drainage; avoiding grading activities and excavations during and immediately following periods of heavy rainfall; geotechnical monitoring of slopes for stability during construction; minimizing the gradient of engineered slope; following natural topography; and, salvaging topsoil for use during final grading to facilitate revegetation, shall be implemented during construction. (E) For construction requiring excavations, such as foundations, appropriate support and protection measures shall be implemented to maintain the stability of excavations and to protect construction worker safety. Where excavations are adjacent to existing structures, utilities, or other features that may be adversely affected by potential ground movements, bracing, underpinning, or other methods of support for the affected facilities shall be implemented. (F) Recommendations in the approved geotechnical report shall be incorporated into the design and construction specifications and shall be implemented during build-out of the Project. (G) The Project geotechnical engineer shall provide observation and testing services during grading and foundation-related work, and shall submit a grading completion report to the County prior to requesting the final inspection. This report shall provide full documentation of the geotechnical monitoring services provided during construction, including the results of American Society for Testing and Materials (ASTM) testing. The Final Grading Report shall also certify compliance of the as-built Project with the recommendations in the approved geotechnical report.	

TABLE ES-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Geology and Soils (cont.)			
Impact 4.7-2: The Project could be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site lateral spreading, subsidence, liquefaction, or collapse.	Significant	Implement Mitigation Measure 4.7-1.	Less than Significant
Impact 4.7-3: Project implementation would expose people or structures to potential substantial adverse effects as a result of landslides.	Significant	Implement Mitigation Measure 4.7-1.	Less than Significant
Impact 4.7-4: Project implementation could result in erosion or loss of top soil.	Less than Significant	None required.	NA
Impact 4.7-5: The Project could result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse.	Significant	Implement Mitigation Measure 4.7-1.	Less than Significant
Impact 4.7-6: Project implementation could occur on expansive soils, creating risks to life and property.	Less than Significant	None required.	NA
Greenhouse Gas Emissions			
Impact 4.8-1: Construction of the Project would result in emissions of greenhouse gases that could contribute to global climate change.	Less than Significant	None required.	NA
Impact 4.8-2: Project operations would result in emissions of greenhouse gases that could contribute to global climate change.	Less than Significant	**Mitigation Measure 4.8-2: F-40 Air Preheater, Distillates Hydrotreater, and Catalytic Reformer Unit Firing Emission Reductions.** Prior to commencement of any Project operations, Shell shall demonstrate to the County that it has accepted a new BAAQMD permit condition that shall restrict the firing of the Distillates Hydrotreater F-13909 and the Catalytic Reformer Unit furnaces F-49, such that the combined DHT, CRU, and F-40 APH CO2e emissions reductions would be at least 17,874 metric tons per year over a 3-year rolling average.	Less than Significant
Impact 4.8-3: The Project could conflict with an applicable plan.	Less than Significant	None required.	Less than Significant

TABLE ES-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Hazards and Hazardous Materials			
Impact 4.9-1: The Project would shift the routine transport of crude oil receipts from mostly pipeline to mostly tanker vessels, which would increase the potential for a hazardous crude oil release.	Significant and Unavoidable	**Mitigation Measure 4.9-1: Implementation of CSLC Oil Spill Mitigation Measures Notification.** Shell shall notify the Contra Costa County Department of Conservation & Development, Community Development Division in writing of implementation of the CSLC measures and any changes to the requirements contained within of CSLC mitigation measures OS-3a through OS-3c, OS-6b, OS-7a and OS-7b within 30 days of the change.	Significant and Unavoidable
Impact 4.9-2: The Project would increase the quantity of routinely stored hazardous materials.	Less than Significance	None required.	NA
Impact 4.9-3: The Project is located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment.	Less than Significance	None required.	NA
Impact 4.9-4: The Project may impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan and, as a result, could create a significant hazard to the public or the environment.	Less than Significance	None required.	NA
Hydrology and Water Quality			
Impact 4.10-1: Project construction activities could cause soil erosion and sedimentation resulting in degradation of the receiving water quality.	Less than Significant	None required.	NA
Impact 4.10-2: Project construction would involve dewatering that could cause degradation of water quality.	Less than Significant	None required.	
Impact 4.10-3: Project-related increase in operations at the MT could affect water quality in the Bay.	Significant and Unavoidable	Implement Mitigation Measures 4.4-2 and 4.9-1.	Significant and Unavoidable
Impact 4.10-4: The Project could result in change in the drainage patterns that would increase stormwater flows that could increase erosion and affect water quality. Increased storm flows could also cause flooding downstream.	Less than Significant	None required.	NA

TABLE ES-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Hydrology and Water Quality (cont.)			
Impact 4.10-5: The Project would involve continuation of current operations and would cause negligible change in water quality.	Less than Significant	None required.	NA
Land Use and Planning			
Implementation of the Project would cause no impact to local land use.	NA	NA	NA
Mineral Resources			
Implementation of the Project would cause no impact on mineral resources.	NA	NA	NA
Noise			
Impact 4.13-1: Project construction activities could violate County and City construction time-of-day restrictions.	Significant	**Mitigation Measure 4.13-1:** All Project construction activities shall be limited to the hours of 7:00 a.m. to 7:00 p.m. Monday through Friday, and 9:00 a.m. to 5:00 p.m. on Saturdays, Sundays, and holidays.	Less than Significant
Impact 4.13-2: Project construction activities would generate ground borne vibration levels.	Less than Significant	None required.	NA
Impact 4.13-3: Operations of the Project would increase local ambient noise levels.	Less than Significant	None required.	NA
Impact 4.13-4: Project construction activities would temporarily increase local ambient noise levels in the vicinity of the Project site.	Significant	**Mitigation Measure 4.13-4:** Shell shall implement the following construction noise nuisance control measures for the duration of the approximately six-month period of construction at Tank 967: • Use equipment with enclosures and high-performance mufflers to the extent feasible; • Place construction equipment at locations to maximize the distance to the nearest residences; and • Notify nearby residents of the planned construction schedule at least one month prior to the scheduled activities at Project Area 2. Notification shall include the types of equipment that are to be used during construction activities at Project Area 2 and include contact information of a designated construction noise coordinator who will maintain communication with affected residences throughout the Tank 967 construction period. Shell's construction noise coordinator shall also disseminate Project information to businesses, and implement a complaint and response tracking program.	Less than Significant

TABLE ES-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Population and Housing			
Implementation of the Project would cause no impact on population and housing.	NA	NA	NA
Public Services			
Implementation of the Project would cause no impact to existing public services.	NA	NA	NA
Recreation			
Implementation of the Project would cause no impact on recreational facilities.	NA	NA	NA
Transportation/Traffic			
Impact 4.17-1: Project construction would temporarily increase traffic volumes on area roadways.	Less than Significant	None required.	NA
Impact 4.17-2: Traffic generated by the Project could contribute to pavement wear-and-tear on area roadways.	Significant	**Mitigation Measure 4.17-2:** Prior to project construction, Shell shall document road conditions for all routes that will be used by project-related vehicles. Shell shall also document road conditions after project construction is completed. The pre- and post-construction conditions of the haul routes shall be reviewed, by Public Works Department staff. Shell shall enter into an agreement prior to construction that will detail the pre-construction conditions and the post-construction requirements of a rehabilitation program. Roads damaged by construction would be repaired to a structural condition equal to that which existed prior to construction activity. A cash bond/deposit to finance damage to County/City roadways shall be required. An encroachment permit may be required from the City/County and a transportation/haul permit may be also required for any extra-legal loads used during construction.	Less than Significant
Utilities and Service Systems			
Impact 4.18-1: Project construction would temporarily increase the flow of solid waste to area landfills.	Less than Significant	None required.	NA
Cumulative Impacts			
Impact 5-1: Multiple accidental crude oil and/or petroleum product spills from marine vessel activity would result in cumulative impacts to scenic vistas and scenic resources within view of a state scenic highway.	Significant and Unavoidable	No additional mitigation is available.	Significant and Unavoidable

TABLE ES-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Cumulative Impacts (cont.)			
Impact 5-2: Potential cumulative impacts to biological resources from the introduction of invasive species from hull fouling or ballast water.	Significant and Unavoidable	Implement Mitigation Measure 4.4-1.	Significant and Unavoidable
Impact 5-3: The proposed increase in crude oil receipts by tanker vessel could increase the cumulative risk to Marine Resources associated with accidental crude oil and petroleum product spills.	Significant and Unavoidable	Implement Mitigation Measures 4.4-2 and 4.9-1.	Significant and Unavoidable
Impact 5-4: Accidental crude oil spills could have cumulative hazardous effects in the Central Bay, San Pablo Bay, Carquinez Strait, and Suisun Bay.	Significant and Unavoidable	Implement Mitigation Measures 4.4-2 and 4.9-1.	Significant and Unavoidable
Impact 5-5: Operations at the MT could cumulatively affect water quality in the Bay.	Significant and Unavoidable	Implement Mitigation Measures 4.4-2 and 4.9-1.	Significant and Unavoidable
Impact 5-6: Potential cumulative traffic impacts could occur during the three-year Project construction period.	Significant	**Mitigation Measure 5-6:** Construction Traffic Coordination. Shell shall provide a haul route plan for review and approval of the County Public Works Department and obtain a transportation/haul permit, if required, for review and approval of the County Public Works Department. TCPs should include at a minimum, a defined haul route, timing of deliveries/trips to avoid peak hours (construction schedule).	Less than Significant

NOTE: NA = Not Applicable.

CHAPTER 1
Introduction

1.1 Purpose of This Document

This Environmental Impact Report (EIR) is an informational document intended to disclose to the public and decision-makers the environmental effects of the proposed Shell Crude Tank Replacement Project (referred to herein as the Project or the CTRP). This document assesses the direct and indirect environmental impacts, as well as the cumulative environmental impacts, that could occur as a result of the decommissioning of existing tanks, as well as construction, operation, and maintenance of the Project. The analyses in this document are based upon information contained in the Shell Martinez Land Use Permit (LUP) application to Contra Costa County's Department of Conservation & Development, Community Development Division. This EIR is intended as an informational document that, in itself, does not determine whether the Project would be approved, but informs the local planning and decision-making process.

1.2 Project Overview

Shell's Martinez Refinery (Refinery) is located approximately 25 miles northeast of San Francisco adjacent to the community of Martinez. The Refinery is primarily bounded by Pacheco Boulevard to the south and Interstate 680 to the north, except for portions of the Refinery that border the Carquinez Strait north of Marina Vista. Shell Avenue bisects the plant from north to south and Marina Vista Drive runs east-west along the northern portion of the Refinery. The primary processing area of the Refinery is between Pacheco Boulevard and Marina Vista, and the wastewater treatment plant and wharf operations are between Marina Vista and the Carquinez Strait. Approximately 20 percent of the Refinery is located within the corporate limits of the City of Martinez. The remainder of the Refinery is in an unincorporated area of the County. All of the Project components would be constructed within the County.

The Refinery property is designated for industrial use in the County and City of Martinez general plans, and its zoning is heavy industrial. Present land uses at the locations where Project components would be installed are petroleum refining. Construction and operation of equipment associated with the Project would be within the current Refinery property boundaries.

Construction of the Project is scheduled to begin in 2012 and be complete by 2015. Decommissioning of existing tanks would begin in 2012.

1.3 Key Areas of Environmental Concern

This EIR examines the potential impacts of the Project. All of the topics (resources areas) in the current California Environmental Quality Act (CEQA) Guidelines Appendix G Checklist and other topics pertinent to the Project were studied: Aesthetics; Agriculture and Forest Resources; Air Quality; Biological Resources; Cultural Resources; Energy Conservation; Geology and Soils; Greenhouse Gas Emissions; Hazards and Hazardous Materials; Hydrology and Water Quality; Land Use and Planning; Mineral Resources; Noise; Population and Housing; Public Services; Recreation; Transportation and Traffic; and Utilities and Service Systems.

1.4 Organization of the Document

This document is organized into the following chapters:

- **Chapter 1 – Introduction**
- **Chapter 2 – Summary of Environmental Impacts:** Summarizes environmental impacts that could result from implementation of the Project. The summary of each resource area indicates the level of significance of potential impacts to those resources.
- **Chapter 3 – Project Description:** Provides a detailed description of the Project, including its location, background information, major objectives, and technical characteristics.
- **Chapter 4 – Environmental Settings, Impacts, and Mitigation Measures:** Contains an analysis of environmental resource areas. Discussion of each resource area is divided into: a) the setting, which describes environmental conditions and regulatory information; b) the standards of significance for determining the degree or level of potential environmental impacts for each issue; c) potential impacts, which indicate the environmental effects that are anticipated from the Project, and d) mitigation measures.
- **Chapter 5 – CEQA Statutory Sections:** Provides discussions of various CEQA-mandated considerations including significant and unavoidable environmental impacts, cumulative impacts, and growth-inducing impacts.
- **Chapter 6 – Analysis of Alternatives:** Describes alternatives to the Project and analyzes their associated environmental effects.
- **Chapter 7 – Report Preparation:** Lists report authors by section and County staff that assisted with the preparation and review of the EIR as well as agencies and organizations consulted.
- **Chapter 8 – References:** Lists of references used in the entire document.
- **Appendices:** Present background information pertaining to the Project and the CEQA process, including the Project's Notice of Preparation and Scoping Comments (Appendix A). All appendices are located on CD only (see back cover of EIR).

1.5 Use of this Document by Agencies

In accordance with CEQA, Contra Costa County will consider the environmental implications of the Project before making a decision to grant or deny Shell's request for a LUP. Other agencies that may rely on this EIR when considering approvals for the Project include the Bay Area Air Quality Management District (BAAQMD), and the San Francisco Bay Regional Water Quality Control Board.

1.6 Permits and Approvals

Several permits and approvals are required before Project construction could begin. These include, but are not limited to, a LUP, Grading Permit and Building Permit from Contra Costa County and an Authority to Construct permit from the BAAQMD. More detail on permits is provided in Section 3.8.

CHAPTER 2
Summary of Environmental Impacts

This chapter provides a summary of the environmental impacts of the proposed Project, as identified and analyzed in this EIR. Table 2-1 includes statements of impact and related mitigation measures. Statements of Project-specific impacts and mitigation measures have been extracted from the analysis set forth in Chapter 4 of this document; statements of cumulative impacts and mitigation measures have been extracted from Chapter 5. The information in Table 2-1 is arranged in four columns: 1) environmental impacts; 2) level of significance without mitigation; 3) adopted or recommended mitigation measures; and 4) level of significance with mitigation measures applied.

TABLE 2-1
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Aesthetics			
Impact 4.1-1: A Project-related accidental crude oil spill would have an adverse effect on scenic vistas.	Significant and Unavoidable	Implement Mitigation Measures 4.4-2 and 4.9-1.	Significant and Unavoidable
Impact 4.1-2: The proposed tanks would have an adverse effect on scenic vistas.	Less than Significant	None required.	NA
Impact 4.1-3: A Project-related accidental crude oil spill would substantially damage scenic resources within view of a state scenic highway.	Significant and Unavoidable	Implement Mitigation Measures 4.4-2 and 4.9-1.	Significant and Unavoidable
Impact 4.1-4: The Project would degrade the existing visual character and quality of the site and its surroundings.	Less than Significant	None required.	NA
Impact 4.1-5: Night lighting required for operations could adversely affect nighttime views in the Project area.	Significant	**Mitigation Measure 4.1-5:** Reduce Glare Impacts from Night Lighting. At least 30 days prior to issuance of grading or building permits, the Project applicant shall submit a *Lighting Mitigation Plan* for the review and approval of the County Zoning Administrator. The applicant shall design and install all lighting at Project facilities, such that light sources including bulbs and reflectors generally are not visible from public viewing areas, specifically areas to the east of the Refinery, and that lighting does not cause reflected glare or any unnecessary illumination of the Project facilities and vicinity. The plan shall include, but not be limited to the following measures: • Lighting shall be hooded with lights directed downward or toward the area to be illuminated so that backscatter to the nighttime sky is minimized and the light sources are not visible offsite. The design of the lighting shall be such that the luminescence or light sources are shielded to minimize light trespass outside the Project boundary, and to reduce glare. • All lighting shall be of minimum necessary brightness consistent with worker safety. • High illumination areas not occupied on a continuous basis shall be equipped with switches or motion detectors to light the area only when occupied.	Less than Significant
Agriculture and Forestry Resources			
Implementation of the Project would result in no impact to agriculture and forestry resources.	NA	NA	NA
Air Quality			
Impact 4.3-1: The Project could conflict with or obstruct implementation of the 2010 Bay Area Clean Air Plan.	Less than Significant	None required.	NA

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Air Quality (cont.)			
Impact 4.3-2: The Project would result in short-term construction emissions of criteria pollutants that could contribute to existing air quality violations.	Significant	**Mitigation Measure 4.3-2: Implement BAAQMD Basic Mitigation Measures.** Shell and its construction contractors shall comply with the following applicable BAAQMD basic control measures: • All exposed unpaved surfaces (e.g., parking areas, staging areas, soil piles, and graded areas, and access roads) shall be watered two times a day. • All haul trucks transporting soil, sand, or other loose material off-site shall be covered. • All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited. • All vehicle speeds on unpaved roads shall be limited to 15 mph. • All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. • Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California Airborne Toxics Control Measure Tile 13, Section 2485 of California of Regulations). Clear signage shall be provided for construction workers at all access points. • All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation. • Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.	Less than Significant
Impact 4.3-3: The Project would result in long-term emissions of criteria pollutants.	Significant	**Mitigation Measure 4.3-3a: TK-967 Mass POC Emissions Limit.** Prior to commencement of any Project operations, Shell shall demonstrate to the County that it has accepted a new BAAQMD permit condition that identifies and limits annual TK-967 POC mass emissions to 0.4 tons per year. **Mitigation Measure 4.3-3b:** CCU Mass NOx Emissions Limit. Prior to commencement of any Project operations, Shell shall demonstrate to the County that it has accepted a new BAAQMD permit condition that limits annual average CCU NOx mass emissions to no more than 468 tons per year.	Less than Significant
Impact 4.3-4: The Project would result in increases in NOx, PM10, and PM2.5, which in the Bay Area are non-attainment of standards.	Significant	Implement Mitigation Measures 4.3-2, 4.3-3a, and 4.3-3b.	Less than Significant

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Air Quality (cont.)			
Impact 4.3-5: The Project would expose sensitive receptors to emissions of Toxic Air Contaminants.	Less than Significant	None required.	NA
Impact 4.3-6: The Project could create an increase in objectionable odors in the Project area.	Less than Significant	None required.	NA
Biological Resources			
Impact 4.4-1: Potential impacts to biological resources from the introduction of invasive species from hull fouling or ballast water.	Significant and Unavoidable	**Mitigation Measures 4.4-1: Implementation of CSLC Invasive Species Mitigation Measures Notification**. Shell shall notify the Contra Costa County Department of Conservation & Development, Community Development Division in writing of implementation of the CSLC measures and any changes to the requirements contained within of CSLC mitigation measures WQ-2, WQ-4, and BIO-4b within 30 days of the change.	Significant and Unavoidable
Impact 4.4-2: Potential impact to biological resources from the accidental release of crude oil.	Significant and Unavoidable	**Mitigation Measure 4.4-2: Implementation of CSLC Oil Spill Mitigation Measures Notification.** Shell shall notify the Contra Costa County Department of Conservation & Development, Community Development Division in writing of implementation of the CSLC measures and any changes to the requirements contained within of CSLC mitigation measures BIO-6b, BIO-6c, BIO-6d, and BIO-7 within 30-days of the change.	Significant and Unavoidable
Cultural Resources			
Impact 4.5-1: Inadvertent discovery of a historical resource or unique archaeological resource.	Significant	**Mitigation Measure 4.5-1:** Project personnel shall be alerted to the possibility of encountering archaeological materials during ground-disturbing activities. If an inadvertent discovery is made of items of pre-contact or historic-period archaeological potential, all work activities shall immediately cease in the area of discovery. After cessation of ground-disturbing activity in the vicinity of the find, the contractor shall immediately contact the Project proponent. Archaeological resources inadvertently discovered during Project activities shall be evaluated by a cultural resources specialist that meets the Secretary of the Interior's standards in the appropriate discipline. If the find is determined to be potentially significant as either a historical resource or a unique archaeological resource, the archaeologist, in consultation with the Project proponent and appropriate Ohlone representatives or historical societies, shall develop a research design and treatment plan outlining management of the resource, analysis, and reporting of the find.	Less than Significant
Impact 4.5-2: Inadvertent discovery of a unique paleontological resource or site or unique geological feature.	Significant	**Mitigation Measure 4.5-2:** Project personnel shall be alerted to the possibility of encountering paleontological materials during ground-disturbing activities. If paleontological resources, such as fossilized bone, teeth, shell, tracks, trails, casts, molds, or impressions are discovered during ground-disturbing activities, all such activities within 50 feet of the find shall be halted until a qualified paleontologist can assess the significance of the find and, if necessary, develop appropriate salvage measures in conformance with Society of Vertebrate Paleontology Guidelines (SVP, 1995 and 1996).	Less than Significant

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Cultural Resources (cont.)			
Impact 4.5-3: Inadvertent Discovery of Human Remains.	Significant	**Mitigation Measure 4.5-3:** The treatment of human remains and associated or unassociated funerary objects discovered during any ground-disturbing activity shall comply with applicable State law. Project personnel shall be alerted to the possibility of encountering human remains during Project implementation, and apprised of the proper procedures to follow in the event they are found. State law requires immediate notification of the County coroner, in the event of the coroner's determination that the human remains are Native American, notification of the California Native American Heritage Commission (NAHC), which would appoint a Most Likely Descendent (MLD) (PRC Section 5097.98). The MLD would make all reasonable efforts to develop an agreement for the treatment, with appropriate dignity, of human remains and associated or unassociated funerary objects (CEQA Guidelines Section 15064.5[d]). The agreement shall take into consideration the appropriate excavation, removal, recordation, analysis, custodianship, curation, and final disposition of the human remains and associated or unassociated funerary objects. The PRC allows 48 hours to reach agreement on these matters. If the MLD and the other parties do not agree on the treatment and disposition of the remains and funerary objects, Shell shall follow PRC Section 5097.98(b), which states that "the landowner or his or her authorized representative shall reinter the human remains and items associated with Native American burials with appropriate dignity on the property in a location not subject to further subsurface disturbance."	Less than Significant
Energy Conservation			
Impact 4.6-1: Construction and operation of the Project would result in consumption of energy.	Less than Significant	None required.	NA
Impact 4.6-2: Construction and operation of the Project would require use of transportation energy.	Less than Significant	None required.	NA
Geology and Soils			
Impact 4.7-1: Project facilities could be damaged by seismically induced ground shaking.	Significant	**Mitigation Measure 4.7-1:** Shell shall comply with and implement all of the following measures designed to reduce potential substantial adverse effects resulting from strong seismic ground shaking: (A) A California licensed geotechnical engineer or engineering geologist shall perform a comprehensive geotechnical investigation of all Project facilities based on adequate subsurface exploration, laboratory testing of selected samples, and engineering/geologic analysis of the data gathered. The information shall be compiled and presented as a geotechnical report that provides an evaluation of potential seismic and geologic hazards, and provides 2010 CBC seismic design parameters, along with providing specific standards and criteria for site grading, drainage, berm, and foundation design.	Less than Significant

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Geology and Soils (cont.)			
Impact 4.7-1 (cont.)		(B) The Project geotechnical engineer or engineering geologist shall prepare an Original Geologic Map of the Project site and adjacent areas based on subsurface exploration, field geologic mapping and interpretation of historic aerial photographs. The map shall show the details of site geologic conditions, including lithologic units (i.e., bedrock units/stratigraphy), geologic structure, and the distribution of surficial deposits (e.g., colluvium, landslides, and artificial fill). (C) The information shall be compiled and presented as a geotechnical report that provides an evaluation of potential seismic hazards, including secondary seismic ground failures such as liquefaction and collapse, lateral spread and earthquake induced settlement, and other geologic hazards, such as landslides, expansive and corrosive soils, and provides 2010 CBC seismic design parameters, along with specific standards and criteria for site grading, drainage, and foundation design. (D) Where landslides are confirmed within or immediately adjacent to planned improvements, specific geotechnical design measures shall be used to achieve long-term stability. These shall include, but will not necessarily be limited to, corrective grading of landslides or colluvial wedges that present the potential to effect improvements. Additionally, standard practices such as minimizing the amount of grading required in areas that are deemed to be stable in their existing condition; installing adequate drainage; avoiding grading activities and excavations during and immediately following periods of heavy rainfall; geotechnical monitoring of slopes for stability during construction; minimizing the gradient of engineered slope; following natural topography; and, salvaging topsoil for use during final grading to facilitate revegetation, shall be implemented during construction. (E) For construction requiring excavations, such as foundations, appropriate support and protection measures shall be implemented to maintain the stability of excavations and to protect construction worker safety. Where excavations are adjacent to existing structures, utilities, or other features that may be adversely affected by potential ground movements, bracing, underpinning, or other methods of support for the affected facilities shall be implemented. (F) Recommendations in the approved geotechnical report shall be incorporated into the design and construction specifications and shall be implemented during build-out of the Project. (G) The Project geotechnical engineer shall provide observation and testing services during grading and foundation-related work, and shall submit a grading completion report to the County prior to requesting the final inspection. This report shall provide full documentation of the geotechnical monitoring services provided during construction, including the results of American Society for Testing and Materials (ASTM) testing. The Final Grading Report shall also certify compliance of the as-built Project with the recommendations in the approved geotechnical report.	

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Geology and Soils (cont.)			
Impact 4.7-2: The Project could be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site lateral spreading, subsidence, liquefaction, or collapse.	Significant	Implement Mitigation Measure 4.7-1.	Less than Significant
Impact 4.7-3: Project implementation would expose people or structures to potential substantial adverse effects as a result of landslides.	Significant	Implement Mitigation Measure 4.7-1.	Less than Significant
Impact 4.7-4: Project implementation could result in erosion or loss of top soil.	Less than Significant	None required.	NA
Impact 4.7-5: The Project could result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse.	Significant	Implement Mitigation Measure 4.7-1.	Less than Significant
Impact 4.7-6: Project implementation could occur on expansive soils, creating risks to life and property.	Less than Significant	None required.	NA
Greenhouse Gas Emissions			
Impact 4.8-1: Construction of the Project would result in emissions of greenhouse gases that could contribute to global climate change.	Less than Significant	None required.	NA
Impact 4.8-2: Project operations would result in emissions of greenhouse gases that could contribute to global climate change.	Less than Significant	**Mitigation Measure 4.8-2: F-40 Air Preheater, Distillates Hydrotreater, and Catalytic Reformer Unit Firing Emission Reductions.** Prior to commencement of any Project operations, Shell shall demonstrate to the County that it has accepted a new BAAQMD permit condition that shall restrict the firing of the Distillates Hydrotreater F-13909 and the Catalytic Reformer Unit furnaces F-49, such that the combined DHT, CRU, and F-40 APH CO2e emissions reductions would be at least 17,874 metric tons per year over a 3-year rolling average.	Less than Significant
Impact 4.8-3: The Project could conflict with an applicable plan.	Less than Significant	None required.	Less than Significant

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Hazards and Hazardous Materials			
Impact 4.9-1: The Project would shift the routine transport of crude oil receipts from mostly pipeline to mostly tanker vessels, which would increase the potential for a hazardous crude oil release.	Significant and Unavoidable	**Mitigation Measure 4.9-1: Implementation of CSLC Oil Spill Mitigation Measures Notification.** Shell shall notify the Contra Costa County Department of Conservation & Development, Community Development Division in writing of implementation of the CSLC measures and any changes to the requirements contained within of CSLC mitigation measures OS-3a through OS-3c, OS-6b, OS-7a and OS-7b within 30 days of the change.	Significant and Unavoidable
Impact 4.9-2: The Project would increase the quantity of routinely stored hazardous materials.	Less than Significance	None required.	NA
Impact 4.9-3: The Project is located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment.	Less than Significance	None required.	NA
Impact 4.9-4: The Project may impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan and, as a result, could create a significant hazard to the public or the environment.	Less than Significance	None required.	NA
Hydrology and Water Quality			
Impact 4.10-1: Project construction activities could cause soil erosion and sedimentation resulting in degradation of the receiving water quality.	Less than Significant	None required.	NA
Impact 4.10-2: Project construction would involve dewatering that could cause degradation of water quality.	Less than Significant	None required.	
Impact 4.10-3: Project-related increase in operations at the MT could affect water quality in the Bay.	Significant and Unavoidable	Implement Mitigation Measures 4.4-2 and 4.9-1.	Significant and Unavoidable
Impact 4.10-4: The Project could result in change in the drainage patterns that would increase stormwater flows that could increase erosion and affect water quality. Increased storm flows could also cause flooding downstream.	Less than Significant	None required.	NA

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Hydrology and Water Quality (cont.)			
Impact 4.10-5: The Project would involve continuation of current operations and would cause negligible change in water quality.	Less than Significant	None required.	NA
Land Use and Planning			
Implementation of the Project would cause no impact to local land use.	NA	NA	NA
Mineral Resources			
Implementation of the Project would cause no impact on mineral resources.	NA	NA	NA
Noise			
Impact 4.13-1: Project construction activities could violate County and City construction time-of-day restrictions.	Significant	**Mitigation Measure 4.13-1:** All Project construction activities shall be limited to the hours of 7:00 a.m. to 7:00 p.m. Monday through Friday, and 9:00 a.m. to 5:00 p.m. on Saturdays, Sundays, and holidays.	Less than Significant
Impact 4.13-2: Project construction activities would generate ground borne vibration levels.	Less than Significant	None required.	NA
Impact 4.13-3: Operations of the Project would increase local ambient noise levels.	Less than Significant	None required.	NA
Impact 4.13-4: Project construction activities would temporarily increase local ambient noise levels in the vicinity of the Project site.	Significant	**Mitigation Measure 4.13-4:** Shell shall implement the following construction noise nuisance control measures for the duration of the approximately six-month period of construction at Tank 967: • Use equipment with enclosures and high-performance mufflers to the extent feasible; • Place construction equipment at locations to maximize the distance to the nearest residences; and • Notify nearby residents of the planned construction schedule at least one month prior to the scheduled activities at Project Area 2. Notification shall include the types of equipment that are to be used during construction activities at Project Area 2 and include contact information of a designated construction noise coordinator who will maintain communication with affected residences throughout the Tank 967 construction period. Shell's construction noise coordinator shall also disseminate Project information to businesses, and implement a complaint and response tracking program.	Less than Significant

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Population and Housing			
Implementation of the Project would cause no impact on population and housing.	NA	NA	NA
Public Services			
Implementation of the Project would cause no impact to existing public services.	NA	NA	NA
Recreation			
Implementation of the Project would cause no impact on recreational facilities.	NA	NA	NA
Transportation/Traffic			
Impact 4.17-1: Project construction would temporarily increase traffic volumes on area roadways.	Less than Significant	None required.	NA
Impact 4.17-2: Traffic generated by the Project could contribute to pavement wear-and-tear on area roadways.	Significant	**Mitigation Measure 4.17-2:** Prior to project construction, Shell shall document road conditions for all routes that will be used by project-related vehicles. Shell shall also document road conditions after project construction is completed. The pre- and post-construction conditions of the haul routes shall be reviewed, by Public Works Department staff. Shell shall enter into an agreement prior to construction that will detail the pre-construction conditions and the post-construction requirements of a rehabilitation program. Roads damaged by construction would be repaired to a structural condition equal to that which existed prior to construction activity. A cash bond/deposit to finance damage to County/City roadways shall be required. An encroachment permit may be required from the City/County and a transportation/haul permit may be also required for any extra-legal loads used during construction.	Less than Significant
Utilities and Service Systems			
Impact 4.18-1: Project construction would temporarily increase the flow of solid waste to area landfills.	Less than Significant	None required.	NA
Cumulative Impacts			
Impact 5-1: Multiple accidental crude oil and/or petroleum product spills from marine vessel activity would result in cumulative impacts to scenic vistas and scenic resources within view of a state scenic highway.	Significant and Unavoidable	No additional mitigation is available.	Significant and Unavoidable

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SHELL CRUDE TANK REPLACEMENT PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Cumulative Impacts (cont.)			
Impact 5-2: Potential cumulative impacts to biological resources from the introduction of invasive species from hull fouling or ballast water.	Significant and Unavoidable	Implement Mitigation Measure 4.4-1.	Significant and Unavoidable
Impact 5-3: The proposed increase in crude oil receipts by tanker vessel could increase the cumulative risk to Marine Resources associated with accidental crude oil and petroleum product spills.	Significant and Unavoidable	Implement Mitigation Measures 4.4-2 and 4.9-1.	Significant and Unavoidable
Impact 5-4: Accidental crude oil spills could have cumulative hazardous effects in the Central Bay, San Pablo Bay, Carquinez Strait, and Suisun Bay.	Significant and Unavoidable	Implement Mitigation Measures 4.4-2 and 4.9-1.	Significant and Unavoidable
Impact 5-5: Operations at the MT could cumulatively affect water quality in the Bay.	Significant and Unavoidable	Implement Mitigation Measures 4.4-2 and 4.9-1.	Significant and Unavoidable
Impact 5-6: Potential cumulative traffic impacts could occur during the three-year Project construction period.	Significant	**Mitigation Measure 5-6:** Construction Traffic Coordination. Shell shall provide a haul route plan for review and approval of the County Public Works Department and obtain a transportation/haul permit, if required, for review and approval of the County Public Works Department. TCPs should include at a minimum, a defined haul route, timing of deliveries/trips to avoid peak hours (construction schedule).	Less than Significant

NOTE: NA = Not Applicable.

CHAPTER 3
Project Description

3.1 Project Introduction and Location

3.1.1 Introduction

Equilon Enterprises, LLC, a Delaware limited liability company, doing business as Shell Oil Products U.S. (Shell), owns and operates an oil refinery located in and adjacent to Martinez, California. Shell is proposing the Crude Tank Replacement Project (CTRP or the "Project"). The Project would require a land use permit (LUP) under the Contra Costa County Department of Conservation and Development Industrial Safety Ordinance Section 84-63.1002(d). Approval of the LUP requires compliance with the California Environmental Quality Act (CEQA), including the preparation of an Environmental Impact Report (EIR). An application for an LUP was submitted by Shell to Contra Costa County (County) on January 14, 2010, and the Notice of Preparation (NOP) for the EIR was filed by the County on February 9, 2010. A scoping meeting was held by the zoning administrator on February 22, 2010 and comments were received from ten agencies during the 30-day scoping period.

In August 2010, Shell informed the County that it intended to make some revisions to the Project and provided updated information to the County for incorporation into the environmental review process. In April 2011, Shell advised the County that it intended to revise the Project again. These revisions included removing the two energy efficiency projects identified in the original application, the Catalytic Reformer Unit (CRU) Energy Recovery and the Distillates Hydrotreater (DHT) Energy Recovery energy efficiency projects, to enable those projects to be implemented in advance of the issuance of the LUP for the CTRP. As discussed in more detail in the Section 4.8, *Greenhouse Gas Emissions*, both the CRU and DHT energy efficiency projects are being implemented by Shell, but would be implemented prior to the issuance of the LUP for the CTRP; therefore, they are not considered part of the CTRP. The revisions also included adding the F-40 Air Preheater project as a part of the Project to further reduce greenhouse gas emissions.

The California State Lands Commission (CSLC) recently completed a CEQA review for an application for a new 30-year lease of California sovereign lands to Shell. The lease, granted on June 23, 2011, allows Shell to continue to operate its existing marine terminal (MT). The MT lease project objective is to maintain the Refinery operational viability by continuing current Shell MT operations. Without the use of the MT, the Refinery would not be viable and would be shut down and would render the CTRP unnecessary. The issuance of a new lease by the CSLC for the MT was required for continued operation of the Refinery with or without the CTRP. This Chapter presents some additional information about the MT lease project in Section 3.4.3.

3.1.2 Location

Shell's Martinez Refinery (Refinery) is located approximately 25 miles northeast of San Francisco (see Figure 3-1) adjacent to the community of Martinez. Figure 3-2 displays an aerial photograph of the Refinery property boundary. The Refinery is primarily bounded by Pacheco Boulevard to the south and Interstate 680 to the north, except for portions of the Refinery that border the Carquinez Strait north of Marina Vista. Shell Avenue bisects the plant from north to south and Marina Vista Drive runs east-west along the northern portion of the Refinery. The primary processing area of the Refinery is between Pacheco Boulevard and Marina Vista, and the wastewater treatment plant and wharf operations are between Marina Vista and the Carquinez Strait. Approximately 20 percent of the Refinery is located within the corporate limits of the City of Martinez. The remainder of the Refinery is in an unincorporated area of the County. All of the Project components would be constructed within the County.

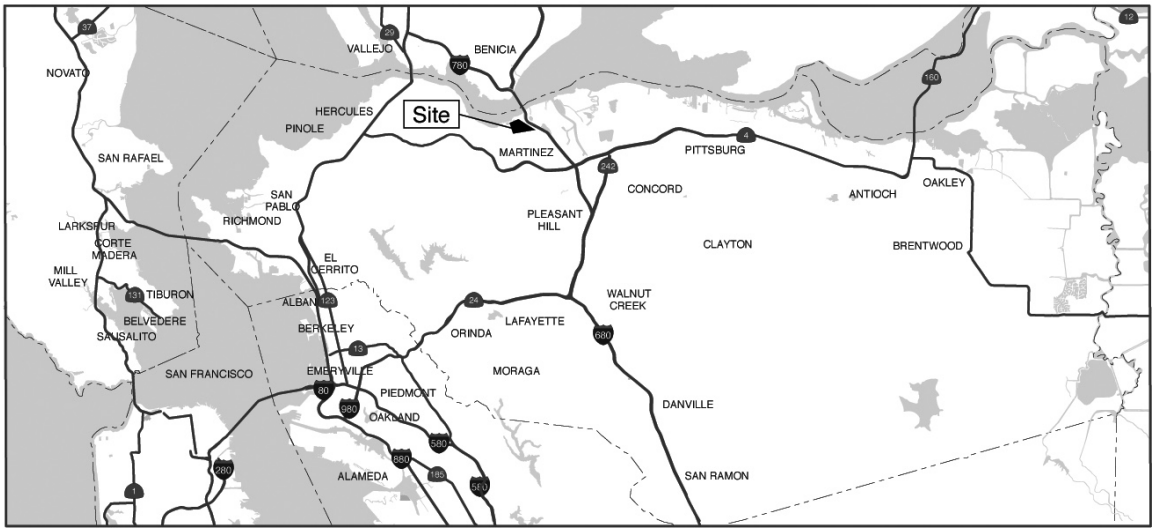
The Refinery property is designated for industrial use in the County and City of Martinez general plans, and its zoning is heavy industrial. Present land uses at the locations where Project components would be installed are petroleum refining. Construction and operation of equipment associated with the Project would be within the current Refinery property boundaries.

3.2 Project Overview

3.2.1 Project Objectives

The Project would increase crude oil storage capacity at the Refinery in order to maintain current production levels. Shell's long-term prospect of providing fuels to the market hinges on the Refinery's ability to supplement diminishing San Joaquin Valley (SJV) crude oil feedstocks with other similar crudes. Historically, the Refinery has relied on a steady flow of SJV crudes through the Kettleman to Los Medanos Pipeline operated by Chevron, and the Shell Pipeline[1]. Crude oil supply dynamics independent of the Project require that the Refinery shift from its reliance on pipeline supply to receiving more imports by vessel in order to sustain current production levels and remain competitive. Without increased storage tank capacity, the Refinery would operate at greater risk of periodic crude oil shortages. The Project would reduce the risk of crude shortages by increasing the onsite crude oil storage capacity as the source of crude oil supply shifts from pipeline to vessel. Receipt of crude oil via vessel is by nature more sporadic and unpredictable than receiving crude oil continuously by pipeline because shipments periodically arrive in large volumes and may arrive more or less frequently than expected. Due to this uncertainty, Shell has indicated that it is essential that the Refinery increase its onsite crude oil storage capacity in order to accommodate peaks and declines in crude oil shipments, thus ensuring that sufficient inventory is maintained to provide for the safe and steady operation of the Refinery. The Refinery is designed to process heavy to intermediate crude oil. The CTRP does not change the characteristics of the crude oil the Refinery processes. No physical modifications would be made

[1] The Shell 20" pipeline originates in the Bakersfield region of southern San Joaquin Valley and terminates in the San Francisco Bay Area at the Valero, Tesoro, and Shell refineries.



Shell Crude Tank Replacement Project

Figure 3-1
Project Site Location

Shell Crude Tank Replacement Project

Figure 3-2
Shell Martinez Refinery Property Boundary

at the Refinery's hydrocarbon processing equipment or marine terminal and there would be no change in the existing Refinery permit conditions that limit emissions from the marine terminal.

In summary, the objectives of the Project are to:

- Increase crude oil storage capacity at the Refinery to facilitate future operations at current production levels despite anticipated changes in the source of crude oil feed stocks with no increases in crude oil throughput at the Refinery;
- Maintain current operation and production levels of California Air Resources Board (CARB) mandated cleaner-burning gasoline and ultra low sulfur diesel (ULSD) fuels at the Refinery substituting imported crude oil by vessel for diminishing SJV crude by pipeline;
- Make no modifications to Refinery process equipment and operations, other than to provide criteria pollutant and greenhouse gas emission reduction measures; and
- Coordinate with the California State Lands Commission's environmental review of the new lease renewal for the MT to insure consistency between the CTRP LUP conditions and the new MT lease.

3.2.2 Project Component List

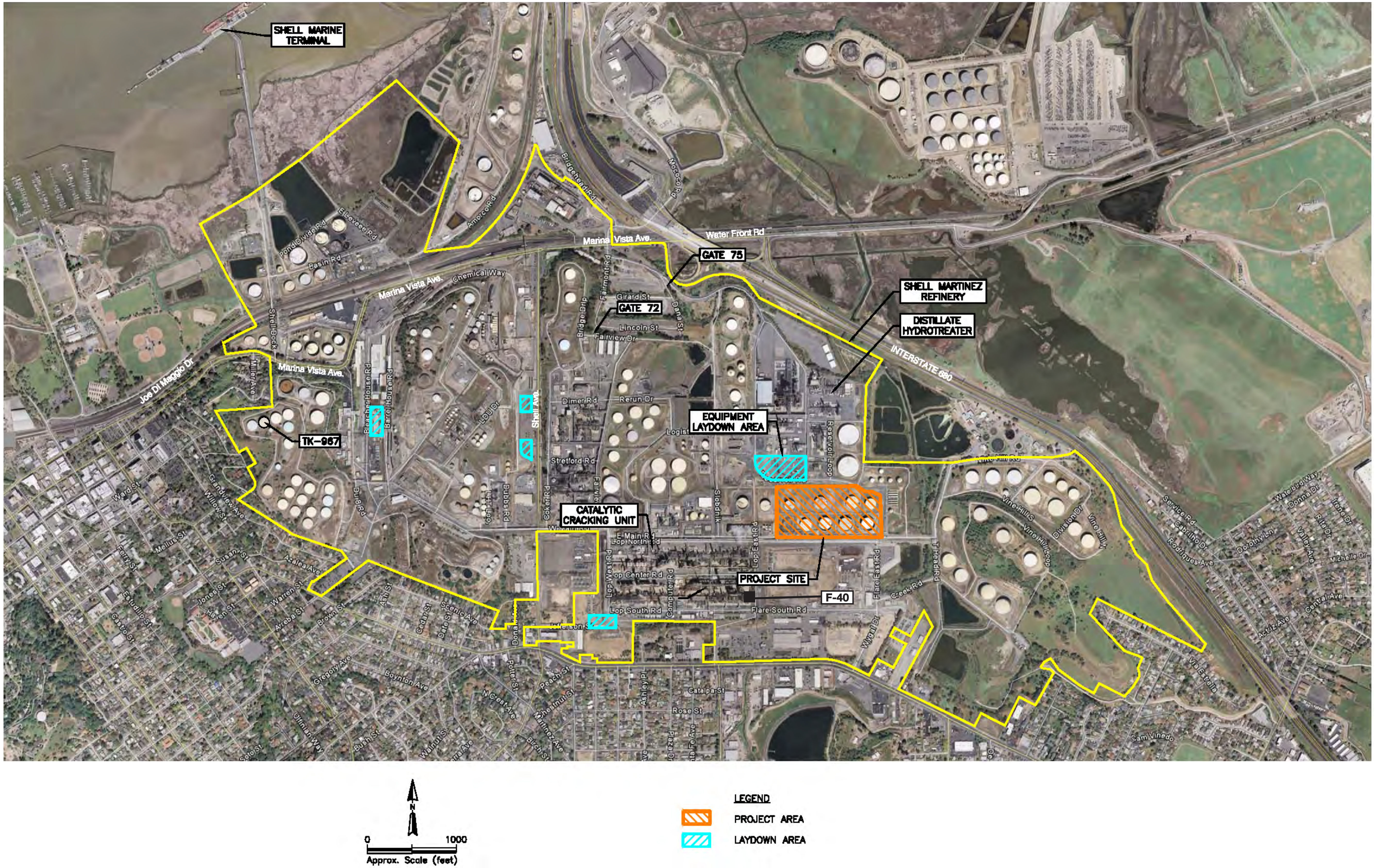
The Project includes three components:

- **Crude Oil Storage Tanks Replacement** – Replacement of two existing crude oil storage tanks and the existing crude oil mix tank with three new, larger crude oil storage tanks, and construction of a new crude oil mix tank. The CTRP would also include refurbishment of an existing storage tank for crude oil service. The CTRP would result in an increase in storage capacity at the facility of approximately 800 thousand barrels (MBbl).
- **Increased Crude Oil Shipments Received at the Marine Terminal** – Increase the volume of crude oil shipments received at the marine terminal by approximately one ship per week to maintain production levels as crude oil delivered by vessel replaces SJV crude oil received by pipeline.
- **Emission Reductions Measures** – Implementation of emission reduction components as proposed measures to reduce Project emissions to or below applicable CEQA thresholds.

For each CTRP component described above, the relation to the Project objectives, a description of current operations, and the proposed changes in operations and equipment are presented below.

3.3 Existing Shell Martinez Refinery

The Refinery converts crude oil into many finished products, including the specialized cleaner-burning CARB gasoline and ULSD fuels, which are sold in California. In addition, the refinery produces liquefied petroleum gas, jet fuel, industrial fuel oils, and asphalt. The Refinery also operates a wastewater treatment plant for treating refinery-generated wastewater, and a marine terminal that services refinery product and feedstock transports via ocean-going vessels.



SOURCE: Google Earth

Figure 3-3
Project Component Locations

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The maximum amount of throughput that the Refinery is currently permitted by the Bay Area Air Quality Management District (BAAQMD) to process is 178.8 MBbl per day and an annual average of 59,568 MBbl (BAAQMD Condition 18618). The BAAQMD permit covers maximum allowable emissions associated with the Refinery, which includes the marine terminal (BAAQMD Condition 7618).

Major equipment used for processing both fuels and other refinery products includes distillation columns, storage tanks, reactors, vessels, heaters, boilers, and other ancillary equipment. The purpose of refining is to convert low-grade crude oil to high-grade products such as gasoline, jet fuel, diesel fuel, asphalt, and other products. Oil refining includes four basic processes, described in the following sections.

3.3.1 Basic Refinery Processes

Refineries are designed to process crude oils with certain physical and chemical characteristics. Crude oils throughout the world vary significantly in these characteristics and, consequently, refinery designs vary throughout the world as well. The two most common measurements of crude oil quality are its specific gravity and sulfur content. The Refinery is currently designed to process heavy crude with moderate sulfur content. The suite of the Refinery process and support units (see Table 3-1) has evolved over time to accommodate this heavy, moderate sulfur content crude historically received from SJV as well as to comply with the rigorous California environmental and product specification requirements.

TABLE 3-1
SHELL MARTINEZ REFINERY EXISTING PROCESS UNITS

Unit	Basic Purpose/Comments
Crude Oil/Vacuum Flashers	Initial distillation cuts for further processing
Catalytic Cracking Unit	“Cracks” big hydrocarbon molecules into small ones
Flexicoker	Produces coke then gasifies it for refinery fuel
Delayed Coking Unit	Produces coke for market (uses “pitch” for feed)
Hydrocracking Unit	“Cracks” big hydrocarbon molecules into small ones
Dimersol Unit	Makes “C6” gasoline from two “C3s”
Isomerization Unit	Reduces benzene content for refinery fuel gas blending
Catalytic Reformer	Removes hydrogen for octane enhancement
Alkylation Unit	Makes “C8” iso-octane from two “C4s”
Asphalt Plant	Made from the heavy ends or “bottom of the barrel”
5 Light Product Hydrotreaters	Removes sulfur and other impurities from hydrocarbons
3 Hydrogen Plants	Hydrogen replaces sulfur and “saturates” hydrocarbons
4 Sulfur Plants	Produced from hydrotreating and light gas processing

The density of crude oil is typically measured using the American Petroleum Institute (API) standard gravity of the crude oil. The API gravity is inversely related to specific gravity. Specific gravity is the ratio of the density of a material to the density of water (the specific gravity of pure water at 60°F is defined as 1.0). Water with a specific gravity of 1.0 has an API gravity of 10.0 degrees. Crude oil with API gravity greater than 10.0 degrees would float on water, crude oil with API

gravity less than 10.0 degrees would be known as a “sinker.” Crude oil is characterized as heavy, intermediate, or light with respect to its API gravity. Heavy crude oil is defined as crude with an API gravity of 18 degrees or less. This heavy crude oil contains smaller amounts of low-boiling-point hydrocarbons (gasoline and jet/diesel range) than contained in lighter crude.

The Refinery is designed to convert the heavier hydrocarbon into the gasoline- and diesel-range hydrocarbons using the conversion process units listed in Table 3-1. These units include the Catalytic Cracking, Hydrocracking, and Delayed Coking units. Typical SJV crude oil ranges from 12 to 30 degrees API gravity. Non-California crude oil processed at the Refinery over the past several years has ranged from 10 to 32 degrees API gravity. The Refinery blends its various stocks of crude oil prior to processing in order to refine an overall composite heavy crude oil blend.

Sulfur content is another basic characteristic of crude oil. Crude oil is defined as “sweet” if the sulfur content is 0.5 percent or less by weight and “sour” if the sulfur content is greater than 1.0 percent by weight. Sulfur compounds in crude oil are chemically bonded to hydrocarbon molecules in the oil. Sulfur must be removed from the hydrocarbon streams to meet the Federal and California product specifications and environmental emission limitations. The Refinery is designed to process moderately sour crude oil by removing the sulfur from the crude oil, intermediate-hydrocarbon feedstocks, and finished products through the operation of its hydrotreaters and sulfur plants. The SJV crude processed at the Refinery has ranged from 0.5 to 1.6 percent by weight sulfur whereas non-California crude processed at the Refinery has ranged from 0.5 to 4.0 percent or less by weight sulfur.

A more extensive discussion of crude oil used at the Refinery is provided in Appendix B.

Refineries process crude oil into usable products, such as gasoline, diesel, jet fuel, fuel oil, liquefied petroleum gas (LPG), or other petroleum based products. To produce these products, various process units in a Refinery perform one or several of four fundamental functions, including:

- Separation;
- Conversion;
- Purification; and/or
- Blending.

Additionally, refineries require a number of supporting processes and equipment to provide energy and raw materials as well as to manage and treat wastes.

3.3.1.1 Separation

To carry out the process of separation, the Refinery takes advantage of the fact that individual hydrocarbon molecules boil at different temperatures (at a specified pressure) according to the size of the molecules. As a result, a mixture of various compounds contained in a single-feed stream, such as crude oil, can be separated using a distillation column or fractionator where the temperature decreases from the bottom to the top of the column. The smaller hydrocarbon molecules rise to the top of the column as gases. The heavier hydrocarbons fall to the bottom of the column

as liquids. With distillation, mixed feed stocks in crude oil can be separated into distinct hydrocarbon streams or fractions.

At petroleum refineries, the first main processing step is to remove inorganic salts from crude oil and then separate the crude oil into several distinct hydrocarbon streams using atmospheric- and vacuum-distillation columns. The separation process is used at many other Refinery units in fractionators and splitters to separate various products into distinct hydrocarbon streams.

3.3.1.2 Conversion

After the initial separation of crude oil has occurred, fractions created from distillation are routed to process units that convert the molecules for optimal blending into finished products. Conversion of molecules is accomplished by two primary processes – cracking and reforming.

The process of cracking breaks large and cyclic molecules into smaller compounds that possess chemical and physical properties better-suited for the finished product. Cracking at most refineries is performed at catalytic cracking units, hydrocracking units, and coking units. Catalytic cracking units use catalysts to induce chemical transformations to smaller molecules. Hydrocracking units are a class of cracking units that use hydrogen, high temperature and pressure, and catalysts to achieve the desired molecular conversions. Coking units use high temperature to induce thermal cracking.

The process of reforming (i.e., combining) transforms the shape of hydrocarbon molecules. Process units such as catalytic reformers, isomerization units, and alkylation units rearrange a compound's chemical structure without significant cracking or breaking of molecules. These reforming process units create a high percentage of final blending components for gasoline.

3.3.1.3 Purification

Impurities must be removed from fractions of gasoline and diesel before these fractions are processed or blended into finished products. Purification includes the removal of undesirable components such as hydrogen sulfide, sulfur, and nitrogen compounds. Hydrotreaters purify the fractions by heating a mixture of hydrocarbons and hydrogen and then feeding this mixture into a reaction chamber containing a catalyst. When the hydrocarbon and hydrogen molecules come in contact with the catalyst, a chemical reaction converts sulfur and nitrogen molecules bound in hydrocarbon molecules to hydrogen sulfide and ammonia gases. These gases are separated from the hydrocarbon liquids and sent to the Sulfur Recovery Plant where the ammonia is converted to nitrogen and the sulfides are converted to elemental sulfur, to be sold as a product.

3.3.1.4 Blending

After separating, converting, and purifying, the final Refinery process is blending. The blending process involves numerous streams from storage tanks and process vessels that are mixed (i.e., blended) into finished products. The final products contain the correct chemical and physical properties specified for each fuel.

3.3.1.5 Supporting Processes

Refineries require support processes that rely on utilities such as cooling water, electricity, steam, and hydrogen for production. Cogeneration facilities provide continuous electric power and steam to the Refinery, which operates 24 hours per day, seven days per week. Numerous boilers and furnaces are used throughout the Refinery to generate steam and heat for process units. Onsite support facilities supply raw materials such as hydrogen and oxygen used in refining.

Refineries must manage the liquid and solid wastes generated in the refining of fuel products. Wastewater treatment systems manage the process water discharged in the Refinery and the storm water collected in the Refinery. The Refinery must comply with environmental regulations that limit the levels of organic and inorganic chemicals in wastewater discharge.

Refineries also operate systems to recover those hydrocarbons that are mixed with liquid and solid wastes. The recovered hydrocarbons are recycled back to the crude oil unit to make useful products. The solid wastes that are collected onsite are sent for appropriate offsite disposal.

3.3.1.6 Existing Refinery Processes and Facilities

Through a variety of chemical reactions and physical changes, the Refinery manufactures finished petroleum products from crude oil. The purpose of refining is to convert low-grade crude oil to high-grade products such as gasoline, jet fuel, diesel fuel, asphalt, and other products.

Figure 3-4 displays a Refinery-wide schematic of the general process flows through the various Refinery units. Table 3-1 provides a brief description of these process units. The Project would not alter the existing process flows of the Refinery.

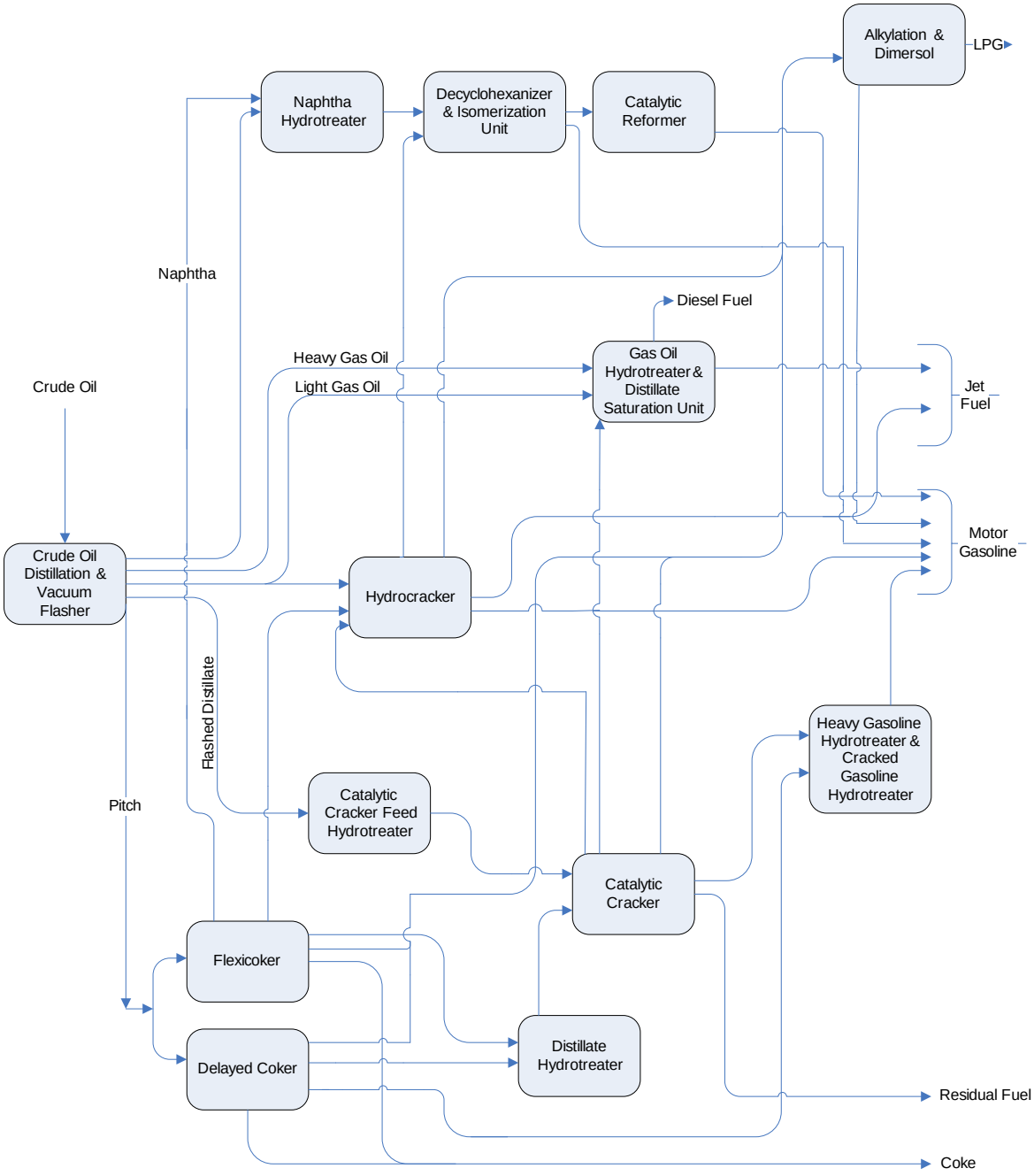
3.4 Components of the Project

3.4.1 Introduction

The Project includes three components: Crude Oil Storage Tanks Replacement, Increased Crude Oil Shipments Received at the Marine Terminal, and Emission Reductions Measures. A more detailed description of each of the Project components is provided in the following sections of this chapter and the impacts of each Project component are described in Chapter 4, *Environmental Setting, Impacts, and Mitigation Measures*.

3.4.2 Crude Oil Storage Tanks Replacement

As discussed above, the primary objective of the CTRP is to increase onsite crude oil storage capacity at the Refinery to maintain production levels as crude oil delivered by vessel increases and pipeline SJV crude oil decreases as a feedstock. Because SJV crude oil has been delivered by pipeline, crude oil supply has been steady and predictable, and the Refinery has been able to operate with its existing onsite crude oil storage capacity. In the future, the Refinery would require an increasing percentage of its crude oil supply to be delivered by vessels instead of pipelines. To accommodate

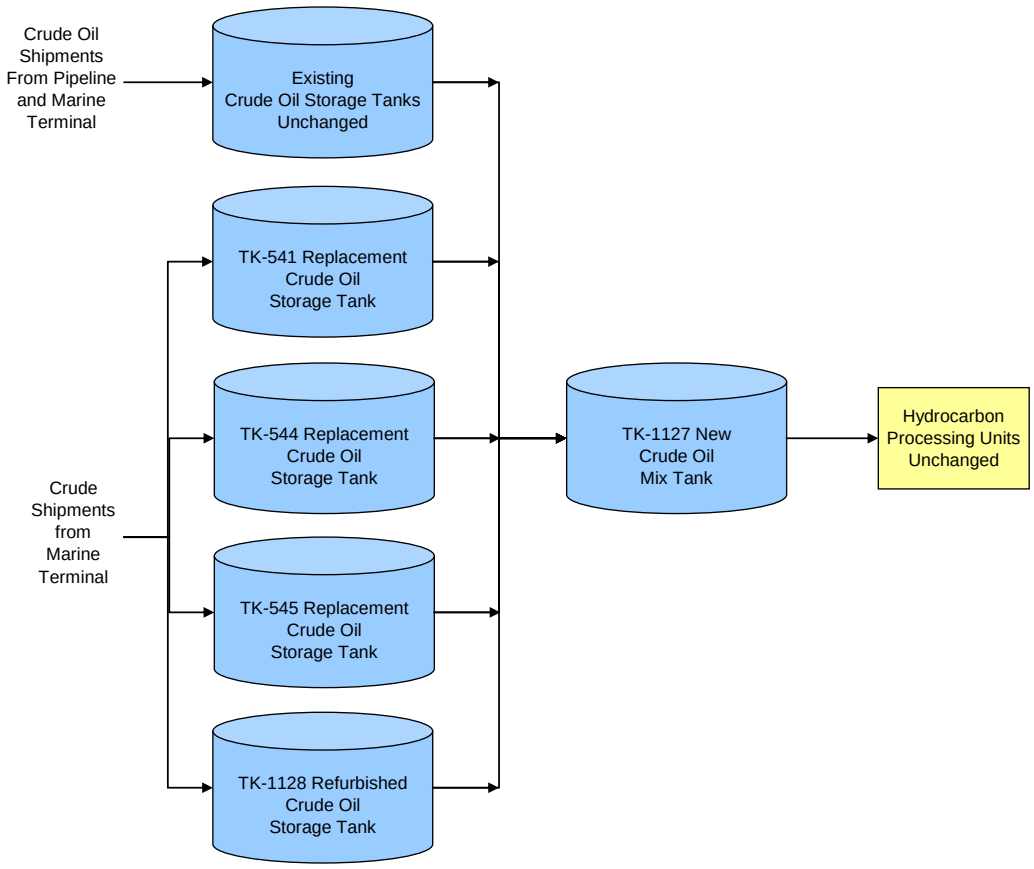


Shell Crude Tank Replacement Project

Figure 3-4
Shell Martinez Refinery Process Schematic

these increases and the corresponding variability and intermittent nature of crude oil marine shipments/volumes, the increase in onsite crude oil storage capacity would be necessary to provide for the steady operation of the facility.

To expand on-site crude oil storage capacity to accommodate the expected increase in crude oil via marine shipments, Shell proposes to increase crude oil storage capacity for marine shipments at the Refinery by approximately 800 MBbl. To create the additional necessary storage capacity, Shell proposes to replace two existing crude oil storage tanks and the existing crude oil mix tank with three new larger crude oil storage tanks, and to construct a new crude oil mix tank. The CTRP would also include refurbishment of an existing storage tank for crude oil service. Operations of the crude oil storage tanks would remain unchanged, in that, as with the current operation, crude oil received via pipeline and at the marine terminal would be stored in crude oil storage tanks and then blended together in a mix tank and transferred to the hydrocarbon processing units. Figure 3-5 shows a schematic of the proposed operation of the crude oil storage tanks, indicating existing and unchanged, replacement, refurbished, and new tanks.



Shell Crude Tank Replacement

Figure 3-5
Crude Oil Storage Schematic –Proposed Operations

The existing crude oil storage tanks and mix tank would be decommissioned and removed, and the new storage tanks and mix tank would be built in the same area as the tanks they replace. Figure 3-6 presents an aerial view the existing tank farm location, indicating where the existing crude oil storage tanks would be replaced with the new tanks.

The Project would replace three existing riveted crude storage tanks (i.e., TK-541, TK-544, and TK-545) with welded tanks and would refurbish one existing welded tank (i.e., TK-1128). The new crude oil mix tank (TK-1127) would also be a welded tank.

The proposed replacement crude oil storage tanks would be larger in diameter and taller than the tanks to be replaced. Tables 3-2 and 3-3 provide dimensions and capacities for the existing and proposed storage tanks and mix tank. An Authority to Construct and Permit to Operate would be required from the BAAQMD to construct and operate these tanks.

TABLE 3-2
EXISTING STORAGE TANKS TO BE REPLACED OR REFURBISHED

Shell Tank ID	Tank Type	Shell	Capacity (MBbl)	Height (feet)	Diameter (feet)
TK-541	Mix Tank / External Floating Roof	Riveted	55	41	120
TK-544	Storage Tank / External Floating Roof	Riveted	78	40	144
TK-545	Storage Tank / External Floating Roof	Riveted	79	40	144
TK-1128	Fixed Roof / Out of Service	Welded	55	40	120

TABLE 3-3
PROPOSED REPLACEMENT, NEW AND REFURBISHED CRUDE OIL STORAGE TANKS

Shell Tank ID	Tank Type	Shell	Capacity (MBbl)	Height (feet)	Diameter (feet)
TK-541 – Replacement	Storage Tank / External Floating Roof	Welded	300	70	190
TK-544 – Replacement	Storage Tank / External Floating Roof	Welded	300	70	190
TK-545 – Replacement	Storage Tank / External Floating Roof	Welded	300	70	190
TK-1127 – New	Mix Tank / External Floating Roof	Welded	55	40	120
TK-1128 – Refurbished	Storage Tank / Internal Floating Roof	Welded	55	40	120

Each of the proposed replacement, new, and refurbished storage tanks would contain a welded shell and each replacement and new tank would have an external floating roof. The proposed refurbished tank would contain an internal floating roof. The proposed tanks would use primary and secondary roof seals, and roof fittings that comply with the most current BAAQMD requirements for floating roof tanks to maintain vapor control for precursor organic compounds (POC) emissions pursuant to BAAQMD regulations.

Similar to the existing storage tanks, the proposed storage tanks and mix tank would be heated to maintain the tank contents at a temperature[2] to facilitate pumping. The proposed crude oil storage tanks and mix tank would also contain electric in-tank mixers similar to those used in the existing crude oil storage tanks (including the out of service tank) and the existing mix tank. Each of the proposed replacement, new, and refurbished crude storage tanks would be equipped with a new upgraded tank dewatering system. This would include enclosed piping from the bottom of each tank, transport to existing oil/water separation facilities, and injection into the Refinery's wastewater treatment system.

The following discussions provide specific details on the existing and proposed crude oil storage and mix tanks as well as information associated with other tank infrastructure components.

3.4.2.1 Tank 541, Mix Tank

Tank 541 (TK-541), located in the northwestern corner of the Project area (see Figure 3-6), is currently used as the mix tank. This tank is used to blend crude oils received via pipeline and marine shipments prior to transfer to the hydrocarbon processing units. TK-541 is a riveted tank with an external floating roof. TK-541 is designated as S-541 in the BAAQMD Permit to Operate and Title V Permit.

Shell proposes to demolish the existing mix tank (TK-541) and in its place construct a new external floating roof storage tank of welded construction. The new TK-541 crude oil storage tank would be larger in capacity, diameter, and height than the existing TK-541, and would be used for storage of crude oils received via marine shipment. This tank would require a BAAQMD Authority to Construct permit. The proposed external floating roof would meet BAAQMD best available control technology (BACT) requirements to control POC emissions.

3.4.2.2 Tank 544, Crude Oil Storage Tank

Currently a crude oil storage tank, Tank 544 (TK-544) is located in the northern row of tanks in the Project area (see Figure 3-6). Tank 544 is a riveted tank with an external floating roof. TK-544 is designated as S-544 in the BAAQMD Permit to Operate and Title V Permit.

Shell proposes to demolish the existing TK-544 crude oil storage tank and build an external floating roof storage tank of welded construction in the same location. The new TK-544 crude oil storage tank would be larger in capacity, diameter, and height than the existing TK-544, and would be used for storage of crude oils received via marine shipment. This tank would require a BAAQMD Authority to Construct permit. The proposed external floating roof would meet BAAQMD BACT requirements to control POC emissions.

[2] The anticipated typical operating ranges for the tanks are between 90 F to 120 F for the storage tanks and 130 F-150 F for the mix tank.

LEGEND

PROPERTY BOUNDARY

PROJECT AREA

N

0 1000

Approx. Scale (feet)

SOURCE: Google Earth

Shell Crude Tank Replacement Project . 209699

Figure 3-6

Aerial View of Existing Tank Farm and Tank Replacement

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3.4.2.3 Tank 545, Crude Oil Storage Tank

Tank 545 (TK-545), located in the northern row of tanks in the Project area (see Figure 3-6), adjacent to existing Tank 1128, is currently in service as a crude oil storage tank. TK-545 is a riveted tank with an external floating roof. TK-545 is designated as S-545 in the BAAQMD Permit to Operate and Title V Permit.

Shell proposes to demolish the existing TK-545 crude oil storage tank and build an external floating roof storage tank of welded construction in the same location. The capacity of the new TK-545 would be greater than the existing TK-545 capacity, and the new TK-545 would be larger in height and diameter. The new TK-545 would be used for storage of crude oils received via marine shipment. This tank would require a BAAQMD Authority to Construct permit. The proposed external floating roof would meet BAAQMD BACT requirements to control POC emissions.

3.4.2.4 Tank 1128, Out-of-Service Storage Tank

Tank 1128 (TK-1128), an out-of-service welded, insulated fixed roof storage tank, is located in the northeastern corner of the Project area (see Figure 3-6).

Shell proposes to refurbish the existing tank structure of TK-1128 to retrofit it to an internal floating roof storage tank. The refurbished TK-1128 would continue to be welded with insulation and would have the same capacity, height, and diameter as the existing TK-1128. The refurbished TK-1128 would be used for storage of crude oils received via marine shipment. This tank would require a BAAQMD Authority to Construct permit. The proposed internal floating roof would meet BAAQMD BACT requirements to control POC emissions.

3.4.2.5 New Tank 1127, Crude Oil Mix Tank

A new tank, Tank 1127 (TK-1127) would be constructed in the southwest corner of the Project area (see Figure 3-6). The new TK-1127 would be built south of TK-541, in a currently unoccupied space, with an external floating roof. The tank shell would be of welded construction and would be used as a mix tank for crude oils received from both the pipeline and the marine terminal. This tank would require a BAAQMD Authority to Construct permit. The proposed external floating roof would meet BAAQMD BACT requirements to control POC emissions.

3.4.2.6 Tank Infrastructure Components

New piping would be constructed within the Project area from the existing onshore piping connection to allow transfer of crude oil to the proposed crude oil storage tanks. In addition, new piping and new electric transfer pumps would be installed to allow transfer of crude oil from the proposed storage tanks to the proposed mix tank. The tanks would also be equipped with steam coils in order to facilitate pumping of crude oil. A set of three new heat exchangers would also be installed to supplement the tank steam coils. These heat exchangers would be shared by the affected project tanks. A dewatering system including pumps and piping for the proposed tanks would also be installed. Each tank would be constructed with a process sewer sump and pump. The tank levee would continue to have storm water sumps and pumps.

3.4.3 Marine Terminal

As previously discussed, the Shell marine terminal (MT) operates on sovereign land leased from the CSLC as a barge and tanker transfer facility for crude oil and petroleum products. Figure 3-7 is an aerial photo that illustrates the MT area. The MT is capable of operating annually for 365 days, 24 hours a day, although actual operating time depends on shipping demands. The CSLC has primary authority, jurisdiction, and extensive experience with respect to marine terminals.

3.4.3.1 Terminal Lease Status

In 2004, Shell applied to the CSLC for a new 30-year lease for its MT operations. CSLC recently certified an EIR (SCH 2004072114) (CSLC, 2011) for the proposed new 30-year lease on June 23, 2011, and in the same action approved a new 30-year lease. The CSLC EIR describes the MT operations and evaluates the impacts of the proposed new lease, including evaluation of future vessel traffic impacts during the term of the lease. The additional marine vessel trips that would be associated with the proposed CTRP are included in the forecasted activity of the MT lease operations. The CSLC EIR estimates vessel activity at the Shell MT for the next 30 years and is based on a level of vessel activity considerably in excess of that assumed to result from the CTRP, which only includes the increase in deliveries of crude oil.

Provided below is a summary of the Shell MT operations, based on the detailed information available in the CSLC EIR.

3.4.3.2 Physical Description of Shell Marine Terminal

The MT is located on the southern shore of the Carquinez Strait approximately one-half mile west of the Benicia-Martinez Bridge (Interstate 680). The T-shaped MT consists of a concrete wharf connected to shore by an elevated wooden approach roadway. A 40-foot-wide, pile-supported pipe rack parallels the approach roadway. The wharf is 1,950 feet long and an average of 40 feet wide. The elevated roadway is 1,900 feet long and 16 feet wide.

The wharf has four berths (the location on the wharf where ships dock), including: two berths (i.e., #1 and #2) on the outer northern side, and two berths (i.e., #3 and #4) on the inner southern side. The berths are equipped with pumps, pipelines, electrical utilities, and other mechanical equipment. Berths #1 and #2 can be occupied simultaneously.

The northern side of the wharf (berths #1 and #2) normally maintains a minimum draft of minus 38 feet mean lower low water (MLLW) and has not historically required dredging to support vessel traffic due to the high current velocities in the Carquinez Strait. Given the current level of use of the facility and the hydrodynamic setting, it appears that sediments have not substantially deposited or built up at berths #1 and #2. This is because propeller wash from the high volume of historical vessel traffic at the berths has likely already scoured sediment so that the bottom contours are no longer affected by propeller wash associated with maneuvering and berthing vessels. Resuspension and offsite transport of bottom sediments induced by existing vessel propeller wash likely no longer occurs. Consequently, berthing of an additional tanker per week

SOURCE: Google Earth

Shell Crude Tank Replacement Project . 209699

Figure 3-7
Marine Terminal

would not be likely to cause scour that would remobilize large quantities of bottom sediment (Peck, 2010). Berths #3 and #4 normally serve to load and unload barges, but currently are not in use because of accumulated silt. These berths were dredged to minus 20 feet MLLW in 1989.

There are two breasting dolphins (sturdy pilings for protecting the wharf from moored vessels) and two mooring dolphins connected by walkways on each side of the wharf to attach vessel's mooring lines. Oil-containment booms are located on each end of the wharf. The MT is equipped with a marine vapor recovery system to capture hydrocarbon vapor emitted during loading operations.

Hydrocarbon pipelines connect the MT to the Refinery storage tanks on the upland parcel. All pipelines connecting the MT to the Refinery tank farm are above ground, regularly inspected, and painted for corrosion protection.

3.4.3.3 Current Operations

The Shell MT serves inbound and outbound shipments and handles different types of crude oil, refined products, and feedstocks. Petroleum products handled at the MT consist of light products and heavy products. Light products include finished gasoline, gasoline components and blend stocks, jet fuels, diesel fuels, and cutter stocks. Heavy products include crude oils, gas oils, residual materials, condensates, and other refinery feedstocks.

A summary of operations and procedures for the MT are outlined as follows:

- Inspection and testing prior to ship arrival;
- Vessel mooring;
- Oil/product transfers;
- Inspection programs; and
- Emergency shutdown systems.

Shell records indicate that during the period from 1994 to 2004, the Shell terminal handled as many as 412 annual vessel calls at a volume of 48,300 thousand barrels (MBbl) per year. Table 3-4 shows the volume of receipts and deliveries for the MT for the last three years, 2007 through 2009, in MBbl per year. Table 3-5 shows the crude oil tanker[3], total tanker, and barge calls and the total vessel call amounts at the MT for the last three years, 2007 through 2009.

TABLE 3-4
THROUGHPUT SUMMARY FOR THE SHELL MARINE TERMINAL

Year	Shell Terminal Receipts (Vessel Volumes Arriving) (MBbl/y)	Shell Terminal Deliveries (Vessel Volumes Departing) (MBbl/y)	Total Yearly Throughput (MBbl/y)
2007	14,750	11,780	26,530
2008	14,870	14,974	29,844
2009	13,876	16,705	30,581
Average	14,499	14,486	28,985

[3] Crude oil delivered to the marine terminal can arrive either by tanker or barge. In the last three years, all crude oil deliveries have been by tanker.

TABLE 3-5
VESSEL CALL SUMMARY FOR THE SHELL MARINE TERMINAL

Year	Crude Oil Tanker Calls	Other Type Tanker Calls	Barge Calls	Total Vessel Calls
2007	34	23	120	177
2008	32	34	134	200
2009	23	46	148	217
Average	30	34	134	198

Annual volumes of crude oil shipments received at the MT are presented in Table 3-6 for the last three years, 2007 through 2009.

TABLE 3-6
CRUDE OIL THROUGHPUT SUMMARY FOR THE SHELL MARINE TERMINAL

Year	Shell Terminal Crude Oil Receipts (MBbl/d)	Shell Terminal Crude Oil Receipts (MBbl/y)
2007	31	11,147
2008	31	11,310
2009	20	7,235
Average	27	9,897

Typically, crude oil tankers calling at the MT range from 30,000 Dead Weight Tonnage (DWT) to 150,000 DWT and up to 1,000 feet in length. DWT is the unit used to establish the maximum weight of a vessel that can be handled safely. The depths of the water and bridge clearances are limiting factors for the sizes of vessels calling at the terminal.

3.4.3.4 Proposed Changes

There are no physical changes to MT equipment proposed as part of the CTRP. However, as SJV crude oil deliveries by pipeline diminish, Shell would require an increasing percentage of its crude oil supply to be delivered by vessels. Vessel deliveries would be handled at the existing MT. In a previous ten-year period between 1994 and 2004, there were as many as 412 vessel calls per year. At the date of the NOP for the CSLC EIR, Shell's vessel traffic was approximately 260 vessels per year and Shell has estimated that future vessel traffic during the term of the new lease could reach up to 330 vessel calls per year (CSLC, 2011). As shown on Table 3-5, the current three-year average for vessel calls at the MT is 198. Shell estimates that when the CTRP would be fully implemented, vessel calls at the MT would increase above recent levels by approximately 57 calls per year.

Shell proposes to increase the total daily volume of crude oil shipments received at the MT up to 120 MBbl per day from the current 27 MBbl per day average. To accommodate this increase in crude oil shipments across the MT, there would be an increase of approximately one ship per

week to maintain production levels as crude oil delivered by vessel replaces SJV crude oil received by pipeline.

3.4.4 Energy Consumption

Energy at the Refinery is used to provide power to transfer pumps and heating elements associated with moving and storing crude oil. The energy is in the form of electricity, natural gas, refinery fuel gas, or steam. Electricity is obtained either from Pacific Gas and Electric Company (PG&E) off the electricity grid, or from the on-site cogeneration plant that is owned and operated by Shell. Natural gas supplied by PG&E is used to supplement fuel gas produced in the Refinery. Both natural gas and refinery fuel gas are used to fuel furnaces, boilers, and other combustion devices. Steam is produced within the Refinery by a series of boilers and by the heat recovery steam generators associated with the cogeneration plant.

The additional energy demand that would be associated with the CTRP is expected to be negligible in comparison to current Refinery usage. Current and Project energy usage demands for the CTRP are described below.

3.4.4.1 Existing Crude Oil Storage Tanks

Steam is used to heat the contents of the storage tanks to maintain the tank contents at a temperature that facilitates pumping into the mix tank for blending with other crude oils prior to discharge to the Crude Oil Distillation Unit. Some of the existing crude oil storage tanks proposed for replacement are equipped with steam heating coils and none are insulated.

Electricity is used to power in-tank mixers located at the base of the crude oil storage tanks. The electric in-tank mixers are used to maintain a homogenous mixture prior to pumping the crude oil to the mix tank for blending. Table 3-7 shows the baseline energy consumption for in-tank mixers.

TABLE 3-7
EXISTING TANK ELECTRIC MIXERS

Tank	Current Number of Mixers	Horsepower Rating (hp)	Annual Electrical Demand (MW-hr) (Capacity Factor 0.6)
Tank 1128-out of service	NA	NA	NA
Tank 541 (current mix)	3	50	587
Tank 544	3	40	470
Tank 545	1	50	196
Total	**7**	NA	**1,253**

3.4.4.2 New and Refurbished Crude Oil Storage Tanks

The proposed crude oil storage tanks would have steam-heating coils to maintain the tank contents at a constant temperature to facilitate pumping, and would be insulated. Steam would be used occasionally, and its use would be dependent on the temperature of the crude oil as it would

come off the vessel, the viscosity, and the firing requirements at the crude unit furnaces. New heat exchangers using steam would also be used to provide additional heating. Although there would be an increase in crude oil volume requiring heating, because the new tanks would be insulated, the net increase in steam demand from current baseline is expected to be negligible.

The new crude oil storage tanks would be constructed with new electric in-tank mixers with larger horsepower ratings compared to the existing mixers as shown in Table 3-8 below.

TABLE 3-8
PROPOSED TANK ELECTRIC MIXERS

Tank	Planned Number of Mixers	Horsepower Rating (hp)	Annual Electrical Demand (MW-hr) (Capacity Factor 0.6)
Tank 1128-refurbished	1	60	235
Tank 541	3	75	881
Tank 544	3	75	881
Tank 545	3	75	881
Tank 1127 (New Mix Tank)	2	50	392
Total	**12**	NA	**3,270**

Based on the electric demand shown in Tables 3-7 and 3-8, electricity consumption for the CTRP in-tank electric mixers would increase by approximately 2,017 megawatt-hours (MW-hr) over baseline usage for the existing in-tank mixers.

In addition to the new in-tank mixers, electric transfer pumps would be installed, which would replace existing smaller pumps, to pump crude oil that would be re-routed from the SJV pipeline tanks to the new crude oil tanks. Since the overall amount of crude oil transferred within the Refinery and subsequently to the mix tank would be unchanged, there would be no net increase in electricity required from crude oil pump transfers. Any increase in electricity demand required by the new transfer pumps would be offset by a decrease in electricity demand from the existing pumps. For example, crude oil is currently pumped from the SJV crude oil pipeline tanks to the mix tank, and crude oil received via marine shipment is pumped from the storage tanks in marine crude oil service. As the amount of crude oil received via the wharf increases, and the pumping to the mix tank from storage tanks in marine crude oil service increases, there would be a corresponding drop in the volume of crude oil pumped from the SJV pipeline tanks to the mix tank. Therefore, there would be no net change in pump usage or electrical demand due to the installation of the three new transfer pumps. Although there is no net change in electrical demand, additional electrical infrastructure would be installed to accommodate the location of the new pumps.

To provide additional heating, new heat exchangers would be installed to support the affected project tanks. An additional set of two heat circulation pumps would be installed to circulate crude oil between the storage tank and the heat exchanger. There would also be seven new pumps installed in process wastewater and tank dewatering service. The additional electrical demand from these incremental new pumps is shown in Table 3-9.

TABLE 3-9
PROPOSED ADDITIONAL ELECTRIC PUMPS

Pump Service	Planned Number of Pumps	Horsepower Rating (hp)	Annual Electrical Demand (MW-hr)
Heat Circulation	2	150	1,175
Process Wastewater	6	75	294
Tank Dewatering	1	22	14
Total	**9**	**------**	**1,483**

NOTE: (Capacity Factor 0.6 for heat circulation, 0.1 for process wastewater and 0.1 for tank dewatering)

Based on the electric demand shown in Tables 3-7, 3-8, and 3-9, electricity consumption for the CTRP in-tank electric mixers and pumps would increase by 3,500 megawatt-hours (MW-hr) over baseline usage for the existing in-tank mixers and pumps. This increase in electricity usage would correspond to approximately 0.4 percent of current overall Refinery electricity consumption.

3.4.5 Emission Reduction Measures

Shell proposes to implement several Refinery wide emission reduction measures to reduce net Project emissions to or below applicable BAAQMD CEQA thresholds. These proposed measures include retrofits to an existing organic liquid storage tank to reduce POCs, operational changes to the existing Catalytic Cracking Unit (CCU) to reduce oxides of nitrogen (NO_x), and energy efficiency measures to ensure reduced fuel gas consumption would result in reductions of greenhouse gas (GHG) emissions.

3.4.5.1 Tank 967 Retrofits

Retrofits to the existing Tank 967 (TK-967) would be implemented to generate onsite contemporaneous emission reduction credits to offset POC emission increases from the new crude oil storage tanks, associated infrastructure components, and from increased marine vessel fuel combustion associated with the anticipated increase in crude oil shipping activity.

Current Operations

Existing TK-967 is a vertical cone-style, fixed-roof storage tank. TK-967 is used to store Jet A, an aviation fuel. As shown in Figure 3-3, TK-967 is located in the western vicinity of the Refinery, approximately 4,800 feet west-northwest of the proposed location of the crude oil tank area. TK-967 has a shell of welded construction and is 40 feet high with a diameter of 120 feet. This tank is currently designated as S-967 in the BAAQMD Permit to Operate and Title V Permit as a source subject to a unit throughput limit (Condition 18618, Part 2).

Proposed Changes

To reduce POC emissions, Shell proposes to replace the existing fixed-roof on TK-967 with an internal floating roof. An internal floating roof consists of two components, a roof that floats on

the top of the petroleum liquid in the tank, and a fixed roof over the floating roof. The internal floating roof would be installed inside the tank. The internal floating roof design would limit the volume of airspace above the liquid into which volatile hydrocarbon vapors can evaporate, and thereby would reduce POC emissions. The tank shell would remain welded.

3.4.5.2 Catalytic Cracking Unit Changes

Operational changes of the existing CCU would be implemented to generate onsite contemporaneous emission reduction offsets. This would offset NO_x emission increases from increased marine vessel fuel combustion associated with the anticipated increase in crude oil shipping activity.

Current Operations

The CCU uses heat, pressure, and catalysts to break large hydrocarbon molecules into smaller ones, thereby converting more crude oil to gasoline blending stocks. The CCU input feedstocks come from the heavier fractions from the Crude Oil Distillation Unit. The CCU is designated as S-1426 in the BAAQMD Permit to Operate and Title V Permit. Emissions from the CCU are currently abated by carbon monoxide (CO) boilers and are limited by Refinery-wide and specific CCU emission limits for criteria pollutants (BAAQMD Condition 7618 and 12271) and as a source subject to a unit throughput limit (Condition 18618, Part 2).

Proposed Changes

In order to generate the necessary NO_x reductions at the CCU to offset NO_x emissions from increased shipping activity, Shell intends to make operational changes at the CCU and supporting CCU hydrotreater feed units. A combination of all of the operational changes summarized below would be used at any given time to achieve the necessary NO_x reductions.

Optimize Regenerator Conditions. Shell would reduce the amount of CO in the CCU regenerator and thereby run the unit closer to "full burn[4]." When a catalytic cracking unit operates closer to full burn, the nitrogen chemistry shifts to favor lower NO_x levels in the regenerator, resulting in lower NO_x emissions.

CCU Feed Quality Management. Two hydrotreaters currently treat the CCU feed of nitrogen prior to delivery to the CCU. Shell would optimize the performance of the two hydrotreaters in order to minimize the amount of nitrogen in the CCU feed. By lowering the amount of nitrogen in the CCU feed, the amount of potential nitrogen converted ultimately to NO_x in the CCU would be reduced.

[4] The CCU's primary components include the regenerator, steam stripper, and reactor. A CCU is operated in "full burn" when the regenerator is operated at low CO levels and with measurable oxygen (O_2) levels. When a CCU is operated closer to "full burn," the regenerator vessel CO level is reduced. The lower CO environment typically results in a shift in the nitrogen chemistry in a manner favorable to lower NO_x emissions.

Optimize CCU Hydrocarbon Stripper Operations. The CCU hydrocarbon stripper vessel located between the CCU regenerator and the CCU reactor removes hydrocarbon containing nitrogen from the catalyst before the catalyst enters the regenerator. By operating the CCU stripper (by adjusting and controlling steam rates), the hydrocarbon on the catalyst would be removed and hence the amount of hydrocarbon entering the regenerator would be reduced. By reducing the hydrocarbon entering the regenerator, the amount of nitrogen would be reduced and therefore, the amount of potential nitrogen converted ultimately to NO_x emissions would be reduced.

Optimize Catalyst Circulation Rate. By optimizing the catalyst circulation rate by adjusting operating conditions in the reactor (temperature, water injection rates, etc.), a reduction in NO_x emissions would be realized.

Import CCU Feed Management. As market conditions allow, Shell may selectively purchase lower nitrogen CCU feeds in order to lower NOx emissions at the CCU.

3.4.5.3 F-40 Air Preheater Energy Efficiency Improvement

Shell would install an air preheater (APH) at the Crude Unit furnace F-40, to improve the efficiency of this heater to reduce GHG emissions. The APH would reduce the amount of fuel consumed by F-40 and thereby lower GHG emissions. The reduction in GHG emissions would be applied to offset the CO_2e increases from the increased marine vessel combustion associated with the anticipated increase in crude oil shipping activity.

Current Operations

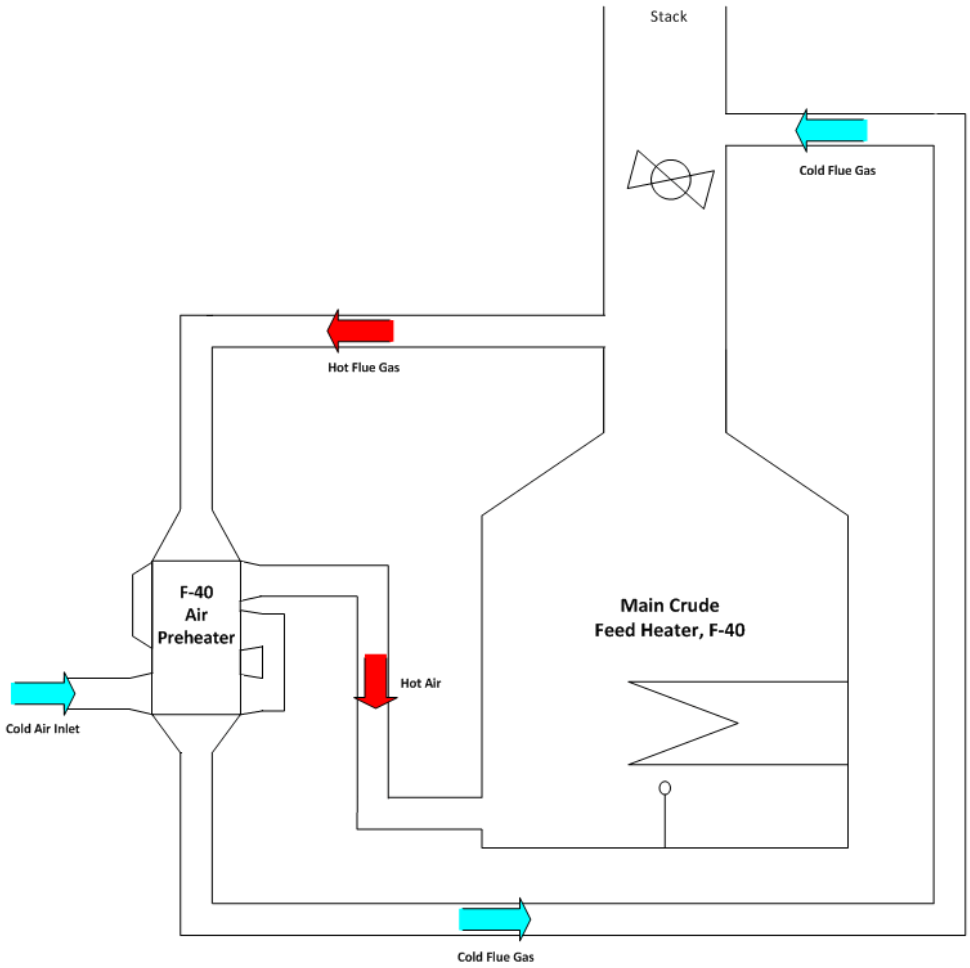
The Crude Unit F-40 furnace heats incoming crude oil prior to the crude oil reaching the Crude Unit by combusting refinery fuel gas. The F-40 exhaust (or flue gas) exits the stack and is then discharged to the atmosphere. In the BAAQMD Permit to Operate and Title V permit, The F-40 furnace is designated as S-1486, DH CU Feed.

Proposed Changes

As shown in Figure 3-8, the F-40 APH would use the hot flue gas from F-40 to heat the cold inlet combustion air used at F-40 for combustion. The increase in heat in the inlet combustion air would directly reduce the amount of refinery fuel gas required to heat the furnace firebox and thereby reduce GHG emissions.

3.5 Project Operations

Operation of the Project would not result in an increase in throughput to the Crude Oil Distillation Unit. The Refinery would continue to purchase crude oil within the range of specific gravity the Refinery is designed to process and the Project would not change the ability of the Refinery to process this range of specific gravities and sulfur content. The Project would not result in any modification to hydrocarbon processing units nor would its implementation cause an increase in crude oil processing capacity at the Refinery.



Shell Crude Tank Replacement Project

Figure 3-8
F-40 Air Preheater (Not to Scale)

3.5.1 Water Use

The Refinery currently uses two types of water: raw water and potable water. Raw water, obtained from the Contra Costa Water District, is untreated canal water. The Refinery treats the water and uses it to produce steam and for cooling water in the Refinery processes. The water is also used for fire suppression. Potable water, obtained from the City of Martinez, is treated water. It is used for drinking water, sanitary facilities, and for safety equipment (e.g., eyewash, showers, etc.). The Project would result in a negligible increase in water demand, with the increase occurring in increments over approximately three years as the equipment would be installed and operations begin.

3.5.2 Wastewater

The Project would not cause any appreciable increase in process wastewater volume. The type of wastewater generated by the Project would be similar in nature to the wastewater currently generated at the Refinery. Any process wastewater generated by the Project would be treated at the Refinery's Effluent Treatment Plant (ETP) and discharged through the existing outfall into Carquinez Strait, in compliance with the Regional Water Quality Control Board's (RWQCB) National Pollutant Discharge Elimination System (NPDES) permit (CA 0005789). Contra Costa Sanitary District treats the sanitary wastes on the eastern side of (where the CTRP is located) the Refinery.

3.5.3 Storm Water

Storm water that falls within the tank containment berms would be managed in accordance with Refinery storm water practices and Spill Prevention Control and Countermeasures (SPCC) Plan regulations. Uncontaminated storm water would be routed to the Refinery storm water system that is governed by the Refinery's NPDES permit. Shell estimates the Project would have little or no adverse effect on storm water discharges or quality because the surface area that collects storm water at the location of the crude oil storage and blending tanks would remain the same, and a higher percentage of the area would be covered by the storage and blending tanks.

3.5.4 Waste

No new waste streams or significant waste quantities would be created as a result of the Project. The potential increased waste quantity as a result of larger crude oil storage tanks would be expected to be negligible. Waste associated with infrequent tank cleanings would be managed either by recycling, through processing in the Refinery Delayed Coking Unit, or proper disposal of excess waste material.

3.5.5 Operations Workforce

Shell does not plan to add any additional full-time personnel to accommodate increases in workload due to this Project.

3.6 Project Construction

Decommissioning and removal of existing storage tanks and construction of new storage tanks would be conducted in phases as shown in Table 3-10. Shell proposes to begin construction of new tanks in 2012 and commence decommissioning and replacement of the initial existing storage tank in 2012. Completion of tank construction activities for all CTRP storage tanks would occur in 2015. Peak construction activity is expected to occur during concurrent construction of two tanks, site grading, and dike modifications.

TABLE 3-10
PROPOSED CONSTRUCTION SCHEDULE

	Phase		
Activity	**2012**	**2013**	**2014/2015**
Demolition	Tank 545	Tank 544	Tank 541
Construction	Tank 1127 and Tank 1128	Tank 545	Tank 541 and Tank 544

3.6.1 Tank Decommissioning and Demolition

Each of the three existing tanks would be decommissioned and demolished prior to construction of each replacement tank. Tank decommissioning would involve removal and disposal of any hazardous materials, cleaning of the tank interior using an inert material (nitrogen or steam) or water, and dismantling of appurtenant equipment from the existing tank and immediate area around it. Then, the tank would be cut up and the steel recycled. This process would involve minimal or no soil disturbance. These activities, as well as the management and disposal of hazardous and non-hazardous wastes from these construction activities, would be conducted in accordance with established procedures and the applicable regulatory requirements.

Decommissioning and removal of the three existing storage tanks would be conducted in phases. Shell proposes to begin decommissioning and replacement of the first storage tank in 2012, with subsequent demolitions occurring in 2013, and completion of all demolition activities in 2014.

3.6.2 Excavation and Grading

Excavation and grading would be required to modify the existing tank berms/levees to accommodate the new tanks. Additional grading could be conducted as necessary in the laydown areas to accommodate larger equipment and construction materials. In addition, excavation and grading would be necessary for the foundations of the new tanks. The majority of excavation activities would take place after tank demolition and prior to construction phases.

It is expected that approximately 22 acres of land at the proposed tank farm site and the laydown area (about 20 acres attributed to the tank farm area) would be affected by construction of the CTRP. It is expected that any fill required for site-grading purposes would be obtained from onsite stockpiles. If offsite fill would be required, it would not exceed a total of 1,500 cubic yards. The majority of the grading activities would occur at the tank farm area and would be done in parallel with tank construction and would be completed after tank construction would be finished.

3.6.3 New Tank Construction

New construction would entail modifications to existing equipment and piping, and construction and installation of new crude oil tanks. Activities associated with construction of the new tanks and modifications to existing tanks would require the use of construction cranes to lift and maneuver heavy construction materials, and forklifts for moving materials. Tank construction could potentially require pile-driving to drive heavy beams into the ground to support the larger structures.

3.6.4 Construction Waste

Tanks proposed for demolition would be drained and cleaned, and materials would be recycled prior to demolition. Wastes generated by construction may include oil-coated steel from tanks and piping, oil tank sludge, wood trash, asbestos and other insulation, debris, cardboard, and refractory. Demolished equipment would be cut up and salvaged. Rubbish, oily insulation, oil-coated-steel refractory, and asbestos materials would be disposed of off site at licensed facilities. Hazardous materials would be profiled and disposed of at the appropriate disposal facilities in accordance with hazardous waste regulations.

Equipment removal and disposal would be done in compliance with all applicable regulations. Decontamination of demolished materials would occur prior to disposal and/or recycling. Plant Reclamation (located in Richmond, CA) manages Shell's dismantling wastes (metal reclamation – scrap from tank shell demolition). An asbestos and lead survey would be performed prior to the initiation of demolition and, as needed, the required permits would be obtained from the appropriate agencies.

3.6.5 Construction Material Deliveries

Construction materials would be delivered via Gate 75 (see Figure 3-3). Material deliveries would include, but would not be limited to, pipes, valves, fittings, structural steel, plates, concrete, rebar, formwork, machinery and equipment, electrical equipment, electrical conduit and cable, instrumentation, insulation, gaskets, bolts, nuts, refractory, and fill material from off site. Deliveries would also be required for additional services equipment (e.g., portable toilets and temporary office trailers for construction contractors).

3.6.6 Construction Labor Force

Shell estimates that the Project would take up to 36 months for completion. It is estimated that construction would occur in three phases as shown in Table 3-10, and employ as many as 100 total workers. Construction workforce would be expected to consist of carpenters, riggers, electricians, welders, pipe fitters, ironworkers, painters, laborers, cement finishers, and administrative and office personnel.

3.6.7 Construction Traffic

The Project would generate additional construction and personal vehicle trips during the peak construction period. Vehicle traffic would be generated by employees, administrative personnel, management staff, material deliveries, bus drivers (transporting workers around the Refinery), and soil deliveries. No new physical entrance, new roadway, or intersection improvements would be needed to accommodate construction traffic volume.

3.6.8 Construction Parking and Laydown Areas

Parking and onsite services would be provided for construction workers. The Project site and construction equipment laydown areas have been delineated as shown in Figure 3-3. The laydown area located north of the tank farm would host Project equipment, and may also contain temporary office trailers, security lighting, and other incidental features. An additional laydown area near TK-967 would be used as necessary for construction equipment and materials necessary for the proposed retrofits to TK-967. Additional laydown areas located along Shell Avenue and at the southern perimeter of the Refinery are identified in Figure 3-3. These laydown areas would be used as necessary during construction. There would be no laydown activities off site.

The parking area adjacent to Gate 72 (see Figure 3-3) would be used for parking for construction employees. Employees would be bused from the parking area to the construction site. All temporary administrative, sanitary, and comfort services would be provided in the areas designated for these purposes on Shell property. There would be no parking or other Project-related services off site.

3.6.9 Dust Control and Stormwater Pollution Prevention

The entire site, where the new storage tanks and new mix tank would be constructed, is located on unpaved land. The containment berms currently in place would be upgraded to increase the containment capacity to accommodate the increased volumes of the new tanks. An existing paved road that runs along the top of the containment berm that intersects the tank farm would be repaved as part of the modifications to the containment berms and levees. Appropriate suppression techniques would be implemented during construction to reduce or avoid the generation of dust.

All excavated soil would be tested for hydrocarbons and managed in conformance with the Shell Martinez Refinery's Regional Water Quality Control Board-approved Soil Management Program for disposition. Excavated soil that is contaminated would be managed in accordance with BAAQMD Regulation 8 (Organic Compounds), Rule 40 (Contaminated Soil). Shell would implement BAAQMD guidelines to control fugitive dust emissions from all construction activities. Implementation of such control measures would be enhanced as required. Construction activities resulting in the actual or potential disturbance of asbestos-containing material would be conducted in accordance with all applicable regulations to assure worker health and safety.

Shell is required to prepare a project specific Construction Stormwater Management Plan (CSMP) as part of its existing Storm Water Pollution Prevention Plan (SWPPP) under NPDES Permit CA 0005789 Order R2-2006-070. This CSMP would be prepared and incorporated into the Refinery's SWPPP. As required by the NPDES permit, the SWPPP would be updated as needed and submitted to the RWQCB for approval.

3.7 Maintenance Activities

Operation of the Refinery requires substantial ongoing maintenance activities. Maintenance is needed so that all Refinery process units operate within their design parameters, especially for emissions and pressure-containing equipment, and to assure that products meet quality and quantity goals. Regular maintenance is essential to the overall safe operation of the Refinery.

In addition to the ongoing activities, scheduled large-scale maintenance actions, called “turnarounds,” are also necessary. The term “turnaround” refers to the period of time when Refinery equipment is down for maintenance and inspections, and is not available to process feedstocks, compared to Refinery equipment’s typical 24-hours-a-day, 365-days-a-year operation. Reasons to schedule periods when equipment would be out of operation include:

- To inspect the internals of Refinery vessels;
- To clean pipe and vessel internals;
- To replace and/or upgrade existing Refinery equipment and vessels;
- To renew catalysts in vessels that do not use continuous regeneration;
- To make connections for new equipment being installed at the Refinery;
- To perform maintenance or inspection on critical equipment; and/or
- To repair and renew piping and equipment before they fail.

Ongoing maintenance of the proposed equipment would include cleanings and inspections coincident with turnarounds. However, bulk storage tanks are typically removed from service for cleaning and inspection on an ongoing and individual basis to allow periodic inspections without impacting Refinery operations. API Standard 653 provides industry standards for aboveground storage tank inspection, maintenance and repair. The frequency of major cleanout and internal inspection of an individual storage tank is typically determined based upon findings from prior inspections.

Turnarounds are termed “major” when significant portions of the Refinery are shut down for extended periods of time; minor turnarounds may affect only certain units, or parts of the total Refinery, for short periods of time. Major turnarounds usually occur between three to five years apart. Minor turnarounds may occur less than one year to three years apart. Refinery turnarounds affect production; therefore, Refinery staff plan turnarounds carefully, so that work is accomplished quickly and process units can resume operation as soon as possible. The planning includes ensuring all necessary supplies and equipment are onsite and available when needed. Refinery maintenance and technical staff, as well as additional contract maintenance staff, work in shifts around the clock to minimize the duration of a turnaround.

The Refinery usually plans major unit turnarounds to occur several years apart to maximize the overall production of the Refinery. A Refinery major maintenance turnaround is scheduled to coincide for the units affected by the Project, during which certain process units would be shut down for about four to five weeks. A major turnaround offers the chance to change other equipment and processes in the Refinery during that scheduled downtime, such as the planned improvements to the Refinery crude oil units. Thus, the turnaround schedule becomes the controlling factor when planning and scheduling upgrades or other major changes to the process equipment occur at the Refinery.

3.8 Permits and Approvals Required

The Project would require the permits and approvals listed in Table 3-11.

TABLE 3-11
AGENCY PERMITS OR APPROVALS

Agency Permit or Approval	Requirement	Applicability to Project
Contra Costa County	Land Use, Ministerial (building, electrical, etc) Permits	Required for new facilities that manage certain hazardous substances and for construction of projects above certain thresholds of scale
Bay Area Air Quality Management District	Authority to Construct / Permit to Operate, Title V Permit Amendment	Required in order to construct or modify and to operate certain stationary emission sources
San Francisco Regional Water Quality Control Board	Project Construction NPDES Storm Water Pollution Prevention Plan	Required to control surface runoff during construction

CHAPTER 4

Environmental Setting, Impacts, and Mitigation Measures

4.0 Approach to the Analysis of Impacts

Organized by environmental resource area, this chapter provides an integrated discussion of the environmental setting (including the regional, local and/or Project setting; regulatory setting; and Project baseline) and environmental consequences (including environmental impacts and mitigation measures for potentially significant impacts) associated with dismantling of existing facilities and construction, operation, and maintenance of the Project.

4.0.1 CEQA Requirements

CEQA and the CEQA Guidelines require that the environmental analysis for an EIR must evaluate impacts associated with a project and identify mitigation measures for any potentially significant impacts. All phases of a project are evaluated in the analysis. The CEQA Guidelines state:

- An EIR shall identify and focus on the significant environmental effects of the proposed project. In assessing the impact of a proposed project on the environment, the lead agency should normally limit its examination to changes in the existing physical conditions in the affected area as they exist at the time the Notice of Preparation (NOP) is published, or where no notice of preparation is published, at the time environmental analysis is commenced. Direct and indirect significant effects of the project on the environment shall be clearly identified and described, giving due consideration to both the short-term and long-term effects. The discussion should include relevant specifics of the area, the resources involved, physical changes, alterations to ecological systems, and changes induced in population distribution, population concentration, the human use of the land (including commercial and residential development), health and safety problems caused by the physical changes, and other aspects of the resource base such as water, historical resources, scenic quality, and public services. The EIR shall also analyze any significant environmental effects the project might cause by bringing development and people into the area affected (CEQA Guidelines Section 15126.2[a]).

- An EIR must discuss any inconsistencies between the proposed project and applicable general plans and regional plans, including, without limitation, the applicable air quality attainment or maintenance plan or State Implementation Plan, area-wide waste treatment and water quality control plans, regional transportation plans, regional housing allocation plans, habitat conservation plans, natural community conservation plans and regional land use plans (CEQA Guidelines Section 15125[d]).

- An EIR must describe feasible measures that could minimize significant adverse impacts; such measures must be fully enforceable through permit conditions, agreements, or other legally-binding instruments. Mitigation measures are not required for effects that are found to be less than significant (CEQA Guidelines Section 15126.4[a]).

4.0.2 Section Contents and Definition of Terms

Chapter Organization

Chapter 4 is organized into the following 18 environmental resource or issue areas:

4.1 Aesthetics
4.2 Agriculture and Forestry Resources
4.3 Air Quality
4.4 Biological Resources
4.5 Cultural Resources
4.6 Energy Conservation
4.7 Geology, Soils and Seismicity
4.8 Greenhouse Gas Emissions
4.9 Hazards and Hazardous Materials
4.10 Hydrology and Water Quality
4.11 Land Use and Planning
4.12 Mineral Resources
4.13 Noise
4.14 Population and Housing
4.15 Public Services
4.16 Recreation
4.17 Transportation and Traffic
4.18 Utilities and Service Systems

Section Contents

Sections 4.1 through 4.18 follow this format:

- **Regional, Local, and/or Project Setting:** provides an overview of the physical environmental conditions in the area at the time of, or prior to, the publication of the NOP, that could be affected by implementation of the Project in accordance with State CEQA *Guidelines* Section 15125.

- **Regulatory Setting:** identifies the laws, regulations, ordinances, plans, and policies that are relevant to each resource area.

- **Project Baseline:** identifies the actual existing physical conditions to provide a point of comparison between pre-project conditions (the baseline) and post-project conditions in order to determine whether the change in the environment caused by the Project is significant under CEQA. The baseline is tailored to each resource area, and is predicated on the significance criteria under which the impacts are assessed. For most resource areas, the baseline is the same as the "environmental setting," i.e., the physical environmental conditions in the vicinity of the Project as they existed in the winter of 2010[1] when the NOP was published for the Project. (CEQA *Guidelines* §§ 15125(a), 15126.2(a)). In sections where this is not the case, the baseline used and the reasoning for the baseline are discussed in detail.

- **Significance Criteria:** provides the criteria used in this document to define the level at which an impact would be considered significant in accordance with CEQA. Significance criteria are based on CEQA *Guidelines* section 15064.5, Appendix F, and the checklist presented in Appendix G; factual or scientific information and data; and regulatory standards of Contra Costa County, and federal, State, and local agencies.

[1] The County issued the NOP for the Project on February 9, 2010.

- **Impact Identification:** each section lists impacts numerically and sequentially. An impact statement precedes the discussion of each impact and provides a summary of the impact topic. Each impact is categorized as one of the following:

  - **No Impact:** would not cause any change in the environment as measured by the applicable significance criterion; therefore, no mitigation would be required.

  - **Less than Significant:** would not cause a substantial adverse change in the environment as measured by the applicable significance criterion; therefore, no mitigation would be required.

  - **Less than Significant with Mitigation Incorporated:** would cause a substantial adverse change in the physical conditions of the environment; one or more feasible mitigation measures would reduce the environmental effects to a less-than-significant level.

  - **Significant and Unavoidable:** would cause a substantial adverse change in the physical conditions of the environment; there is either no feasible mitigation available or, even with implementation of feasible mitigation measures, the project would cause a significant adverse effect on the environment.

- **Mitigation Measures:** recommended where feasible to avoid, minimize, rectify, reduce, or compensate for potential significant, adverse impacts of the Project in accordance with CEQA *Guidelines* Section 15126.4. Each mitigation measure is identified numerically to correspond with the number of the impact it addresses.

4.0.3 Other Impact Analysis

Cumulative impacts resulting from combination of the Project's impacts with impacts associated with other projects in the area are not discussed in Chapter 4. The cumulative impact scenario is presented in Chapter 5, *CEQA Statutory Sections*. Chapter 6, *Analysis of Alternatives*, provides the alternative impact analysis for each resource area, as compared to the impacts of the Project.

4.1 Aesthetics

This section presents analyses of the Project's relationship to aesthetic resources, also referred to as visual resources. Discussed are the physical and regulatory setting, the baseline for determining environmental impacts, the significance criteria used for determining environmental impacts, and potential impacts associated with construction, operation, and maintenance of the Project. This analysis also considers the event of an accidental crude oil spill and analyzes those potential impacts on regional aesthetic resources separately from normal operations.

4.1.1 Introduction

Visual/aesthetic resources consist of the landforms, vegetation, rock and water features, and cultural modifications that create the visual character and sensitivity of a landscape. The primary existing visual/aesthetic factors considered in this EIR are: Visual Quality, Viewer Exposure, and Visual Sensitivity, as introduced below.

Visual Quality is defined as the overall visual impression or attractiveness of an area as determined by the arrangement of all landscape features or characteristics, including landforms, roads, houses, rocks, water features, and vegetation patterns. The attributes of line, form, and color combine in various ways to create visual characteristics such as variety, vividness, coherence, uniqueness, harmony, and pattern, which all contribute to the overall visual quality of an area. For the purposes of this EIR, visual quality is defined according to three levels:

- Indistinctive, defined as generally lacking in natural or cultural visual resource amenities otherwise typical of the region;
- Representative, defined as visual resources typical or characteristic of the region's natural and/or cultural visual amenities; and
- Distinctive, defined as visual resources that are unique or exemplary of the region's natural or cultural scenic amenities.

Viewer Exposure addresses the variables that affect viewing conditions from potentially sensitive areas. Viewer exposure considers the following factors:

- Landscape visibility, the ability to see the Project elements within landscape;
- Viewing distance, the proximity of viewers to the Project;
- Viewing angle, whether the Project would be viewed from above (superior), below (inferior), or from a level (normal) line of sight;
- Extent of visibility, whether the line of sight is open and panoramic to the Project site or restricted by terrain, vegetation, and/or structures; and
- Duration of view.

Visual Sensitivity is the overall measure of an existing landscape's susceptibility to adverse visual changes. People in different visual settings, typically characterized by different land uses surrounding a Project, have varying degrees of sensitivity to changes in visual conditions depending on the overall visual quality of the place. In areas of more distinctive visual quality, such as designated scenic highways, designated scenic roads, and parks, recreation, and natural areas, visual sensitivity is characteristically more pronounced. In areas of more indistinctive or representative visual quality sensitivity to change tends to be less pronounced, depending on the level of visual exposure. The following analysis of visual sensitivity is based on the combined factors of visual quality of the setting and viewer exposure to the Project. Visual sensitivity is reflected according to high, moderate, and low visual sensitivity ranges.

4.1.2 Setting

Shell's Martinez Refinery (Refinery) is located approximately 25 miles northeast of San Francisco (see Section 3, *Project Description*, Figure 3-1) adjacent to the community of Martinez. Approximately 20 percent of the Refinery is located within the corporate limits of the City of Martinez. The remainder of the Refinery is in an unincorporated area of the County. All of the Project components would be constructed within the County.

The regional and local geographic areas are relevant to this analysis of impacts on aesthetic resources. The regional geographic area considers the visual effect upon the entire San Francisco Bay in the unlikely event that crude oil brought by tankers to the Shell Marine Terminal (MT) would spill into the water and be dispersed by the currents and tides to a broader area. The local setting encompasses the landscapes directly affected by, and the surrounding areas that would be within view of, the Project components. For the Project area, the local setting focuses on nearby, publically accessible views from scenic corridors, highways, and recreational areas.

4.1.2.1 Regional and Local Setting

This section describes the existing visual character of the region and the Project site followed by a discussion of the visual character of the public viewpoints (locations from which the Project would be visible to the public). Figure 4.1-1 provides the scenic characteristics and selected viewpoints in the Project area, including the location and direction from which photographs of the region and Project site were taken.

Existing Regional Visual Characteristics and Sensitivity

The San Francisco Bay is the largest estuary along the Pacific shore of North and South America. The Bay contains a wide diversity of habitats, including sub-tidal areas, tidal flats, tidal marsh, diked baylands, salt ponds, managed marsh, and agricultural baylands. San Francisco Bay is an essential resting place, feeding area, and wintering ground for millions of birds on the Pacific Flyway, while also sustaining nearly 500 species of fish, invertebrates, birds, mammals, insects and amphibians (BCDC, 2008).

The Bay contains numerous ports, marine terminals, harbors, and naval terminals. The Bay also contains many urbanized and industrial areas, as well as several dozen designated recreation areas (BCDC, 2008) along the shore of the Bay. In the central and south-central portion of the San Francisco Bay in particular, urban development - including residential, water-based industry and other industry - is prevalent on the western and eastern shores.

The shorelines of San Pablo Bay, the Carquinez Strait, and Suisun Bay are predominately tideland and marshland, interspersed with recreational areas and urban and industrial development. Approximately half of San Pablo Bay shorelines are wildlife refuge areas, a classification that includes national wildlife refuges, State wildlife areas and ecological reserves, as well as other shoreline sites around the Bay. Their primary purpose is to protect threatened or endangered native plants, wildlife, and aquatic organisms and/or preserve unique habitat types or highly significant wildlife habitats (BCDC, 2008). The San Pablo Bay National Wildlife Refuge encompasses the entire north shore of the Bay, while the San Pablo Bay Wildlife Area encompasses the majority of the west shore. The south shoreline of San Pablo Bay is primarily waterfront park/beach area, including John F. McInnis County Park, China Camp State Park, and Point Pinole Regional Shoreline, as well as water-related industrial development (i.e., ports, harbors, and associated industrial facilities). The west and south-west side shoreline is lined with water-related industry, waterfront parks (including San Pablo Regional Shoreline), and some urban development (BCDC, 2008).

The Carquinez Strait connects San Pablo Bay on the west to Suisun Bay on the east, and serves as a shipping channel for commercial and military shipping. The Strait is traversed by the Carquinez Bridge, and its shorelines are home to industrial areas, parks, and urban development. Suisun Bay is the largest contiguous estuarine marsh in the entire United States, and is ringed by salt ponds, tidal marsh, and managed wetlands. Its shoreline includes some water-related industrial development, and several wildlife refuge areas including the Grizzly Island Wildlife Area, Point Edith Wildlife Area, Peytonia Slough Ecological Reserve, and Hill Slough Wildlife Area (BCDC, 2008).

Scenic Vistas

In its General Plan, Contra Costa County (2010) identifies its numerous scenic vistas as a major component of the perception of the County as a desirable place to live and work. The General Plan identifies four kinds of scenic locations in the County including: (1) scenic ridges, hillsides, and rock outcroppings; (2) the San Francisco Bay/Delta estuary system; (3) Scenic Highways and Expressways; and (4) Scenic Routes.

Of these four kinds of scenic locations, (2) the San Francisco Bay/Delta estuary system is relevant to the regional setting (the others are addressed in the local setting below). The waterway in which the MT is located, and the adjacent shoreline, is part of the General Plan’s designated ‘Scenic Waterways’ system, as defined in its Open Space Element. This designation is intended to draw attention to the location’s scenic character for consideration when reviewing nearby projects and development proposals.

The San Francisco Bay and nearby outer coast are lined with several dozen cities and unincorporated areas, falling under the jurisdiction of eight different counties. Many of these cities and counties have their own scenic resource policies, and there are numerous designated scenic vistas around the San Francisco Bay and outer coast that overlook areas potentially subject to petroleum product spills. Some of the more well known scenic vistas include, but are not limited to: multiple scenic overlooks in the Presidio in San Francisco (Immigrant Point, Inspiration Point, and Crissy Field Overlook), North and South Vista Points at either end of the Golden Gate Bridge, and views from designated recreation areas such as Mount Tamalpais, Angel Island, and Alcatraz. In addition, in its 2008 Bay Plan, the Bay Conservation and Development Commission (BCDC) points out that many waterfront parks and wildlife refuges designated in the Bay Plan also contain vista points (BCDC, 2008).

Existing Local Visual Characteristics and Sensitivity

The Refinery lies on the eastern edge of the City of Martinez on the southern bank of the Sacramento River along the Carquinez Strait. Wooded ridges to the west and south of Martinez define the edges of town. Interstate 680 (I-680) visually defines the eastern edge of town as it connects Benicia to the north and Walnut Creek to the South. I-680 defines the eastern perimeter of the Refinery and separates it from the Waterbird Regional Preserve and McNabney Marsh. To the south of the Refinery are residential neighborhoods, some in the City of Martinez and others in unincorporated Contra Costa County. All are accessible from Pacheco Boulevard. To the north of the Refinery is Marina Vista Avenue, which in the Project area offers views mostly of the roads and railroad that parallel the Carquinez Strait. Following are discussions of the more prominent visual characteristics of the region, including descriptions of visual sensitivity.

Waterbird Regional Preserve

The Waterbird Regional Preserve is 198 acres of wetland and associated uplands just to the east of the Refinery and I-680 and is jointly operated by the East Bay Regional Park District (EBRPD) and the Mountain View Sanitary District (MVSD). The wetland area, known as the Al McNabney Marsh, provides rich habitat for many diverse bird species including waterbirds and raptors (EBRPD, 2003). The Preserve provides a rich natural foreground and a visual quality that is representative of views of the Refinery from the east near the waterfront. This parkland perspective, and similar perspectives from I-680, provides relatively close up views of the Refinery and therefore the visual sensitivity from this location to proposed changes at the Refinery would be *moderately high*. This perspective is presented in the photo for Key Observation Point (KOP) 1 (see Figure 4.1-1).

Closer, though less accessible are views from the MVSD Water Treatment Facility (accessible through a tunnel under I-680). Images from both perspectives are shown in Figure 4.1-2, where the Martinez Scenic Ridgelines are visible in the background.

SOURCE: Shell, 2010

Shell Crude Tank Replacement Project . 209699

Figure 4.1-1
Scenic Characteristics and Viewpoints

Viewpoint A – From Waterbird Regional Preserve, with wetlands in foreground and scenic ridgeline backdrop.

Viewpoint B – From the Mountain View Sanitation District visitor center.

SOURCE: Shell, 2010

Shell Crude Tank Replacement Project . 209699

Figure 4.1-2
Views from the East

Martinez Scenic Ridgelines

Along the western and southern margins of the City of Martinez are ridgelines designated as scenic. These hills form the backdrop to the City of Martinez and the Refinery. They are considered protected scenic resources and in some cases are designated parklands and open space.

The Pedestrian Walkway and Interstate 680 on the Benicia Martinez Bridge

The pedestrian walkway along the Benicia Martinez Bridge for I-680 offers one an elevated overview of the area. Most views from the bridge are fleeting from this perspective, since most viewers are traveling in a car. However, for pedestrians and cyclists on the walkway, the views downriver include the Carquinez Strait, the City of Martinez, the Refinery, as well as other nearby refineries. These overviews are broadly representative of the diversity of landscapes in the region; however, upriver views to the wetlands of the Delta are obscured by the bridge itself and traffic.

The Project site is aligned with the bridge and visible from the pedestrian walkway, but is nearly 8,000 feet away. As viewers get closer to the Project area, views of the Refinery become obscured by vegetation, and therefore visual sensitivity from this perspective to the proposed changes at the Refinery is *low to moderate.* This perspective is presented in the photo for Key Observation Point (KOP) 2 (see Figure 4.1-1).

This stretch of I-680 over the Carquinez Strait and by the Refinery is not a designated scenic highway; however, it still provides some of the closest views of a refinery available in the region. Only south of the Project area, through Walnut Creek, is I-680 designated as a scenic highway.

Gateway and Connector Roads

The Gateway to Contra Costa County lies at the intersection of I-680 and Marina Vista Road just north of the project site (Contra Costa County, 2010). Here the Bay Trail drops off the Benicia Martinez Bridge and turns on to Marina Vista Road. Marina Vista Road is defined as a Scenic Connector Corridor because it links to other scenic resources in the area. It also defines the northern perimeter of the Refinery, which is landscaped along its edge. Both the gateway and the connector are in the vicinity of the Project, but direct views of the Refinery are blocked because of large foreground vegetation and therefore from this perspective the visual sensitivity to changes at the Refinery would be *low*. Images from along the Bay Trail, as it enters the Gateway and continues on to Marina Vista Boulevard, are shown in Figure 4.1-3.

Carquinez Strait Scenic Waterway

The Carquinez Strait of the Sacramento River, is downriver of the Benicia Martinez Bridge and is designated a scenic waterway along the Martinez Waterfront. Parks mix with industrial activity on either shore. To the north in Benicia is the Valero Refinery; to the south is the Shell Refinery. Marshes and wetlands more typical of a scenic waterway can be found east of the Benicia Bridge.

The visual quality along the Martinez shoreline is variable, ranging from distinctive in the parkland areas and at the open river's edge, to indistinctive in areas where industrial activity

Viewpoint C – From Bay Trail as it enters the Contra Costa Gateway.

Viewpoint D – Intersection with Marina Vista Connector.

Viewpoint E – Scenic character of Gateway and Connectors nearest to the Project site

SOURCE: Shell, 2010

Shell Crude Tank Replacement Project . 209699

Figure 4.1-3

Views from "Gateway" into Martinez

overshadows the natural character of the river's edge. Typically, the closer the industrial activity is to the edge of the river, the less room there is available for a natural riparian edge and thus a lower visual quality of the river's edge. Sensitivity to increased industrial development varies by existing land use, with lower sensitivities to change in existing industrial areas and higher sensitivities to change in or near parklands.

The Project site is not visible from the Carquinez Strait or the Martinez shoreline and therefore sensitivity to the proposed tanks would be *low*.

Neighborhoods around the Refinery

Because of the topography and scale of the Refinery, very few neighborhoods in Martinez can see the Project site. Where the Refinery does join neighborhoods the perimeter is generally landscaped, such as along Pacheco Boulevard where the southern entrance is located. To the north the boulevard is the Refinery and to the south land uses are a combination of rural to moderate density residential occasionally mixed with light commercial. Views into the Refinery are limited to stacks that may extend above the landscaping and occasional glimpses of entry points. Sensitivity to the proposed changes from this neighborhood is *low to moderate.* A photo from this perspective is presented as KOP 3 (see Figure 4.1-1).

Along the western perimeter of the Refinery a ridgeline visually separates the adjacent neighborhood from most views into the Refinery. Some views of the northern or waterfront portion of the Refinery are available from the crest of this ridgeline such as from portions of Dineen Street. An image offering the best available view of the Refinery from publically accessible locations in this neighborhood is presented in Figure 4.1-4. The Project site is not visible from these residential locations and therefore the sensitivity to change is *low.*

Existing Visual Quality of Project Site

The proposed tank farm site is surrounded by the heavy industrial equipment and facilities of the Refinery. The visual characteristics of the Refinery include considerable piping and piping racks connected to large industrial buildings with stacks and tanks. The visual character is highly organized and geometrically involved heavy industrial, as can be seen in Figure 4.1-4. Because of the Refinery's domination over natural elements; however, the visual quality of the Refinery itself is *low.*

Summary of Visual Sensitivity

Visual sensitivity is a composite of the overall susceptibility of an area and associated viewer groups to adverse visual impacts, given the combined factors of landscape visual quality and viewer exposure in terms of duration and numbers of viewers. Table 4.1-1 summarizes the visual sensitivity of the major viewer types that would be affected by the Project, as discussed above. In the first column, viewpoints refer to the photos in Figures 4.1-5 through 4.1-7 and KOP # (Key Observation Point number) refers to subsequent photos and simulations in forthcoming figures.

Viewpoint F – From residential Dineen Street looking east, view of Project site is obstructed and not visible

Viewpoint G – From within the Shell Refinery looking northeast towards the existing tank site

SOURCE: Shell, 2010

Shell Crude Tank Replacement Project . 209699

Figure 4.1-4
Views from the West

TABLE 4.1-1
SUMMARY OF VISUAL SENSITIVITY FROM REPRESENTATIVE VIEWPOINTS CONSIDERING VISUAL QUALITY AND VIEWER EXPOSURE

View Point KOP #	Viewer Location	Visual Quality[1]	Viewer Exposure	Visual Sensitivity[2]
A **KOP 1**	Waterbird Regional Preserve	Representative	Views with open parklands and wetland wildlife habitat in foreground. I-680 and shell Refinery in middle ground, Scenic hillside forms backdrop. Existing stacks penetrate ridgeline into skyline. Low number of viewers from park with long duration. High number of viewers from I-680 with short duration.	Moderate to High
B	Mountain View Sanitation District visitor center	Representative	Industrial equipment is softened by vegetation. Sanitation District tanks and clarifiers occupy the foreground backed up by Refinery equipment and stacks penetrating the skyline in the middle ground. Moderate number of viewers with moderate exposure.	Moderate
KOP 2	Benicia Martinez Bridge	Representative	The bridge and pedestrian walkway are aligned towards the Refinery. The bridge provides overviews of the Carquinez Strait and Martinez. Tanks visible from atop the bridge at a distance, and at closer distances become screened by vegetation when descending.	Low to Moderate
C	Bay Trail entering Contra Costa County Gateway	Representative	Taller tanks remain visible when the Bay Trail enters the Gateway, vegetation screens closer views. Moderate number of viewers from a long distance, but with distractions caused by traffic.	Low to Moderate
D-E	Bay Trail at Marina Vista Connector	Indistinct	The Bay Trail changes from a Class I Bikeway on the bridge to a Class II Bikeway on Marina Vista. Signage, striping and offset connections create cluttered images. Moderate number of viewers on Bay Trail and Marina Vista. Duration is low as viewers pass through the connector.	Low
F	Residential Views over the Refinery	Indistinct	Publically accessible streets from the neighborhood west of the Refinery do provide views over the Refinery to the Benicia Martinez Bridge. However, the Tank Replacement site is not visible from this neighborhood. Low number of viewers, long potential duration of view.	Low Not visible
G	Internal View	Representative	Shows existing character of the Refinery. Employees or guests of Shell typically see internal views.	Low
KOP 3	Views from Pacheco Boulevard on the Southern Perimeter	Indistinct	Views into the Refinery are limited to stacks that may extend above the landscaping and occasional glimpses of entry points. Moderate number of viewers with limited exposure.	Low to Moderate

1 **Visual Quality** has three ratings for natural and/or cultural visual amenities: Indistinctive, generally lacking in visual amenities; Representative, visual resource typical or characteristic of the region's visual amenities; or Distinctive, unique or exemplary of the region's scenic amenities

2 **Visual Sensitivity** is based on visual quality and viewer exposure. It has five ratings ranging from low to high.

4.1.2.2 Regulatory Setting

Federal

The United States Code of Federal Regulations, Title 33 C.F.R. Section 154.570, pertains to lighting of facilities in navigable waters for transferring oil or hazardous material in bulk. It states that between sunset and sunrise, a facility must have fixed lighting that adequately illuminates: each transfer connection point at the facility; any connection point on a barge moored at the facility to or from which oil or hazardous material is being transferred; and all transfer operations work areas. It specifies illumination levels of five foot candles at transfer connection points and one foot candle over transfer operations work areas. Lighting must be located or shielded so as not to mislead or otherwise interfere with navigation on the adjacent waterways.

State of California Scenic Highway Program

In 1963 the Scenic Highway Program was established to protect scenic highway corridors from changes that would diminish the aesthetic value of lands next to the highways. The State statutes governing the Scenic Highway Program are found in the Streets and Highways Code, Section 260 et seq. A highway may be designated as “scenic” depending on how much of the natural landscape can be seen by travelers, the scenic quality of the landscape, and the extent to which development intrudes upon the travelers’ enjoyment of the view.

The region around northern San Francisco Bay, San Pablo Bay, Carquinez Straits and Suisun Bay has four highways recognized as eligible for the Scenic Highway Program (Caltrans 2010). These include:

Rte	County	Location (From/To)	Views
1	Mar/Son/Men	SR 101 Nr Marin City/SR 101 Nr Leggett	Richardson Bay
101	Marin	Opposite San Francisco/SR 1 in Marin City	San Francisco Bay
29	Sol/Nap	SR 37 Nr Vallejo/SR 221 Nr Napa	San Pablo Bay
121	Sonoma	SR 37 Nr Sears Point/SR 12 Nr Sonoma	San Pablo Bay

No state-designated scenic routes are in the specific Project area, although I-680 is a designated scenic highway just to the south of the Project area. Also, a portion of State Route 4 (SR 4) in Contra Costa County is an eligible State Scenic Highway (Caltrans, 2010).

Contra Costa County General Plan

The Scenic Resources section of the Contra Costa County General Plan 2005-2020 (Contra Costa County, 2010) identifies goals related to the preservation and protection of areas of high scenic value, scenic ridges, and the scenic qualities of the San Francisco Bay/Delta estuary system and the Sacramento-San Joaquin River/Delta shoreline. It identifies development features, including storage tanks, as having the potential to degrade the scenic quality of an area if they are not carefully designed, located, and landscaped.

The Carquinez Strait is considered a scenic waterway in the County General Plan Open Space Element. In addition, the ridgelines to the west and south of downtown Martinez are designated by the County General Plan as Scenic Ridgelines. These designations, however, apply to features directly affecting those areas, such as development on the ridgeline or in the strait, rather than setting any specific limitation on landscape alteration of adjacent developed areas, such as the Refinery.

The Scenic Routes section of the Transportation and Circulation Element identifies State- and locally designated scenic routes in the County. A scenic route is a road, street, or freeway that traverses a scenic corridor of relatively high visual or cultural value. It consists of both the scenic corridor and the public right of way. Two roadways, I-680 and Marina Vista Drive/Waterfront Road, are identified in the County General Plan as "Connecting Roads," as they have scenic potential or connect scenic areas. The General Plan recommends continued efforts should be made to achieve State scenic route recognition for appropriate routes in the County.

The Marina Vista Drive/I-680 interchange is considered one of the "gateways" to northern Contra Costa County. Special protection for natural topographic features, aesthetic views, vistas, hills, and prominent ridgelines is called for by the County General Plan at gateway sections of scenic routes.

4.1.2.3 Project Baseline

The baseline for this visual evaluation is the existing Refinery within the existing Martinez/ Contra Costa County setting. This includes all existing facilities at the Refinery and existing opportunities within the community to see the Refinery, both during the day and at night. The baseline includes the current designations of scenic resources in the area.

4.1.3 Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause significant adverse impacts to aesthetic resources if it would:

a) Have a substantial adverse effect on a scenic vista;

b) Substantially damage scenic resources, including but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway;

c) Substantially degrade the existing visual character or quality of the site and its surroundings; or

d) Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

4.1.3.1 Definition and Use of Significance Criteria

The determination of impact significance is based on combined factors of Visual Sensitivity and the degree of Visual Change that the Project would cause. An adverse impact to visual/aesthetic resources may occur when: (1) the Project perceptibly changes the existing physical features of the landscape that are characteristic of the region or locale; (2) the Project introduces new features to the physical landscape that are perceptibly uncharacteristic of the region or locale, or become visually dominant in the viewshed; or (3) the Project blocks or totally obscures aesthetic features of the landscape. Determining the significance of visual changes in the landscape depends on how noticeable the Project features would be from different views, and the varying viewing conditions from which the Project could be seen.

4.1.3.2 Physical Changes Proposed

Chapter 3, *Project Description*, provides a thorough discussion of the project and its components. The visible components of the Project (Section 3.4) will include the new crude oil storage tanks, which will be larger in diameter and taller than the existing tanks. Table 4.1-2 summarizes the difference in dimensions between the existing and the new storage tanks and mix tank, as proposed for the CTRP.

TABLE 4.1-2
EXISTING AND PROPOSED TANK DIMENSIONS

Tank Number	Type	Existing Height (feet)	New Height (feet)	Existing Diameter (feet)	New Diameter (feet)	Difference in size between existing and new Tanks
TK – 541	Replace with New tank	41	70	120	190	+ 29 ft higher + 70 ft dia
TK – 544	Replace with New tank	40	70	144	190	+ 30 ft higher + 46 ft dia
TK – 545	Replace with New tank	40	70	144	190	+ 30 ft higher + 46 ft dia
TK – 1127	New Mix tank	--	40	--	120	New tank 40 ft high x 120 feet dia
TK – 1128	Refurbished tank	40	40	120	120	No change

The proposed new tanks (TK-541, TK-544, TK-545, and TK-1127) would be similar in color and finish to the existing tanks within the Refinery. Night lighting would be placed at the new tanks similar to the existing lighting in the Refinery.

Tank 1128 would be refurbished with no change in external dimensions; therefore, there would be no visual change resulting from this element of the Project. Tank 1128 is therefore not considered in the remainder of this assessment. Although there would be no physical changes to the MT associated with the CTRP, the regional analysis considers the proposed additional use of the pier for ships transferring crude oil to the new tanks at the Refinery.

4.1.3.3 Selection of Key Observation Points and Visual Simulations

After careful evaluation of the visual sensitivity in the setting and the changes that would be associated with Project, three Key Observation Points (KOPs) were selected to be representative of the Project for this visual evaluation. These representative KOPs were selected to portray the Project from the closest publically accessible vantage points from which the Project would be visible. Because the proposed tanks are well within the Refinery, most views available to the public are relatively distant, ranging from 3,000 to 8,000 feet away.

Visual simulations for each of the KOPs are presented as part of this aesthetics analysis and illustrate representative "before and after" visual conditions in the Project area. In the text below, the evaluation of potential impacts associated with the Project is based, in part, on comparing the "before" and "after" visual conditions as portrayed in the set of simulations and assessing the degree of visual change that the Project would bring about. The significance determination is based on the evaluation criteria described above.

Simulations of the Project were produced using three-dimensional full-scale models of the CTRP. These simulations were developed using illustrations of the Project components viewed from the same relative perspectives as where the existing KOP photos were taken. The computer photos of the modeled facilities were then inserted into the existing photograph and photo-realistically rendered. The results are visual simulations of the proposed facilities from specific KOPs. The simulations of the Project are described below in Table 4.1-3; KOP locations are located on an aerial photo in Figure 4.1-1, and before and after images for each of the KOP locations are provided in Figures 4.1-5 through 4.1-7.

TABLE 4.1-3
KEY OBSERVATION POINTS

KOP # Figure #	Photo Location / Name	Viewing Direction and Distance	Context
KOP 1 Figure 4.1-5	Waterbird Regional Preserve	SW 3,000 feet	Park and wetland complex across I-680 from the Refinery. Clearest view of the Project.
KOP 2 Figure 4.1-6	Pedestrian Walkway on Benicia Martinez Bridge	SE 8,000 feet	The bridge and I-680 are aligned with the Refinery. The bridge provides overviews of Martinez, the distant hills, and the Carquinez Strait. The bridge and walkway descend to the Contra Costa County Gateway where tank views become screened by vegetation.
KOP 3 Figure 4.1-7	Pacheco Boulevard Entrance to Refinery	N 2,000 feet	Commercial mixed with residential across from Refinery. Proposed tanks would be rarely visible through trees at entrance and among existing tanks.

Evaluation of Visual Changes Resulting from the Project

The three elements that are considered in determining the overall visual change caused by the Project are visual contrast, project dominance, and view blockage, as discussed below. After assessment of these three factors, overall visual change is rated from low to high on a five point scale.

Existing Conditions

Simulation of Project

SOURCE: ESA

Shell Crude Tank Replacement Project . 209699

Figure 4.1-5

KOP 1 - Simulated View from Waterbird Regional Preserve

Existing Conditions

Simulation of Project

SOURCE: ESA, 2010

Shell Crude Tank Replacement Project . 209699

Figure 4.1-6

KOP 2 - Simulated View from Bay Trail above Carquinez Straits

Existing Conditions

Simulation of Project

SOURCE: ESA, 2010

Shell Crude Tank Replacement Project . 209699

Figure 4.1-7

KOP 3 - Simulated View from Pacheco Street Entrance

Visual Contrast

Visual contrast is a measure of the degree of visual change that the Project would create, when compared to the existing landscape. Visual contrast ranges from none to strong, and is defined as:

- *None* – The contrast between Project elements and the existing landscape is not perceived;
- *Weak* – The Project element can be seen but does not attract attention;
- *Moderate* – The Project elements attract attention but do not dominate the landscape; and
- *Strong* – The Project element demands the viewer's attention and cannot be overlooked.

Project Dominance

Visual dominance evaluates the Project feature's apparent size relative to other landscape features in the area. A feature's dominance is affected by its location relative to other elements and the distance from which it is viewed. Especially noticeable features are evaluated in terms of visual dominance. The levels of dominance for a new feature in the landscape are:

- *Subordinate* – new feature(s) would be visible but not be the primary object(s) in the view;
- *Co-dominant* – new feature(s) share the viewers attention with other existing features; and
- *Dominant* – new feature(s) demand the viewer's attention over existing features of the view.

View Blockage or Impairment

View blockage or impairment is a measure of the degree to which a project's features would obstruct or block views to aesthetic features, such as scenic ridgelines due to the project's position and/or scale. Blockage of landscape features or views can cause adverse impacts, particularly in instances where scenic views are important to the use, value, or function of a particular land use. Conversely, views of the Project can also be blocked by other features in the landscape, such as trees, buildings, or hillsides to the point that the Project is no longer visible.

Each of the three KOP simulations showing the Project as it would appear after construction, were evaluated for overall visual change according to the criteria described above. A summary of those evaluations is provided in Table 4.1-4. Overall visual change is a compilation of the Contrast, Dominance, and Blockage findings. The Visual Sensitivity rating is brought forward from earlier discussions in the setting section.

The findings of Overall Visual Change and Visual Sensitivity, in the last two columns in Table 4.1-4, are used to aid in the assessment of significance of the potential visual impacts. Impact significance is based on combined factors of Visual Sensitivity and the Overall Visual Change that the Project would cause. This inter-relationship of two factors in determining whether adverse visual impacts would be significant is shown in Table 4.1-5. For example, low visual change combined with low visual sensitivity combine in the upper left side of the table as 'not significant,' while high visual change combined with high visual sensitivity combine in the lower right side of the table as a 'significant' impact.

TABLE 4.1-4
EVALUATION OF OVERALL VISUAL CHANGE FROM KEY OBSERVATION POINTS

KOP # Figure #	Photo Location / Name	Contrast	Dominance	Blockage	Overall Visual Change	Visual Sensitivity (Table 4.1-1)
KOP 1 Figure 4.1-5	Waterbird Regional Preserve	Moderate	Co-dominant	Minimal (ridgeline)	**Low to Moderate**	**Moderate to High**
KOP 2 Figure 4.1-6	Pedestrian Walkway on Benicia Martinez Bridge	Weak	Subordinate	None	**Low**	**Moderate**
KOP 3 Figure 4.1-7	Pacheco Boulevard Entrance to Refinery	Weak	Co-dominate	Minimal (sky)	**Low**	**Low to Moderate**

TABLE 4.1-5
GUIDELINES FOR DETERMINING SIGNIFICANCE OF VISUAL IMPACTS

Overall Visual Sensitivity	Overall Degree of Visual Change				
	Low	**Low to Moderate**	**Moderate**	**Moderate to High**	**High**
Low	Not Significant	Not Significant	Adverse, but Not Significant	Adverse, but Not Significant	Adverse, but Not Significant
Low to Moderate	Not Significant **KOP 3**	Adverse, but Not Significant	Adverse, but Not Significant	Adverse, but Not Significant	Adverse and Potentially Significant
Moderate	Adverse, but Not Significant **KOP 2**	Adverse, but Not Significant	Adverse and Potentially Significant	Adverse and Potentially Significant	Adverse and Potentially Significant
Moderate to High	Adverse, but Not Significant	Adverse, but Not Significant **KOP 1**	Adverse and Potentially Significant	Significant	Significant
High	Adverse, but Not Significant	Adverse and Potentially Significant	Adverse and Potentially Significant	Significant	Significant

Not Significant impacts may or may not be perceptible and are considered minor in the context of existing landscape characteristics and view opportunity.

Adverse, but Not Significant Impacts are perceived as negative but would not substantially alter the landscape to a degree that would conflict with significance criteria of CEQA Appendix G.

Adverse and Potentially Significant Impacts are perceived as negative and may, depending on Project- and site-specific circumstances, substantially alter the landscape to a degree that would conflict with significance criteria of CEQA Appendix G.

Significant impacts may be reduced with feasible mitigation to less-than-significant levels or avoided all together. Without mitigation or avoidance measures, significant impacts would conflict with significance criteria of CEQA Appendix G.

The simulations for the three KOPs that represent the Project show that the overall visual change would be generally low. This is because the existing setting is the Refinery, a very large industrialized setting with large existing tanks, pipes, and stacks. Even though the proposed tanks would be larger than the existing tanks, they are consistent with the existing setting. Visual sensitivity is more variable, ranging from moderately high to moderately low.

4.1.4 Discussion of No Aesthetic Impacts

There are aesthetics-related impacts for each of the criteria listed in Section 4.1.3.

4.1.5 Discussion of Impacts and Mitigation Measures

Each of the four aesthetic resources criteria are discussed below.

a) Would the Project have a substantial adverse effect on a scenic vista?

Impact 4.1-1: A Project-related accidental crude oil spill would have an adverse effect on scenic vistas. *(Significant and Unavoidable)*

With the Project, delivery of crude oil would shift from overland pipeline to oil tankers over water. Delivery of crude by oil tanker over water has different and increased risks to water based scenic resources than crude oil delivery currently has by overland pipeline. The potentially affected scenic vistas include those of the San Francisco Bay and the Bay/Delta Ecosystems, specifically views of Carquinez Straits, San Pablo Bay, northern San Francisco Bay and Suisun Bay. The discussion below describes potential distribution of oil to these places under different oil spill scenarios and considers the potential effects on scenic resources in these areas.

A crude oil spill analysis for the Project was conducted by Coast Harbor Engineering (see Appendix C). The area and probability of seeing a 'silvery sheen'[1] or worse, on the water and shorelines around San Francisco Bay (collectively includes San Francisco Bay, San Pablo Bay, Carquinez Strait, and Suisun Bay) was evaluated over a period of five days for four different accidental spill sizes, each varying between summer and winter flow conditions in the Bay.

The first six scenarios evaluate possible accidental crude oil spills at the MT and the last two consider an 'in-transit' event at the Carquinez Bridge. Shell maintains a wide variety of spill containment materials directly on the wharf and staff are trained in how to contain a spill if one were to happen (Shell, 2011).

Scenarios 1 and 2 evaluate a possible accidental release of the reasonable worst case spill (1,680 barrels (bbl) of crude oil into the Carquinez Strait) during the summer and winter seasons, respectively. These scenarios show high probabilities (i.e., 50 to 100 percent) of exceedance (or areas where the crude oil colors on the water would be darker (thicker) than a silvery sheen) all along the Carquinez Strait and Suisun Bay. In San Pablo Bay, the sheen would begin to disperse and the probability of exceeding a silvery sheen would drop to a range of 20 to 50 percent in the winter and 10 to 40 percent in the summer. In both seasonal cases there would be higher levels where the Bay narrows at the Richmond Bridge and Tiburon Point.

[1] Silvery sheen is used as the threshold level of concern and is measured by the probability of this threshold being exceeded at shoreline zones. Each shoreline zone is 8,200 feet of shoreline and is graphically portrayed on a Bay Area map by the percentage of exceedance. A silvery sheen is modeled to be produced on the water when approximately 50 gallons of oil are spread over one square nautical mile (see Appendix C).

Scenarios 3 and 4 evaluate a smaller possible accidental release of 168 bbl of crude oil into the Carquinez Strait from the MT during the summer and winter seasons, respectively. Even with the smaller release, most of the Carquinez Strait would exceed the threshold of a silvery sheen nearly 100 percent of the time. Exceedance levels stay high on the south side of Suisun Bay while they diminish to 40 to 70 percent in the more distant northern shorelines of Suisun Bay. Most of San Pablo Bay would not be affected by this smaller spill size although the higher flows during winter would still cause some oiling of the Marin shore at the Richmond Bridge and Tiburon Point.

Scenarios 5 and 6 evaluate the smallest and most probable accidental release of 50 bbl of crude oil into the Carquinez Strait at the MT during the summer and winter seasons, respectively. Modeled results for summer and winter are similar. The area immediately around the MT, which is the upper reaches of the Carquinez Strait, would be the most impacted with 80 to 100 percent exceedance levels above the silvery sheen threshold. Exceedance levels would range between 60 to 80 percent throughout the rest of the Carquinez Strait and along the southern shores of Suisun Bay. Further up Suisun Bay and along the intermediate northern shores, exceedance levels would be in the 30 to 60 percent range. The far northern shores of Suisun Bay show limited exceedance levels of 0 to 10 percent.

Scenarios 7 and 8 evaluate a much larger possible accidental release of 20,000 bbl of crude oil at the Carquinez Bridge (Downstream of the MT) during the summer and winter seasons, respectively. Once again, the Carquinez Strait would bear the brunt of the spill, with 100 percent exceedance of the threshold up and down the Carquinez Strait. Upstream disbursement patterns are very similar to the first two scenarios, where in the upper reaches of Suisun Bay exceedance levels drop to 20 to 50 percent. It is downstream on the shores of San Pablo Bay where the magnitude of this larger spill would be realized. In the winter, most of San Pablo Bay would experience 30 to 70 percent exceedance levels and this would continue on either side of the shoreline out the Golden Gate. In the summer case, Marin and Sonoma County shorelines would be exposed to less crude oil, with an exceedance level of 10 to 30 percent.

San Francisco Bay is home to extensive scenic, wildlife, and parkland resources. Much of San Pablo Bay shoreline consists of federal and State wildlife reserves including the San Pablo Bay National Wildlife Reserve and the Grizzly Island Wildlife Area in Suisun Bay. A crude oil spill at the MT would immediately damage scenic vistas within the Carquinez Strait Scenic Waterway. The largest crude oil spill evaluated would also affect the shores of the San Francisco Waterfront, Ocean Beach, and the Marin Headlands each of which include portions of the Golden Gate National Recreation Area. All these areas are dependant upon scenic vistas of the Bay.

Oil spill prevention, readiness and response are important aspects of Shell’s operations and protocols are in place (see below) to prevent and/or contain any accidental release of oil. These important measures however cannot be assumed to be 100 percent effective in perpetuity, and therefore an accidental release of oil over time becomes increasingly likely. Even following all proper protocols, an accidental spill of crude oil that could not be contained would affect wide portions of the central and northern San Francisco Bay, San Pablo Bay, the Carquinez Strait

Scenic Waterway and portions of Suisun Bay and therefore would have a significant and unavoidable impact on multiple scenic vistas.

A recently certified EIR for the CSLC Shell MT Lease[2] provides additional insight into this impact as it considered future tanker vessel traffic with the San Francisco Bay, the Carquinez Strait, including vessel traffic and operations at the MT related to the CTRP (CSLC, 2011). The CSLC MT EIR considered all MT traffic related to the Shell MT not just the vessel traffic (about one crude oil tanker per week) related to the CTRP and in doing so the CSLC MT EIR includes the proposed vessel traffic that would be associated with the CTRP. The CSLC MT EIR concluded that without rapid containment by immediate booming and cleanup, the visual effects of even a small spill of 50 bbls can leave residual impacts, and they can be significant. It also acknowledged that with containment and clean up the effects can be reduced, but that it is impossible to predict with any certainty the potential consequences of spills; and therefore visual impacts can be considered to be adverse and significant, depending on the effectiveness of first response containment and cleanup. The CSLC MT EIR imposes mitigation measures (VR-2 and VR-3) which require Shell to implement spill prevention and response measures contained in the Operational Safety/Risk of Accidents and Biological Resources sections of the certified EIR. The impacts and mitigation measures are discussed in further detail in the *Biological Resources* and *Hazards and Hazardous Materials* impact discussions of this (CTRP) EIR (see Sections 4.4.6 and 4.9.6, respectively). Finally, the CSLC MT EIR concludes that even with implementation of the proposed spill prevention and response measures, the impact remains significant and unavoidable (CSLC, 2011).

Mitigation: Implement Mitigation Measures 4.4-2 and 4.9-1.

Significance after Mitigation: A review of accidental spills associated with the MT indicate that there have been four spill events between 1984 and 2009 of volumes between 1 and 25 bbl, and no significant environmental impact was documented (Shell, 2011). Given this history and because the Project would add only one additional ship weekly, the likelihood of a spill occurring in a large volume would be very low and regular operational protocols, including the use of secondary containment, would minimize the potential effects of a release on scenic vistas. Although the risk would be low, the impact would be significant and unavoidable even with implementation of the County and CSLC mitigation measures.

Impact 4.1-2: The proposed tanks would have an adverse effect on scenic vistas. *(Less than Significant)*

The view from KOP 1, the scenic vista at the Waterbird Regional Preserve (see Figure 4.1-5), would look directly at the Project's new tank (40 feet high by 120 feet in diameter) and the three replacement tanks (each 30 feet taller and 46 feet to 70 feet larger in diameter). Together, these tanks would increase the contrast and become more dominant than the existing tanks in that view. The larger tanks would also block views to the populated hillsides just below the designated

[2] The EIR was certified on June 23, 2011.

scenic ridges, which form the backdrop to the City of Martinez. The 'harvest gold' color used for all facilities in the Refinery is a high contrast color, which would also contribute to the increased dominance of the Project in this particular scenic vista. For these reasons, the proposed new tank and the increases in replacement tank sizes create an adverse visual effect, because the Project would increase the contrast and dominance of the industrial components in this view. However, all changes would be visually surrounded by Refinery equipment, within the existing Refinery and without visual encroachment upon the wetlands or the designated scenic ridges in the background. Therefore, the visual effect of the tank replacement itself would not be substantial and the impact would be less than significant.

Mitigation: None required.

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b) Would the Project substantially damage scenic resources, including but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

Impact 4.1-3: A Project-related accidental crude oil spill would substantially damage scenic resources within view of a state scenic highway. *(Significant and Unavoidable)*

The proposed new tanks and replacement tanks would not substantially damage scenic resources because there are no scenic resources within the immediate Project area. However, with the increase in the vessel traffic associated with the CTRP the likelihood of an accidental release of crude oil from the MT or a tanker in route to the MT, the possibility of associated damage to regional scenic resources around San Francisco Bay would increase.

In the case of an accidental oil spill, discussed above, there are up to four scenic highways in the region that would experience damage to scenic resources. These, in order of proximity to the MT include: Highway 29 near Vallejo with views to San Pablo Bay; Highway 121 near Sears Point with views also to San Pablo Bay; Highway 1 intersection with Highway 101 in Marin City with views to Richardson Bay; and Highway 101 just north of the Golden Gate Bridge with views of San Francisco Bay. In the case of an accidental oil spill, damage to these scenic resources would be significant and unavoidable.

Mitigation: Implement Mitigation Measures 4.4-2 and 4.9-1.

Significance after Mitigation: Given the spill history at the MT and because the Project would add only one additional ship weekly, the likelihood of a spill occurring in a large volume would be very low and regular operational protocols, including the use of secondary containment, would minimize the potential effects of a release on scenic resources within view of a state scenic highway. Although the risk would be low, the impact would be significant and unavoidable even with implementation of the County and CSLC mitigation measures.

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c) Would the Project substantially degrade the existing visual character or quality of the site and its surroundings?

Impact 4.1-4: The Project would degrade the existing visual character and quality of the site and its surroundings. (*Less than Significant*)

KOP 1 at Waterbird Regional Preserve is sensitive to change because it is the most publically accessible vantage point to the Project site with the most direct and open views of the Refinery. From this vantage point the Project is between two scenic settings, the wetland park area in the foreground and the scenic ridgeline in the background. In this setting, the new and larger tanks would be noticeable and would be considered adverse because the larger tanks would increase the contrast, dominance, and overall scale of industrial components in this view. The Project would not substantially degrade the existing visual character or quality of the site because changes are within the footprint of the existing Refinery and therefore the impact would be adverse, but not significant.

KOP 2 at the Benicia Martinez Bridge is moderately sensitive to changes in the landscape. The elevated pedestrian pathway provides panoramic views to multiple scenic resources from the Benicia Martinez Bridge, which is directly aligned towards the Refinery. While the new tanks would be visible, the long distance and the minimal degree of visible change indicates the new tanks would not be particularly discernable in the Refinery setting, and therefore the visible changes from this perspective would be adverse but not significant.

KOP 3 at the Pacheco Boulevard Entrance to the Refinery has low to moderate sensitivity to change. The low portion of the sensitivity rating reflects the fact that one would expect to see industrial facilities at the entrance to the Refinery. The moderate portion of the sensitivity rating responds to the commercial/residential context of the area that is adjacent to the Refinery. In this mixed land use context, the Refinery is part of the setting and while the new tanks would be visible, they would be placed among existing tanks, behind existing landscaped screens. The new tanks would not block any other scenic views and therefore their presence from this perspective is *not* significant.

The visual quality of the surroundings from each of the KOP perspectives would not be degraded by the Project as described above. The Refinery is an element of the existing landscape and most views of the Project area are surrounded by the Refinery, the visual character of the site and its surroundings would generally remain the same; therefore, the impact would be less than significant.

Mitigation: None required.

d) Would the Project create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?

Impact 4.1-5: Night lighting required for operations could adversely affect nighttime views in the Project area. (*Less than Significant with Mitigation)*

Night lighting could result in potentially significant visual impacts by increasing ambient light to surrounding areas, creating distracting glare, and reducing sky or star visibility. Mitigation Measure 4.1-5, which would require implementation of a *Lighting Mitigation Plan* that incorporates the use of shielded lighting elements, directed fixtures, sensors, and a program for illuminating areas only when active operations or maintenance are occurring, would mitigate potential impacts to a less-than-significant level.

> **Mitigation Measure 4.1-5: Reduce Glare Impacts from Night Lighting.** At least 30 days prior to issuance of grading or building permits, the Project applicant shall submit a *Lighting Mitigation Plan* for the review and approval of the County Zoning Administrator. The applicant shall design and install all lighting at Project facilities, such that light sources including bulbs and reflectors generally are not visible from public viewing areas, specifically areas to the east of the Refinery, and that lighting does not cause reflected glare or any unnecessary illumination of the Project facilities and vicinity. The plan shall include, but not be limited to the following measures:
>
> - Lighting shall be hooded with lights directed downward or toward the area to be illuminated so that backscatter to the nighttime sky is minimized and the light sources are not visible offsite. The design of the lighting shall be such that the luminescence or light sources are shielded to minimize light trespass outside the Project boundary, and to reduce glare.
> - All lighting shall be of minimum necessary brightness consistent with worker safety.
> - High illumination areas not occupied on a continuous basis shall be equipped with switches or motion detectors to light the area only when occupied.

Significance after Mitigation: Less than Significant.

4.2 Agriculture and Forest Resources

4.2.1 Introduction

This section analyzes the Project's relationship to agriculture and forest resources. Discussed are the physical and regulatory setting, the baseline for determining environmental impacts, the significance criteria used for determining environmental impacts, and potential impacts associated with construction, operation, and maintenance of the Project.

4.2.2 Setting

4.2.2.1 Regional and Local Setting

Shell's Martinez Refinery (Refinery) is located approximately 25 miles northeast of San Francisco (see Section 3, *Project Description*, Figure 3-1) adjacent to the community of Martinez. Approximately 20 percent of the Refinery is located within the corporate limits of the City of Martinez. The remainder of the Refinery is in an unincorporated area of the County. All of the CTRP components would be constructed within the County.

Contra Costa County is divided into three distinct regions – West County, Central County, and East County – the boundaries of which are delineated by hills and protected open space. Most of the County's residential and employment opportunities are located in the West County and Central County areas. The Central County area, where the CTRP is located in the north central portion, is the largest of the three areas, including ten of the nineteen cities in Contra Costa and over half of the total population. Central County is composed of mostly low density bedroom communities that have developed in the flat valleys between the East Bay Hills and the Diablo Range to the east, extending north and south of Mt. Diablo. The CTRP is surrounded by the Refinery, and is located towards the eastern side of the Refinery property, which itself is bordered by the City of Martinez on the west through south sides of the Refinery. The entire CTRP area is zoned as H-I (heavy industrial) and there are no agricultural or forestry resources on the Refinery or CTRP site.

4.2.2.2 Regulatory Setting

California Farmland Mapping and Monitoring Program

The California Department of Conservation maintains the Farmland Mapping and Monitoring Program (FMMP), which monitors the conversion of farmland to and from agricultural use. Farmlands are divided into the following categories based on their suitability for agriculture:

- *Prime Farmland*. This land has the best combination of physical and chemical characteristics for crop production. When treated and managed, its soil quality, growing season, and irrigation supply produce sustained high crop yields.

- *Farmland of Statewide Importance*. This is land other than Prime Farmland that has a good combination of physical and chemical characteristics, including irrigation, for crop production.

- *Unique Farmland*. This land does not meet the criteria for Prime Farmland or Farmland of Statewide Importance, but has produced specific crops with high economic value.
- *Farmland of Local Importance*. This land is either currently producing crops or has the capability to produce, but does not meet the criteria of the categories above.
- *Grazing Land*. This is land whose vegetation is suitable for grazing livestock.
- *Other Lands*. This land does not meet the criteria of any of the other categories.

Additional categories used in the FMMP mapping system are "urban and built-up lands" and "lands committed to non-agricultural use." The mapping system uses a minimum mapping unit size of 10 acres. The CTRP is located within the Refinery and is classified as urban and built-up lands (Department of Conservation, 2008).

California Public Resource Code

The California Public Resources Code governs forestry, forests and forest resources, as well as range and forage lands, within the State. "Forest land" is defined by Public Resources Code section 12220(g) as "land that can support 10-percent native tree cover of any species, including hardwoods, under natural conditions, and that allows for management of one or more forest resources, including timber, aesthetics, fish and wildlife, biodiversity, water quality, recreation, and other public benefits." Relatedly, "timberland" is defined by Public Resources Code section 4526 as, "land, other than land owned by the federal government..., which is available for, and capable of, growing a crop of trees of any commercial species used to produce lumber and other forest products, including Christmas trees."

California Government Code

Chapter 6.7 of the California Government Code (§§ 51100-51155) regulates timberlands within the State. "Timberland production zone" is defined in Section 51104(g) as an area that has been zoned pursuant to Government Code section 51112 or 51113 and is devoted to and used for growing and harvesting timber, or for growing and harvesting timber and compatible uses. In this context, "compatible uses" include any use that "does not significantly detract from the use of the property for, or inhibit, growing and harvesting timber" (Gov't Code § 51104(h)). Watershed management, grazing and the erection, construction, alteration, or maintenance of electric transmission facilities are examples of compatible uses.

California Land Conservation Act of 1965 – "Williamson Act"

The California Land Conservation Act of 1965 (Williamson Act) authorizes local governments to enter into contracts with private landowners to restrict specific parcels of land to agricultural or related open space use for a rolling 10-year period (Gov't Code § 51200 et seq.). In return, landowners' property taxes are assessed at a much lower than normal rate because they are based upon farming and open space uses as opposed to full market value. Local governments receive an annual subvention of forgone property tax revenues from the state via the Open Space Subvention Act of 1971.

There are no portions of the CTRP that are subject to Williamson Act contracts (Contra Costa County, 2010).

Contra Costa County General Plan

The Refinery is designated in the County General Plan as heavy industrial lands. This designation allows activities requiring large areas of land with convenient truck and rail access. These uses are typically not compatible with residential uses in close proximity and the operations conducted may be characterized by noise or other conditions requiring spatial separation. Uses may include metalworking, chemical or petroleum product processing and refining, heavy equipment operation and similar activities.

4.2.2.3 Project Baseline

Baseline conditions reflect the ongoing operation of the Refinery as it existed at the time of the issuance of the NOP (February 2010), as an oil refinery, including on-going operations and maintenance activities.

4.2.3 Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause significant adverse impacts to agriculture and forest resources if it would:

a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use;

b) Conflict with existing zoning for agricultural use, or a Williamson Act Contract;

c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g);

d) Result in the loss of forest land or conversion of forest land to non-forest use; or

e) Involve other changes in the existing environment, which due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use.

4.2.4 Discussion of No Agriculture and Forest Resources Impacts

Review and comparison of the setting circumstances and Project characteristics with all of the significance criteria stated above, clearly show that no impacts to agriculture and forest resources would result for all criteria. The following discusses the reasoning supporting this conclusion:

a-e) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use. / Conflict with existing zoning for agricultural use, or a Williamson Act Contract. / Conflict with existing zoning for, or cause rezoning of, forest land, timberland, or timberland zoned Timberland Production. / Result in the loss of forest land or conversion of forest land to non-forest use. / Involve other changes in the existing environment, which due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use.

The heavy industrial designation and zoning of the Refinery, as well as, the past and current use of the site for petroleum product processing, result in no impacts to any local agriculture and forestry resources.

4.2.5 Discussion of Impacts and Mitigation Measures

Implementation of the Project would result in no impact to agriculture and forestry resources.

4.3 Air Quality

4.3.1 Introduction

This section analyzes the Project's relationship to air quality. Discussed are the physical and regulatory setting; the baseline for determining environmental impacts; the criteria used for determining the significance of environmental impacts; potential impacts associated with construction, operation, and maintenance of the Project; and mitigation measures to reduce or avoid environmental impacts determined to be potentially significant.

4.3.2 Setting

4.3.2.1 Regional and Local Setting

Shell's Martinez Refinery (Refinery) is located approximately 25 miles northeast of San Francisco (see Section 3, *Project Description*, Figure 3-1) adjacent to the community of Martinez. Approximately 20 percent of the Refinery is located within the corporate limits of the City of Martinez. The remainder of the Refinery is in an unincorporated area of the County. All of the Project components would be constructed within the County's jurisdiction.

Regional Topography, Meteorology, and Climate

The Project area lies along the Carquinez Strait, with topography dominated by northwest-southeast-trending ridge lines that reach an elevation of approximately 750 feet overlooking Martinez. The Project site is within the San Francisco Bay Area (Bay Area) Air Basin. The Bay Area Air Basin encompasses a nine-county region including all of Alameda, Contra Costa, Santa Clara, San Francisco, San Mateo, Marin and Napa Counties, and the southern portions of Solano and Sonoma Counties.

The climate of the Bay Area Air Basin is determined largely by a high-pressure system that is almost always present over the eastern Pacific Ocean off the west coast of North America. High-pressure systems are characterized by an upper layer of dry air that warms as it descends, which restricts the mobility of cooler marine-influenced air near the ground surface and results in the formation of subsidence inversions. During the winter, the Pacific high-pressure system shifts southward, thereby allowing storms to pass through the region. During summer and fall, emissions generated within the Bay Area Air Basin can combine with abundant sunshine under the restraining influences of topography and subsidence inversions to create conditions that are conducive to the formation of photochemical pollutants, such as ozone.

The Project area is generally well-ventilated by winds. The prevailing wind at the marine terminal is from the north, northwest, and southwest. Winds from the north and northwest are typically associated with the summer Pacific High and winds from the southwest are characteristic of winter storm systems. Wind tends to be strongest in the afternoon, with speeds 15 to 20 miles per hour common in the region.

Between late spring and early fall, a layer of warm air often overlays a layer of cool air influenced by San Francisco Bay, resulting in air temperature gradients that cause stagnation of air referred to as an inversion. Typical winter inversions are formed when the sun heats the upper layers of air, trapping air below that has been cooled by contact with the colder surface of the earth during the night. Although each inversion type predominates at certain times of the year, both types can occur at any time of the year. Because inversions inhibit the vertical mixing of air in the atmosphere, they can prevent air pollution from dispersing, contributing to higher ground surface pollutant concentrations.

Temperature and precipitation data collected in Martinez indicate that the Project area typically has maximum and minimum winter (i.e., January) temperatures of 55 and 39 degrees Fahrenheit (ºF), respectively, while average summer (i.e., July) maximum and minimum temperatures are 89 and 55 ºF, respectively. Precipitation in the Project area averages approximately 19 inches per year (WRCC, 2010).

Air Pollutants of Concern

The U.S. Environmental Protection Agency (USEPA) has identified criteria air pollutants that are a threat to public health and welfare. These pollutants are called “criteria” air pollutants because standards have been established for each of them to meet specific public health and welfare criteria (see Section 4.3.2.2, *Regulatory Setting*). Below are descriptions of criteria pollutants that are a concern in the Project area.

Ozone

Ozone is a respiratory irritant and an oxidant that increases susceptibility to respiratory infections and that can cause substantial damage to vegetation and other materials. Ozone is not emitted directly into the atmosphere, but is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving precursor organic compounds (POC) and NO_x. POC and NO_x are known as precursor compounds for ozone. Significant ozone production generally requires ozone precursors to be present in a stable atmosphere with strong sunlight for approximately three hours.

Ozone is a regional air pollutant because it is not emitted directly by sources, but is formed downwind of sources of POC and NO_x under the influence of wind and sunlight. Ozone concentrations tend to be higher in the late spring, summer, and fall, when the long sunny days combine with regional subsidence inversions to create conditions conducive to the formation and accumulation of secondary photochemical compounds, like ozone.

Nitrogen Dioxide

Nitrogen dioxide (NO_2) is an air quality pollutant of concern because it acts as a respiratory irritant. NO_2 is a major component of the group of gaseous nitrogen compounds commonly referred to as NO_x. A precursor to ozone formation, NO_x is produced by fuel combustion in motor vehicles, industrial stationary sources (such as industrial activities), ships, aircraft, and rail transit. Typically, NO_x emitted from fuel combustion is in the form of nitric oxide (NO) and NO_2. NO is often converted to NO_2 when it reacts with ozone or undergoes photochemical reactions in the atmosphere.

Carbon Monoxide

Carbon monoxide (CO) is a non-reactive pollutant that is a product of incomplete combustion and is mostly associated with motor vehicle traffic. High CO concentrations develop primarily during winter when periods of light winds combine with the formation of ground level temperature inversions (typically from the evening through early morning). These conditions result in reduced dispersion of vehicle emissions. Motor vehicles also exhibit increased CO emission rates at low air temperatures. When inhaled at high concentrations, CO combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart, and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease, or anemia.

Particulate Matter

Particulate matter less than 10 microns in diameter (PM10) and particulate matter less than 2.5 microns in diameter (PM2.5) can be inhaled into air passages and the lungs and can cause adverse health effects. Particulate matter in the atmosphere results from many kinds of dust- and fume-producing industrial and agricultural operations, fuel combustion, and atmospheric photochemical reactions. Some sources of particulate matter, such as demolition and construction activities, are more local in nature, while others, such as vehicular traffic, have a more regional effect. Very small particles of certain substances (e.g., sulfates and nitrates) can cause lung damage directly, or can contain adsorbed gases (e.g., chlorides or ammonium) that may be injurious to health. According to a recent study by the California Air Resources Board (CARB), exposure to ambient PM2.5 can be associated with approximately 14,000 to 24,000 premature annual deaths statewide (CARB, 2009). Particulates can also damage materials and reduce visibility.

Other Criteria Pollutants

Sulfur dioxide (SO_2) is a combustion product of sulfur or sulfur-containing fuels such as coal. SO_2 is also a precursor to the formation of atmospheric sulfate and particulate matter (both PM10 and PM2.5) and contributes to potential atmospheric sulfuric acid formation that could precipitate downwind as acid rain. Lead has a range of adverse neurotoxic health effects, and was formerly released into the atmosphere primarily via the combustion of leaded gasoline. The phase-out of leaded gasoline in California resulted in decreasing levels of atmospheric lead.

Ambient Air Quality

The BAAQMD's regional monitoring network measures the ambient concentrations of criteria pollutants. Existing levels of air quality in the general Project area can be inferred from ambient air quality measurements conducted by BAAQMD at its closest station. The closest station to the Project site with complete data is the Concord Monitoring Station on Treat Boulevard, which is approximately seven miles to the southeast. Table 4.3-1 shows a three-year (2007-2009) summary of ozone, NO_2, CO, PM10, and PM2.5 monitoring data collected at the Concord station. The data are compared to the California Ambient Air Quality Standards (CAAQS) and National Ambient Air Quality Standards (NAAQS) that were applicable during the measurement summary period (see Table 4.3-1 notes).

TABLE 4.3-1
AIR QUALITY DATA SUMMARY (2007–2009) FOR THE PROJECT AREA

Pollutant	Current Standard	Monitoring Data by Year		
		2007	2008	2009
Ozone				
Highest One-Hour Average (ppm)		0.11	0.12	0.11
Days over State Standard	0.09	1	3	2
Highest Eight-Hour Average (ppm)		0.08	0.09	0.09
Days over State Standard	0.070	4	8	5
Days over Federal Standard	0.075*	0	6	2
Nitrogen Dioxide				
Highest One-Hour Average (ppm)		0.05	0.05	0.04
Days over State Standard	0.18	0	0	0
Annual Average (ppm)		0.01	0.01	0.01
Exceed State Standard?	0.030	No	No	No
Carbon Monoxide				
Highest 8-hour Average		1.4	1.1	1.1
Days over State Standard	20	0	0	0
PM10				
Highest 24-Hour Average (μg/m^3)		52	51	33
Days over State Standard	50	2	1	0
Days over Federal Standard	150	0	0	0
Annual Average (μg/m^3)		16.8	17.5	14.7
Exceed State Standard?	20	No	No	No
PM2.5				
Highest 24-hour Average (μg/m^3)		46.2	60.3	39.0
Days over Federal Standard	35	7	3	1
State Annual Average (μg/m^3)		8.4	9.3	8.4
Exceed State Standard?	12	No	No	No

NOTES: ppm = parts per million; μg/m^3 = micrograms per cubic meter.

* On May 17, 2008, the USEPA implemented a more stringent national eight-hour ozone standard, revising it from 0.080 ppm to 0.075 ppm. Federal ozone standard exceedance days for 2007 are based on the old standard.

SOURCE: BAAQMD, 2011

As shown in the table, the State one-hour ozone standard was exceeded between one and three times per year between 2007 and 2009. The State eight-hour ozone standard was exceeded between four and eight times per year between 2007 and 2009, while the national eight-hour ozone standard was exceeded six times in 2008 and twice 2009. The 24-hour State PM10 standard was exceeded twice in 2007 and once in 2008, with no exceedances recorded in 2009, and there were no exceedances of the federal 24-hour PM10 standard recorded during the three years. The annual average PM10 concentrations did not exceed the State standard during the summary period. From 2007 through 2009, the federal PM2.5 standard was exceeded one to seven times per year, while there were no exceedances of the State annual average during the summary

period. As indicated in the table, no violations of the applicable NO_2 or CO standards were recorded at the Concord station during the three year period.

Sensitive Receptors

For the purposes of this air quality analysis, sensitive receptors are places with people who are considered to be more sensitive than others to air pollutants. The reasons for greater-than-average sensitivity include pre-existing health problems, proximity to emissions sources, or duration of exposure to air pollutants. Schools, hospitals, and convalescent homes are considered to be sensitive to poor air quality because children, elderly people, and the infirm are more susceptible to respiratory distress and other air quality-related health problems than the general public. Residential areas are considered sensitive to poor air quality because people usually stay home for extended periods of time, with associated greater exposure to ambient air quality. Recreational uses are also considered sensitive due to the greater exposure to ambient air quality conditions because vigorous exercise associated with some forms of recreation places a high demand on the human respiratory system.

Sensitive receptors surrounding the Refinery include individual homes to the west, east, and south, Martinez Junior High School to the southwest, and a park to the west. The closest sensitive receptors are residences along Dineen Street, approximately 150 feet north of Tank 967, and an apartment complex on Pacheco Boulevard, approximately 2,000 feet from the proposed tank farm site. Daycare centers, nursing homes, schools, hospitals, and colleges are also located within a two mile radius of the site.

4.3.2.2 Regulatory Setting

Criteria Air Pollutants

Regulation of air pollution is achieved through both national and State ambient air quality standards and emission limits for individual sources of air pollutants. As required by the federal Clean Air Act (CAA), the USEPA has identified criteria pollutants and has established NAAQS to protect public health and welfare. NAAQS have been established for ozone, CO, NO_2, SO_2, PM10, PM2.5, and lead. To protect human health and the environment, the USEPA has set “primary” and “secondary” maximum ambient thresholds for each of the criteria pollutants. Primary thresholds were set to protect human health, particularly sensitive receptors such as children, the elderly, and individuals suffering from chronic lung conditions such as asthma and emphysema. Secondary standards were set to protect the natural environment and prevent further deterioration of animals, crops, vegetation, and buildings.

The NAAQS are defined as the maximum acceptable concentration that may be reached, but not exceeded more than once per year. California has adopted more stringent ambient air quality standards for most of the criteria air pollutants. Table 4.3-2 presents both sets of ambient air quality standards (i.e., national and State) and the Bay Area Air Basin’s attainment status for each standard. California has also established State ambient air quality standards for sulfates, hydrogen sulfide, and vinyl chloride.

TABLE 4.3-2
AMBIENT AIR QUALITY STANDARDS AND BAY AREA AIR BASIN ATTAINMENT STATUS

Pollutant	Averaging Time	State Standard		National Standard	
		Concentration	Attainment Status	Concentration	Attainment Status
Ozone	One-Hour	0.09 ppm	Non-attainment	–	
	Eight-Hour	0.070 ppm	Non-attainment	0.075 ppm	Non-Attainment
Carbon Monoxide	One-Hour	20 ppm	Attainment	35 ppm	Attainment
	Eight-Hour	9.0 ppm	Attainment	9 ppm	Attainment
Nitrogen Dioxide	One-Hour	0.18 ppm	Attainment	–	
	Annual	0.030 ppm	Attainment	0.053 ppm	Attainment
Sulfur Dioxide	One-Hour	0.25 ppm	Attainment	–	
	Three-Hour	–		0.5 ppm	Attainment
	24-Hour	0.04 ppm	Attainment	0.14 ppm	Attainment
	Annual	–		0.030 ppm	Attainment
Respirable Particulate Matter (PM10)	24-Hour	50 μg/m^3	Non-Attainment	150 μg/m^3	Unclassified
	Annual	20 μg/m^3	Non-Attainment	–	
Fine Particulate Matter (PM2.5)	24-Hour	–		35 μg/m^3	Non-Attainment
	Annual	12 μg/m^3	Non-Attainment	15 μg/m^3	Attainment
Lead	Monthly	1.5 μg/m^3	Attainment	–	
	Quarterly	–		1.5 μg/m^3	Attainment

NOTES: ppm = parts per million; μg/m^3 = micrograms per cubic meter

SOURCE: BAAQMD, 2010a.

As shown in the table, the Bay Area is currently classified as non-attainment for the one-hour State ozone standard as well as for the federal and State eight-hour standards. Additionally, the Bay Area is classified as non-attainment for the State 24-hour and annual arithmetic mean PM10 standards as well as the State annual arithmetic mean and the national 24-hour PM2.5 standards. The Bay Area is unclassified or classified as attainment for all other pollutants standards (BAAMQD, 2010a).

Toxic Air Contaminants

The Air Toxics “Hot Spots” Information and Assessment Act of 1987 (AB 2588) seeks to identify and evaluate risk from air toxics sources, but does not directly regulate air toxics emissions. Under the Act, toxic air contaminant (TAC) emissions from individual facilities are quantified and prioritized. “High-priority” facilities are required to perform a health risk assessment and, if specific thresholds are violated, are required to communicate the results to the public in the form of notices and public meetings. Depending on the risk levels, emitting facilities are required to implement varying levels of risk reduction measures. The BAAQMD implements AB 2588, and is responsible for prioritizing facilities that emit air toxics, reviewing health risk assessments, and implementing risk reduction procedure. Pursuant to the requirements of AB 2588, the BAAQMD publishes an air toxics emissions inventory that details the TAC emissions of facilities throughout the District.

Federal

USEPA is responsible for implementing the programs established under the federal CAA, such as establishing and reviewing the NAAQS and judging the adequacy of State Implementation Plans (SIPs), but has delegated the authority to implement many of the federal programs to the states while retaining an oversight role to ensure that the programs continue to be implemented.

State of California

CARB is responsible for establishing and reviewing the State standards, compiling the California SIP and securing approval of that plan from USEPA, conducting research and planning, and identifying toxic air contaminants. CARB also regulates mobile sources of emissions in California, such as construction equipment, trucks, and automobiles, and oversees the activities of California's air quality management districts, which are organized at the county or regional level. County or regional air quality management districts are primarily responsible for regulating stationary sources at industrial and commercial facilities within their geographic areas and for preparing the air quality plans that are required under the federal CAA and California CAA.

Bay Area Air Quality Management District

BAAQMD is the regional agency with jurisdiction over the nine-county region located in the Bay Area Air Basin. The Association of Bay Area Governments (ABAG) and the Metropolitan Transportation Commission (MTC), county transportation agencies, cities and counties, and various non-governmental organizations also join in the efforts to improve air quality through a variety of programs. These programs include the adoption of regulations and policies, as well as implementation of extensive education and public outreach programs. BAAQMD is also responsible for attaining and/or maintaining air quality in the Bay Area Air Basin within federal and State air quality standards. Specifically, BAAQMD has the responsibility to monitor ambient air pollutant levels throughout the Bay Area and to develop and implement strategies to attain the applicable federal and State standards.

Any person or facility that puts in place, builds, erects, installs, modifies, modernizes, alters or replaces any article, machine, equipment or other contrivance, the use of which may cause, reduce or control the emission of air contaminants, shall first secure written authorization from the District in the form of an Authority to Construct, unless the source is specifically excluded or exempt from permit requirements. The District's permit process is a pre-construction review and approval process. The District's review is conducted after the equipment is designed, but before it is installed. This is because it is less costly and more efficient to fix a non-complying design than to retrofit or replace non-complying equipment that has already been installed. The pre-construction review for new and modified sources applies to both stationary and portable sources of emissions that do not qualify for a permit exemption. Shell has submitted an application for an Authority to Construction permit for the Project that is currently being reviewed by the BAAQMD.

CEQA Guidelines

On June 2, 2010, the BAAQMD Board adopted an update to its *CEQA Air Quality Guidelines* (BAAQMD, 2010b), which were last updated in December 1999. The CEQA Air Quality

Guidelines is a guidance document to provide lead government agencies, consultants, and project proponents with uniform procedures for assessing air quality impacts and preparing the air quality sections of environmental documents for projects subject to CEQA. The document describes the criteria that BAAQMD uses when reviewing and commenting on the adequacy of environmental documents. It recommends quantitative thresholds for use in determining whether construction and operational activities associated with projects would have significant adverse environmental impacts, identifies methodologies for predicting project emissions and impacts, and identifies measures that can be used to avoid or reduce air quality impacts.

Air Quality Plans

Air quality plans developed to meet federal requirements are referred to as SIPs. The federal CAA and the California CAA require plans to be developed for areas designated as nonattainment (with the exception of areas designated as nonattainment for the State PM10 standard). At a public hearing on September 15, 2010, the BAAQMD Board of Directors adopted the final Bay Area 2010 Clean Air Plan (2010 CAP), and certified the Final Environmental Impact Report on the 2010 CAP. The 2010 CAP serves to update the 2005 Bay Area Ozone Strategy in compliance with the requirements of the Chapter 10 of the California Health & Safety Code. This plan includes ozone control measures and also considers the impacts of these control measures on particulate matter, air toxics, and greenhouse gas emissions in a single, integrated plan.

The 2010 Clean Air Plan control strategy includes revised, updated, and new measures in the three traditional control measure categories: stationary sources measures, mobile source measures, and transportation control measures. In addition, the 2010 CAP indentifies two new categories of control measures, including land use and local impact measures and energy and climate measures (BAAQMD, 2010c).

Air Toxics Program

The BAAQMD’s Air Toxics Program integrates federal and State air toxics mandates with local goals that have been established by the BAAQMD's Board of Directors. The program consists of several elements that are designed to identify and reduce public exposure TACs. Under the preconstruction review of new and modified sources program, proposed projects are reviewed for potential health impacts, with the requirement that significant new/modified sources use the Best Available Control Technology to minimize TAC emissions. All applications for new or modified permits are reviewed for air toxics impacts, in accordance with the BAAQMD’s Risk Management Policy and by Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants.

Contra Costa County General Plan

The Contra Costa County General Plan Conservation Element contains an Air Quality Resources discussion (Section 8.14) that identifies general goals and policies designed to address air pollution. While the goals and policies apply to development projects throughout the unincorporated County, the majority of them are not directly applicable to the Project because they tend to focus on improvements to the transportation system, reducing long distance commuting, encouraging and supporting non-auto transportation, and reducing future land use

conflicts related to air pollution. However, two of the policies (i.e., Policies 8-103 and 8-104) appear to be directly applicable to the CEQA review of projects. Policy 8-103 requires mitigation to be imposed when there is a finding that air quality would be significantly affected, and Policy 8-104 requires proposed projects to be reviewed for potential to generate hazardous air pollutants (Contra Costa County, 2010).

4.3.2.3 Project Baseline

Under CEQA, the project baseline is normally defined as the physical conditions of the environment as it exists at the time of publication of the Notice of Preparation of the project EIR. The Notice of Preparation for the Project was issued in February 2010. For a refinery, emissions often must be averaged over a multi-year period, such as a three-year average, to capture a representative period of refinery operations. This is because refineries undergo lengthy periodic shutdowns for scheduled maintenance that can under-represent emissions for the year when the maintenance shutdown occurs. In addition, market forces can also cause refineries to vary their capacity (up or down). These factors cause refinery emissions to fluctuate up and down between years and so a longer baseline period is needed to account for these cycles.

In consideration of these factors affecting Refinery operations, Shell has utilized data from 2007 to 2009 to arrive at a baseline that best represents typical operations and emissions, and the actual environmental setting related to emissions for normal operations at the Refinery. In 2009 and part of 2008, the Refinery experienced artificially low operations due to an unusual number of turnarounds (maintenance projects) and the extreme downturn in the economy. Therefore, an average of emissions over the three-year period was used to be more representative of typical operations. In addition, the use of a three-year baseline is consistent with BAAQMD permit application methodology. Estimated baseline criteria pollutant emissions for the Project, which are compared to proposed operational emissions for each Project component in the following subsections, are presented in Table 4.3-3.

TABLE 4.3-3
ANNUAL BASELINE EMISSIONS

	Tons per Year				
Source	**NO_x**	**SO_2**	**PM10**	**POC**	**CO**
Crude Oil Storage Tanks	--	--	--	1.7	--
Marine Terminal Operations – Crude Oil Shipping	58.8	92.4	7.6	5.0	7.7
Total	**58.8**	**92.4**	**7.6**	**6.7**	**7.7**

SOURCE: ERM, 2011.

In addition to emissions, the baseline includes the Project area classified as non-attainment for ozone, PM10, and PM2.5 air quality standards and the closest residences are approximately 150 feet from the Tank 967 site and 2,000 feet from the proposed tank farm site. Also, a review of

BAAQMD odor complaint data indicates that there have been two confirmed complaints associated with odors emanating from the Refinery between January 1, 2007, and December 31, 2009 (BAAQMD, 2010d).

4.3.3 Significance Criteria

Based CEQA Guidelines Appendix G, a project would cause adverse impacts to air quality if it would:

a) Conflict with or obstruct implementation of the applicable air quality plan;

b) Violate any air quality standard or contribute to an existing or projected air quality violation;

c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is a non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors);

d) Expose sensitive receptors to substantial pollutant concentrations; or

e) Create objectionable odors affecting a substantial number of people.

Approach to Analysis

As discussed previously, the BAAQMD recently adopted updated *CEQA Air Quality Guidelines*. As a result, the analysis used in this document tiers from methodologies provided in the updated CEQA Air Quality Guidelines (herein referred to as the BAAQMD Guidelines). Emission estimates for the Project presented in this section were prepared by Environmental Resource Management (ERM) and independently reviewed by the County's consultant, Environmental Science Associates (ESA). For details of data, calculations, and assumptions used to determine Project-related emissions and associated public health risks that would be associated with the crude oil storage tanks and marine terminal operations, refer to the *Shell Crude Tank Replacement Project, Air Quality/Greenhouse Gas Emissions/Public Health Assessment* (ERM, 2011), which can be obtained from the County for review.

Criteria Pollutants

For construction impacts, the BAAQMD Guidelines have quantitative significance thresholds for construction related exhaust emissions. Therefore, construction impacts associated with fugitive dust are discussed qualitatively with regard to the applicable BAAQMD-recommended mitigation measures for dust abatement, and construction impacts associated with equipment exhaust emissions are discussed quantitatively with respect to construction activity thresholds identified in the BAAQMD Guidelines. See, 14 C.C.R § 15064.7(c) (a lead agency may rely on thresholds of significance adopted or recommended by other public agencies or by experts).

Under the BAAQMD Guidelines, a project would have a significant short-term construction air quality impact if it would result in average construction-related mass emissions of POC, NOx, or

PM2.5 (non-inclusive of fugitive dust) of more than 54 pounds per day or emissions of PM10 (non-inclusive of fugitive dust) of more than 82 pounds per day, and would have a significant long-term operational air quality impact if it would result in average operational-related mass emissions of POC, NOx, or PM2.5 of more than 54 pounds per day or if emissions of PM10 would be more than 82 pounds per day, or if it would result in maximum annual emissions of POC, NOx, or PM2.5 of more than 10 tons per year or if emissions of PM10 would be more than 15 tons per year. Based on BAAQMD guidance, if a project would result in an increase in POC, NOx, PM10, or PM2.5 of more than its respective average daily or maximum annual mass thresholds, then it would also be considered to contribute considerably to a significant cumulative impact. In developing thresholds of significance for air pollutants, BAAQMD considered the emission levels for which a project's individual emissions would be cumulatively considerable. Therefore, if a project would exceed the identified significance thresholds, its emissions would be cumulatively considerable, and if a project would not exceed the significance thresholds, its emissions would not be cumulatively considerable.

Toxic Air Contaminants

The BAAQMD recommends that a project be found to result in a significant air quality impact if the construction or operation phase would expose persons to substantial levels of TACs such that the probability of contracting cancer exceeds 10 in one million, or if it would expose persons to TACs such that a non-cancer Hazard Index of 1.0 would be exceeded. The BAAQMD also recommends that a significant impact be identified if construction or operation of the project would result in an increase of the annual average ambient concentration of PM2.5 of more than 0.3 $\mu g/m^3$ and the project should be identified as having a significant cumulative TAC-related impact if combined cancer risk associated with all local permitted stationary sources and major roadways, plus the risks associated with the Project, would exceed 100 in one million, or if the non-cancer Hazard Index would exceed 10.

However, the BAAQMD identifies a "zone of influence" for use of these thresholds as a 1,000-foot radius from the property line of the source, and only the Tank 967 retrofit would occur within 1,000 feet of a sensitive receptor. The retrofit would result in a long-term net decrease in TAC emissions compared to baseline conditions and the retrofit would result in no long-term emissions of PM2.5. In addition, the average daily onsite construction emissions that would be associated with the Tank 967 retrofit would be limited to one forklift that would operate on average less than four hours per work-day over a construction period of up to six months. Therefore, for the purposes of assessing TAC-related impacts on nearby sensitive receptors, this analysis focuses on the probability of Project-related operational activities to result in a cancer risk of 10 in one million and/or if the operations of the Project would expose persons to TACs such that a non-cancer Hazard Index of 1.0 would be exceeded.

Odors

The BAAQMD has identified odor screening distances for specific odor-generating facilities that would be considered to provide a sufficient buffer between the facility and nearby sensitive receptors in which odor impacts would be unlikely. The screening distance for petroleum refineries

is two miles. Because the Refinery is within two miles of the nearest sensitive receptors, the BAAQMD guidance recommends that the impact of an existing odor source on surrounding sensitive receptors be evaluated by identifying the number of confirmed complaints received for that specific odor source. To identify how a proposed odor source would affect existing sensitive receptors, the BAAQMD recommends that a three-year annual average of odor complaint data be obtained and analyzed for a facility of similar type and size and with the same type of odor. If the surrogate data indicates that the project would result in an average of five or more confirmed complaints per year, the Project would be considered to result in a significant odor-related impact.

4.3.4 Discussion of No Impacts

As discussed in Section 4.3.5, analysis of the baseline and Project conditions relative to the significance criteria show that the Project would have impacts with respect to all of the above significance criteria.

4.3.5 Discussion of Impacts and Mitigation Measures

a) Would the Project conflict with or obstruct implementation of the applicable air quality plan?

Impact 4.3-1: The Project could conflict with or obstruct implementation of the 2010 Bay Area Clean Air Plan. *(Less than Significant*)

The most recently adopted air quality plan for the Bay Area is the 2010 CAP. The 2010 CAP is an update to the BAAQMD's 2005 Ozone Strategy to comply with State air quality planning requirements. The 2010 CAP also serves as a multi-pollutant air quality plan to protect public health and the climate. The 2010 CAP control strategy includes revised, updated, and new measures in the three traditional control measure categories: stationary sources measures, mobile source measures, and transportation control measures. In addition, the 2010 CAP indentifies two new categories of control measures, including land use and local impact measures and energy and climate measures.

BAAQMD recommends that the agency approving a project where an air quality plan consistency determination is required analyze the project with respect to the following questions: 1) Does the project support the primary goals of the air quality plan; 2) Does the project include applicable control measures from the air quality plan; and 3) Does the project disrupt or hinder implementation of any 2010 CAP control measures? If the first two questions are concluded in the affirmative, and the third question concluded in the negative, the BAAQMD considers the project consistent with air quality plans prepared for the Bay Area.

Any project that would not support the 2010 CAP goals would not be considered consistent with the 2010 CAP. The recommended measure for determining project support of these goals is consistency with BAAQMD CEQA thresholds of significance. As presented in the subsequent impact discussions, the Project with mitigations would not exceed the BAAQMD significance thresholds; therefore, the Project with mitigations would support the primary goals of the 2010 CAP. As mentioned above, projects that incorporate all feasible air quality plan control measures

are considered consistent with the 2010 CAP. Two 2010 CAP Stationary Source Measures (SSMs) would be applicable to the Project, including SSM 10, *Refinery Boilers and Heaters*, and SSM 15, *Greenhouse Gases in Permitting – Energy Efficiency*. The intent of these 2010 CAP SSMs would be incorporated into the Project through the proposed installation of the F-40 air preheater (APH) (see Section 3.4.5.3, F-*40 Air Preheater Energy Efficiently Improvement*), which would reduce fuel consumption associated with Crude Unit furnace F-40.

The Project would support the primary goals of the 2010 CAP, it would be consistent with all applicable 2010 CAP control measures, and would not disrupt or hinder implementation of any 2010 CAP control measures. Therefore, any potential impacts associated with conflicting or obstructing implementation of the applicable air quality plan would be less than significant.

Mitigation: None required.

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b) Would the Project violate any air quality standard or contribute to an existing or projected air quality violation?

Impact 4.3-2: The Project would result in short-term construction emissions of criteria pollutants that could contribute to existing air quality violations. (*Less than Significant with Mitigation*)

Construction activities at the Project site would be associated with demolition of existing tanks, construction of replacement tanks, tank refurbishing, and site grading. Construction of the Project would occur over a period of approximately 36 months. It is estimated that several pieces of off-road construction equipment, including dozers, cranes, forklifts, graders, tractors, water trucks, compactors, etc., would be required between one and eight hours per day, depending on the specific equipment type and construction activity, to construct the Project.

In addition to the off-road equipment, on-road truck trips would be required to deliver materials and equipment to the construction sites as well as to transport workers to and from the construction sites. It is estimated that an average of approximately 100 round trips per day, including truck trips and commuting worker trips, would be required during the construction period. For the purpose of estimating daily construction emissions, construction activities have been identified for the following two worst-case construction scenarios:

- Scenario 1: Simultaneously demolishing one tank, constructing one tank, retrofitting the roof on two tanks, and constructing an energy efficiency project; or
- Scenario 2: Simultaneously grading the site and constructing two tanks.

As shown in Table 4.3-4, the maximum Project daily construction emissions for NO_x, PM10, and PM2.5 would occur under Scenario 2 and maximum daily emissions of POC would occur under Scenario 1. The emission estimates for each scenario were compared with the BAAQMD thresholds of significance for construction activities and found to be below the applicable thresholds.

TABLE 4.3-4
CONSTRUCTION CRITERIA POLLUTANT EXHAUST EMISSIONS

Emissions Scenario	Pollutant Emissions (lb/day)			
	POC	NOx	PM10	PM2.5
Scenario 1				
Total Unmitigated Emissions	46.7	47.5	2.4	2.1
Total Basic Mitigated Emissions*	46.2	46.6	2.3	2.1
BAAQMD Threshold of Significance	54	54	82	54
Scenario 2				
Total Unmitigated Emissions	44.0	50.9	2.6	2.4
Total Basic Mitigated Emissions	43.0	49.3	2.5	2.3
BAAQMD Threshold of Significance	54	54	82	54

NOTES: Fugitive dust emissions for Scenario 1 were estimated to be 6.57 lb/day PM_{10} (1.37 lb/day $PM_{2.5}$) and fugitive dust emissions for Scenario 2 were estimated to be 46.99 lb/day PM_{10} (9.83 lb/day $PM_{2.5}$).

* Assumes implementation of Mitigation Measure 4.3-2.

SOURCE: ERM, 2011.

The BAAQMD CEQA Guidelines (2010) recommend that all projects implement BAAQMD Basic Mitigation Measures, regardless of the level of significance of the unmitigated emissions. Therefore, the basic mitigation measures have been applied to the construction emissions through input options selected in the URBEMIS 2007 9.2.4 modeling tool. According to the BAAQMD CEQA Guidelines, applying the basic mitigation measures would result in a reduction of fugitive dust PM emissions of 79 percent during grading activities. It should be noted that per BAAQMD guidance, fugitive dust emissions are not included in the emission estimates presented in Table 4.3-4. Implementation of the basic mitigation measures would also result in a five percent reduction of NO_x, PM10, and PM2.5 emissions from equipment and vehicle exhaust.

Although Project construction exhaust emissions were found to be less than the applicable significance thresholds, implementation of Mitigation Measure 4.3-2 is required to ensure that all construction-related emissions, included fugitive dust, would result in less-than-significant impacts.

Mitigation Measure 4.3-2: Implement BAAQMD Basic Mitigation Measures. Shell and its construction contractors shall comply with the following applicable BAAQMD basic control measures:

- All exposed unpaved surfaces (e.g., parking areas, staging areas, soil piles, and graded areas, and access roads) shall be watered two times a day.
- All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
- All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
- All vehicle speeds on unpaved roads shall be limited to 15 mph.

- All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.

- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California Airborne Toxics Control Measure Tile 13, Section 2485 of California of Regulations). Clear signage shall be provided for construction workers at all access points.

- All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.

- Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.

Significance after Mitigation: Less than Significant.

Impact 4.3-3: The Project would result in long-term emissions of criteria pollutants. (*Less than Significant with Mitigation*)

Implementation of the Project would increase emissions from the proposed crude oil storage tanks as well as from the increased shipping activity at the marine terminal.

Tank-Related POC Emissions

The proposed three replacement crude oil storage tanks, the new crude oil mix tank, and the refurbished crude oil storage tank would be sources of POC emissions. POC emissions that would be associated with the proposed crude oil storage tanks have been estimated using the USEPA TANKS 4.09D emissions model. Table 4.3-5 includes the estimated baseline emissions, with Project emissions, and the net increase in POC emissions under the Project that would occur at the proposed tank farm site.

The three replacement crude oil storage tanks and the new crude oil mix tank would be constructed with external floating roofs. The existing storage tank to be refurbished (TK-1128) currently has a fixed roof that would be retrofitted to an internal floating roof. All of the proposed storage tanks would be equipped with welded shells and double seals with zero-gap secondary seals, consistent with BAAQMD Regulation 8, Rule 5, BAAQMD specifications for Best Available Control Technology (BACT), and Title 40 of the Code of Federal Regulations (CFR) Part 60 Subpart Kb. The external floating roof tanks would have pontoon-type roofs.

The proposed refurbished and new storage tanks would require replacement and new piping components so that crude oil could enter and exit the tanks and for the new tank dewatering systems. The Project fugitive POC emissions are based on the net increase in the number of components

TABLE 4.3-5
CRUDE OIL TANK POC EMISSIONS

Shell Tank ID	Description	Roof Type	Tons per Year		
			Baseline	With Project	Net Increase
TK-541 – Replacement	Storage Tank	External Floating	0.4	2.6	2.2
TK-544 – Replacement	Storage Tank	External Floating	0.6	2.6	2.0
TK-545 – Replacement	Storage Tank	External Floating	0.7	2.6	1.9
TK-1127 – New	Mix Tank	External Floating	--	1.8	1.8
TK-1128 – Refurbished	Storage Tank	Internal Floating	0.0	1.5	1.5
Total			**1.7**	**11.1**	**9.4**

SOURCE: ERM, 2011.

associated with the proposed crude oil storage tanks. This includes five new crude oil transfer pumps and one new brine water pump for the tank dewatering system and associated valves and flanges. Fugitive emission factors were developed using the Correlation Equation Method guidelines established by California Air Pollution Control Officers Association (CAPCOA) and CARB, with the BAAQMD Regulation 8, Rule 18, leak definitions as the screening values to derive a "potential to emit" estimate. Total fugitive emissions have been estimated by multiplying the emission factor for each component type by the predicted count of each component type. The estimated POC total emissions from the fugitive components that would be associated with the Project are presented in Table 4.3-6.

TABLE 4.3-6
PROJECT FUGITIVE COMPONENTS POC EMISSIONS

Components	Component Counts	POC Emissions (tpy)
Valves	415	0.3
Pumps	6	0.1
Flanges	890	1.0
Total	**--**	**1.4**

SOURCE: ERM, 2011.

Crude Oil Shipping Emissions

Under the Project, crude oil shipments would increase at the Refinery marine terminal from 30 crude oil vessels per year (the average during the three-year baseline period) to a projected 87 crude oil vessels per year. Emissions of criteria pollutants associated with crude oil vessel maneuvering, hotelling, and crude oil pumping at the marine terminal have been estimated using emissions factors consistent with Shell's BAAQMD Permit Condition 7618. Table 4.3-7 summarizes the crude oil shipping emission estimates for the three-year baseline average, for with the Project, and the net change in Project-related emissions.

TABLE 4.3-7
CRUDE OIL SHIPPING CRITERIA POLLUTANT NET EMISSIONS

Criteria Pollutant	Tons per Year		
	Baseline	With Project	Net
NO_x	58.8	147.7	88.9
SO_2	92.4	19.1	-73.3
PM10	7.6	7.8	0.2
POC	5.0	11.1	6.1
CO	7.7	24.1	16.4

SOURCE: ERM, 2011.

Net emissions show a considerable reduction in SO_2 that would occur due to the proposed crude oil shipping activity. Baseline and with Project emissions of SO_2 and PM10 reflect new CARB sulfur standards for marine fuels. Emission factors for SO_2 and PM10 used to estimate actual emissions during the three-year baseline period (2007 through 2009) were adjusted to reflect the July 1, 2009 requirement to limit fuel sulfur content to 1.5 percent. Similar adjustments were made to the SO_2 and PM10 emission factors used to estimate with Project emissions to reflect the future requirement to further decrease marine fuel sulfur content to 0.1 percent by January 1, 2012.

Proposed Emission Reduction Measures

As described in Section 3.4.5, Shell has proposed emission reduction measures that would be implemented prior to the emission-increasing activities of the Project in order to reduce operating emissions to or below applicable BAAQMD significance thresholds.

Tank 967 Retrofit

As discussed in Section 3.4.5.1, to reduce POC emissions, Shell proposes to replace the existing fixed-roof on TK-967 with an internal floating roof. An internal floating roof consists of two components, a roof that floats on the top of the petroleum liquid in the tank, and a fixed roof over the floating roof. The internal floating roof would be installed inside the tank and the existing cone style fixed-roof would be removed and replaced with a new, cone-style fixed roof. The internal floating roof design would limit the volume of airspace above the liquid into which volatile hydrocarbon vapors can evaporate, and thereby would reduce POC emissions compared to the tank's baseline condition. The estimated effectiveness of this emission reduction measure is described in Table 4.3-8.

TABLE 4.3-8
POC EMISSION REDUCTION

Tank ID	POC Emissions (tpy)		
	Pre-Retrofit	Post-Retrofit	Net Reduction
TK-967	7.8	0.4	7.4

SOURCE: ERM, 2011.

Catalytic Cracking Unit Changes

As discussed in Section 3.4.5.2, to offset the NO_x emissions from the proposed increased shipping activity, Shell has proposed to make operational changes to the CCU and supporting CCU hydrotreater feed units through a combination of all or some of the operational changes summarized below to achieve the necessary NO_x reductions.

- Optimize Regenerator Conditions. Shell would reduce the amount of carbon monoxide (CO) in the CCU regenerator and thereby run the unit closer to "full burn." When a catalytic cracking unit is operated closer to full burn, the nitrogen chemistry shifts to favor lower NO_x levels in the regenerator, resulting in lower NO_x emissions.

- CCU Feed Quality Management. Two hydrotreaters currently treat the CCU feed for nitrogen prior to delivery to the CCU. Shell would optimize the performance of the two hydrotreaters in order to minimize the amount of nitrogen in the CCU feed. By lowering the amount of nitrogen in the CCU feed, the amount of potential nitrogen converted ultimately to NO_x in the CCU would be reduced.

- Optimize CCU Hydrocarbon Stripper Operations. The CCU hydrocarbon stripper vessel located between the CCU regenerator and the CCU reactor removes hydrocarbon containing nitrogen from the catalyst before the catalyst enters the regenerator. By operating the CCU stripper (by adjusting and controlling steam rates), the hydrocarbon on the catalyst would be removed and hence the amount of hydrocarbon entering the regenerator would be reduced. By reducing the hydrocarbon entering the regenerator, the amount of nitrogen would reduced and therefore, the amount of potential nitrogen converted ultimately to NO_x emissions would be reduced.

- Optimize Catalyst Circulation Rate. Optimizing the catalyst circulation rate by adjusting operating conditions in the reactor (temperature, water injection rates, etc.) can result in a reduction in NO_x emissions.

- Import CCU Feed Management. As market conditions allow, Shell may selectively purchase lower nitrogen CCU feeds in order to lower NO_x emissions at the CCU.

Baseline emissions data for the three-year baseline period, ending December 31 2009, were obtained from the continuous emissions monitor (CEMS) at the outlet of the CCU boilers to estimate the average baseline NO_x emissions. The estimated reductions in annual average NO_x emissions that would occur due to the proposed operational changes at the CCU are shown in Table 4.3-9.

TABLE 4.3-9
NO_X EMISSION REDUCTIONS

	NO_x Emissions (tpy)
Baseline NO_x Emissions	547
Post-Changes NO_x Emissions	468
Project NO_x Emissions Reductions	-78.9

SOURCE: ERM, 2011.

Net Project Emissions

A summary of total net annual Project operations-related emissions of criteria pollutants is presented in Table 4.3-10. The table shows baseline and with Project emissions for each Project component and the estimated emission reductions that would be associated with each of the proposed emission reduction measures. The Project-related increases are shown with the applicable BAAQMD CEQA thresholds of significance. Implementation of Mitigation Measures 4.3-3a and 4.3-3b, which would require Shell accept a BAAQMD permit condition limits commiserate with the proposed emission reductions prior to Project operations, would ensure that the net Project operational emissions increases would be at or below the applicable thresholds, thereby reducing impacts to a less-than-significant level.

TABLE 4.3-10
TOTAL NET PROJECT ANNUAL EMISSIONS

	Emissions (tpy)					
Emission Scenario	**NO_x**	**SO_2**	**PM10**	**PM2.5[a]**	**POC**	**CO**
With Project Emissions						
Crude Oil Storage Tanks	--	--	--	--	11.1	--
Wharf Operations – Crude Oil Shipping	147.7	19.1	7.8	7.8	11.1	24.1
Fugitive Components	--	--	--	--	1.4	--
Baseline Emissions						
Crude Oil Storage Tanks	--	--	--	--	1.7	--
Wharf Operations – Crude Oil Shipping	58.8	92.4	7.6	7.6	5.0	7.7
Proposed Emission Reductions						
TK-967 Roof Retrofit	--	--	--	--	-7.4	--
CCU Operational Changes	-78.9	--	--	--	--	--
Net Project Emissions	**10.0**	**-73.3**	**0.2**	**0.2**	**9.5**	**16.5**
Thresholds of Significance	**10**	**--**	**15**	**10**	**10**	**--**

[a] For a conservative analysis, it is assumed that PM2.5 emissions are equal to PM10 emissions.

SOURCE: ERM, 2011.

Mitigation Measure 4.3-3a: TK-967 Mass POC Emissions Limit. Prior to commencement of any Project operations, Shell shall demonstrate to the County that it has accepted a new BAAQMD permit condition that identifies and limits annual TK-967 POC mass emissions to 0.4 tons per year.

Mitigation Measure 4.3-3b: CCU Mass NO_x Emissions Limit. Prior to commencement of any Project operations, Shell shall demonstrate to the County that it has accepted a new BAAQMD permit condition that limits annual average CCU NO_x mass emissions to no more than 468 tons per year.

Significance after Mitigation: Less than Significant.

c) Would the Project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is a non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

Impact 4.3-4: The Project would result in increases in NO_x, PM10, and PM2.5, which in the Bay Area are non-attainment of standards. (*Less than Significant with Mitigation)*

Based on BAAQMD guidance, if a project would result in an increase in POC, NO_x, PM10, or PM2.5 of more than its respective average daily or annual mass significance thresholds, then it would also be considered to contribute considerably to a significant cumulative impact. In developing thresholds of significance for air pollutants, BAAQMD considered the emission levels for which a project's individual emissions would be cumulatively considerable. If a project would exceed the identified significance thresholds, its emissions would be cumulatively considerable, and if a project would not exceed the significance thresholds, its emissions would not be cumulatively considerable. Therefore, implementation of Mitigation Measures 4.3-2, 4.3-3a, and 4.3-3b, which would require Project related emissions to not exceed BAAQMD significance thresholds, would ensure that the Project would not be cumulatively considerable.

Mitigation: Implement Mitigation Measures 4.3-2, 4.3-3a, and 4.3-3b.

Significance after Mitigation: Less than Significant.

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d) Would the Project expose sensitive receptors to substantial pollutant concentrations?

Impact 4.3-5: The Project would expose sensitive receptors to emissions of Toxic Air Contaminants. (*Less than Significant)*

The closest sensitive receptors to the Project sites are residents along Dineen Street, approximately 150 feet north of Tank 967, and an apartment complex on Pacheco Boulevard, approximately 2,000 feet south of the proposed tank farm site. Health effects in the form of cancer risk and non-cancer health effects associated with exposure of sensitive receptors to Project-related pollutant concentrations have been estimated by combining human exposure calculations with toxicological dose-response relationships. The assessment considered potential airborne emissions of 17 TACs that would be emitted from the proposed tanks and associated tank components, increased ship maneuvering, hotelling, and crude oil pumping. Table 4.3-11 presents the 17 TACs and identifies which ones have been determined to pose a cancer risk and which ones pose non-cancer acute or chronic effects.

Cancer Risk

Table 4.3-12 summarizes the estimated Project-related cancer risks at the Maximum Exposed Individual at a Residential location (MEIR), the Maximum Exposed Individual at an off-site Worker location (MEIW), and the closest student location. As shown in the table, the estimated cancer risk at the MEIR and MEIW are 1.2 in one million and 0.9 in one million, respectively.

TABLE 4.3-11
TACS INCLUDED IN THE HEALTH RISK ASSESSMENT FOR THE PROJECT

Toxic Air Contaminant	Cancer Risk	Non-Cancer	
		Acute Effects	Chronic Effects
Benzene	✓	✓	✓
Ethylbenzene	✓		✓
Toluene		✓	✓
Hexane			✓
Xylene		✓	✓
Diesel Particulate Matter	✓		✓
Formaldehyde	✓	✓	✓
Naphthalene	✓		✓
Chlorobenzene			✓
Propylene			✓
Lead	✓		
Manganese			✓
Nickel	✓	✓	✓
Arsenic	✓	✓	✓
Cadmium	✓		✓
Copper		✓	
Selenium			✓

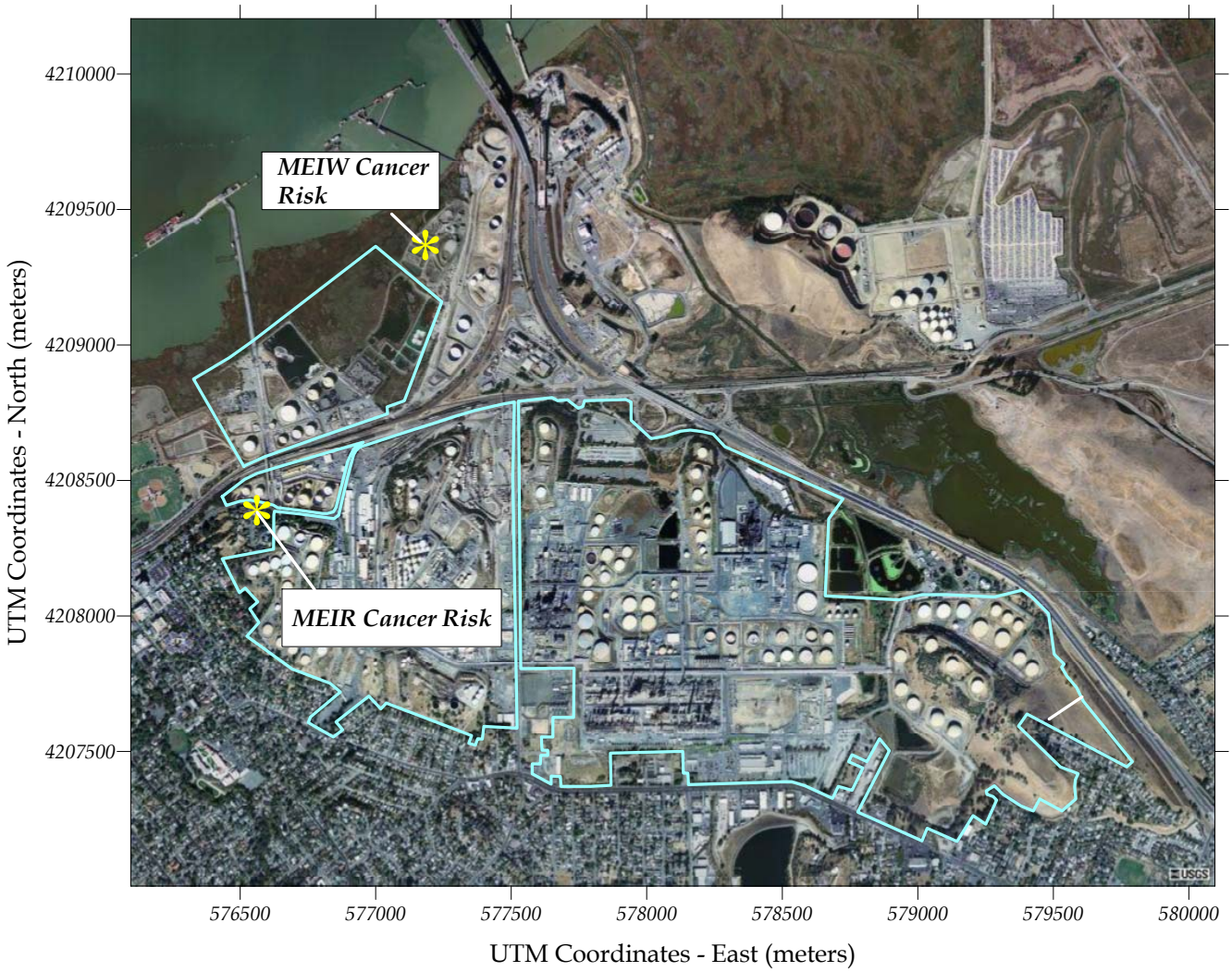
SOURCE: ERM, 2011.

TABLE 4.3-12
PROJECT RELATED CANCER RISK

Location	UTM Coordinates		Cancer Risk
	Easting (X) (meters)	Northing (Y) (meters)	Chances in One Million
MEIR	576,503	4,208,368	1.2
MEIW	577,128	4,209,368	0.9
Closest Student	576,485	4,207,508	0.2

NOTES: MEIR = Maximum Exposed Individual at a Residential location and MEIW = Maximum Exposed Individual at an off-site Worker location.
SOURCE: ERM, 2011.

Both are below the BAAQMD significance threshold of 10 in one million. At both locations, DPM from ship cruising and maneuvering dominated the cancer risk. As illustrated in Figure 4.3-1, the MEIR would be located to the west of the Refinery near the corner of Escobar Street and Miller Avenue. The MEIW would be located to the north of the Refinery and southeast of the marine terminal. The highest estimated cancer risk for a student is 0.2 in one million and would occur at Martinez Junior High School, approximately 1,300 feet southwest of the Refinery property boundary.



MEIR - Maximum Exposed Individual Resident
MEIW - Maximum Exposed Individual Worker

SOURCE: ERM, 2011

Shell Crude Tank Replacement Project . 209699

Figure 4.3-1
Locations of Maximum Health Risk

Non-Cancer Health Effects

Of the 17 TACs analyzed, seven have been identified to potentially cause acute (short-term) health effects, and 15 have been identified to potentially cause chronic (long-term) health effects. The methodology used for assessing chronic and acute non-cancer health effects is the calculation of the hazard index (HI) for each target organ. Fuel combustion from the ship boilers during hotelling and pumping would dominate the potential for acute and chronic health effects for both baseline and with Project conditions. Based on the estimated future changes of fuel that would be combusted in the ship boilers, TAC emissions associated with volatile organic compounds (VOC) and PM10 emissions would decrease compared to baseline conditions, resulting in a reduction in both the acute and chronic health effects. Therefore, no further analysis is required and the potential non-cancer health effects would be less than significant.

Mitigation: None required.

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e) Would the Project create objectionable odors affecting a substantial number of people?

Impact 4.3-6: The Project could create an increase in objectionable odors in the Project area. *(Less than Significant)*

The increase in shipping and crude oil storage that would be associated with the Project may result in an increased potential for nearby residences to be exposed to objectionable odors. There would be a potential for petroleum-related odors to be generated associated with proposed crude oil storage facilities. Because the Refinery is within two miles of the nearest sensitive receptors, the BAAQMD guidance recommends that the impact of an existing odor source on surrounding sensitive receptors be evaluated by identifying the number of confirmed complaints received for the specific odor source. To identify how a proposed potential odor source, such as the Project, would affect existing sensitive receptors, the BAAQMD recommends that a three-year annual average of odor complaint data be obtained and analyzed for a facility of similar type and size, similar geographic setting, and that is the same type of odor source. If the surrogate data indicates that the project would result in an average of five or more confirmed complaints per year over a three year period, the Project would be considered to result in a significant odor-related impact. Due to the relative similarities of the Refinery baseline and with Refinery plus Project conditions, it is reasonable to consider historical odor complaint data associated with the existing Refinery as a surrogate for the Project.

A review of BAAQMD odor complaint data compiled for the Refinery between January 1, 2007 and December 31, 2009, indicates that there have been two confirmed complaints associated with odors emanating from the Refinery during the three year baseline period (BAAQMD, 2010d). The complaints equal an average of less than one confirmed complaint per year during the three-year baseline period. It should also be noted that the BAAQMD did not issue a Notice of Violation for either of the confirmed odor complaints (BAAQMD, 2010d). In addition, the closest part of the Project to the nearest sensitive receptors would be the Tank 967 retrofit, which would

result in a decrease of potential odor-causing emissions compared to baseline emissions. Therefore, the Project would not be anticipated to result in a substantial number of odor complaints and odor-related impacts associated with the Project would be less than significant.

Mitigation: None required.

4.4 Biological Resources

4.4.1 Introduction

This section analyzes the Project's relationship to biological resources. Discussed are the physical and regulatory setting, the baseline for determining environmental impacts, the significance criteria used for determining environmental impacts, and potential impacts associated with construction, operation, and maintenance of the Project.

4.4.2 Setting

4.4.2.1 Regional and Local Setting

Shell's Martinez Refinery (Refinery) is located approximately 25 miles northeast of San Francisco (see Section 3, *Project Description*, Figure 3-1) adjacent to the community of Martinez. Approximately 20 percent of the Refinery is located within the corporate limits of the City of Martinez. The remainder of the Refinery is in an unincorporated area of the County. All of the Project components would be constructed within the County.

The Refinery is located in the Bay Area-Delta Bioregion (as defined by the California Department of Fish and Game (CDFG)). This Bioregion is comprised of a variety of natural terrestrial communities including salt marshes, grasslands, chaparral, and oak woodlands; however, none of these natural communities occurs within the Project site boundaries. It also includes marine habitats and associated communities including open water pelagic, subtidal and intertidal soft sediment, and artificial subtidal and intertidal hard substrate.

Martinez Waterfront Park and Martinez Regional Shoreline border the Refinery Marine Terminal (MT) to the northwest and northeast, respectively, and urban development and residential neighborhoods of Martinez, Mountain View, and Vine Hill about the Refinery from the southwest to the southeast. Interstate-680 to the east separates the Refinery from tidal marshland conservation areas and rolling grasslands. Historically, the Refinery is within tidal marsh habitat surrounded by annual grasslands and low range coastal hills with oak woodlands; however, the Project site has been disturbed from industrial use and habitat no longer exists within the Refinery.

San Francisco Bay-Delta fronts the north border of the Refinery. The San Francisco Bay-Delta is the second largest estuary in the United States (NOAA, 2007) and is composed of multiple aquatic habitats and biological communities. It encompasses 479 square miles (1,241 square kilometers), including shallow mudflats (NOAA, 2007). Typically, San Francisco Bay (the Bay) is divided into four main basins: South Bay, Central Bay, San Pablo (also known as North Bay), and Suisun Bay. The described boundary between South Bay and Central Bay often varies depending on the study or report. For the purposes of this document, South Bay is defined as that area of the Bay south of the Oakland Bay Bridge. Central Bay stretches between the Oakland Bay Bridge and the Richmond-San Rafael Bridge and connects to the Pacific Ocean through the Golden Gate. San Pablo Bay stretches between the Richmond-San Rafael Bridge and the Carquinez Bridge. The most

northern and upstream basin is Suisun Bay, which transforms quickly into the diked wetlands of Suisun Marsh and the west Delta. Suisun Bay lies east of Carquinez Strait to the westerly point where the Sacramento and San Joaquin Rivers combine at the Sacramento Delta, providing the main source of freshwater into the Bay. The Project site is located along the south shore of the Carquinez straight, which connects San Pablo Bay and Suisun Bay.

4.4.2.2 Regulatory Setting

Federal

U.S. Fish and Wildlife Service & National Marine Fisheries Service

The U.S. Fish and Wildlife Service (USFWS) administers the Federal Endangered Species Act (FESA) and Migratory Bird Treaty Act (MBTA).

FESA Section 7 and 10. Under FESA, the Secretary of the Interior and the Secretary of Commerce have joint authority to list a species as threatened or endangered. Two federal agencies oversee FESA: the USFWS has jurisdiction over plants, wildlife, and resident fish, and the National Marine Fisheries Service (NMFS) has jurisdiction over anadromous fish and marine fish and mammals. FESA Section 7 mandates that all federal agencies consult with USFWS and/or NMFS to ensure that federal agency actions do not jeopardize the continued existence of a listed species or destroy or adversely modify critical habitat for listed species. FESA prohibits the unauthorized "take"[1] of any fish or wildlife species listed as threatened or endangered, including the destruction of habitat that could hinder species recovery.

FESA Section 10 requires the issuance of an incidental take permit before any public or private action may take any individual of an endangered or threatened species. The permit requires preparation and implementation of a habitat conservation plan that provides specific measures to avoid, offset, or minimizes impacts on endangered or threatened species.

Critical Habitat. USFWS designates critical habitat for listed species under FESA. Critical habitat designations are specific areas within a geographic region that are occupied by a species and determined to be critical to its survival in accordance with FESA. Federal entities issuing permits or acting as a lead agency must show that their actions do not negatively affect the critical habitat to the extent that it impedes the recovery of the species. Within designated critical habitat, USFWS protects habitat that provides the primary constituent elements (PCEs) for survival of the listed species. PCEs are the physical and biological functions considered essential to species conservation that require special management considerations or protection.

Nesting Birds. The Migratory Bird Treaty Act (MBTA) (16 USC 703, Supp. I, 1989) prohibits the killing, possessing, or trading of migratory birds, bird parts, eggs, and nests, except in accordance with regulations prescribed by the Secretary of the Interior. The MBTA prohibits direct and indirect

[1] FESA defines "take" as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct.

acts, though harassment and habitat modification are not included unless they result in direct loss of birds, eggs, or nests. The list of birds covered by MBTA essentially includes all native birds.

Essential Fish Habitat. The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (16 U.S.C. Section 1801−1884) of 1976, amended in 1996, and reauthorized in 2007 applies to fisheries resources and fishing activities in Federal waters that extend to 200 miles offshore. Conservation and management of U.S. fisheries, development of domestic fisheries, and phasing out of foreign fishing activities are the main objectives of the legislation.

The Magnuson-Stevens Act defines "essential fish habitat" as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. The Magnuson-Stevens Act, as amended through 2007, sets forth a number of new mandates for National Oceanic and Atmospheric Administration (NOAA) Fisheries, regional fishery management councils, and Federal action agencies to identify essential fish habitat and to protect important marine and anadromous fish habitat. The Magnuson-Stevens Act provided NOAA Marine Fisheries with legislative authority to regulate fisheries in the U.S. in the area between 3 miles and 200 miles offshore and established eight regional fishery management councils that manage the harvest of the fish and shellfish resources in these waters. The councils, with assistance from NOAA Marine Fisheries, are required to develop and implement Fishery Management Plans (FMPs), which include the delineation essential fish habitat, for all managed species. An FMP is a plan to achieve specified management goals for a fishery and is composed of data, analyses, and management measures for a fishery. Essential fish habitat that is identified in an FMP applies to all fish species managed by that FMP, regardless of whether the species is a protected species or not. Federal agency actions that fund, permit, or carry out activities that may adversely affect essential fish habitat are required under Section 305(b), in conjunction with required Section 7 consultation under the FESA, to consult with NOAA Fisheries regarding potential adverse effects of their actions on essential fish habitat and to respond in writing to NOAA Fisheries' recommendations.

The waters of the Bay and within the Carquinez Straight are designated as essential fish habitat for fish managed under three FMPs and as a Habitat Area of Particular Concern (HAPC) under two FMPs. Commercially important fish and sharks managed in the Pacific groundfish and coastal pelagic fish FMPs utilize this region of the Bay-Delta as either essential fish habitat or HAPC. In addition, the Pacific coast salmon FMP, which includes Chinook salmon (*Oncorhynchus tshawytscha*) and coho salmon (*Oncorhynchus kisutch*) identifies all of the Bay-Delta as essential fish habitat.

Marine Mammals. The Marine Mammal Protection Act (MMPA) of 1972 and as amended in 1981, 1982, 1984, and 1995, establishes a federal responsibility for the protection and conservation of marine mammal species by prohibiting the "taking" of any marine mammal. The MMPA defines "taking" as the act of hunting, killing, capture, and/or harassment of any marine mammal; or the attempt at such. The Act also imposes a moratorium on the import, export, or sale of any marine mammals, parts, or products within the United States. These prohibitions apply to any person in U.S. waters and by any U.S. citizen in international waters.

The primary authority for implementing the MMPA belongs to the USFWS and NMFS. USFWS is responsible for ensuring the protection of sea otters and marine otters, walruses, polar bears, three species of manatees, and dugongs. NMFS is responsible for protecting pinnipeds (seals and sea lions) and cetaceans (whales and dolphins).

The MMPA, as amended, provides for the "incidental take" of marine mammals during marine activities, as long as NMFS finds the "takings" would be of small numbers of individuals and have no more than a negligible impact on those marine mammal species not listed as depleted under the MMPA (i.e., listed under the FESA, and not having an unmitigable adverse impact on subsistence harvests of these species.

Invasive Species. Under the National Invasive Species Act (NISA) of 1996, the U.S. Coast Guard (USCG) established national voluntary ballast water guidelines. The USCG published regulations on June 14, 2004, establishing a national ballast water management program with mandatory requirements for all vessels equipped with ballast water tanks that enter or operate in U.S. waters. The regulations carry mandatory reporting requirements to aid in the USCG's responsibility, under the NISA, to determine patterns of ballast water movement. The regulations also require ships to maintain and implement vessel-specific ballast water management plans.

Wetlands. The Estuary Protection Act (16 USC 1221–1226) highlights the value of estuaries and the need for conservation of their valuable natural resources. It authorizes the Secretary of the Interior, in cooperation with other federal agencies and the states, to study and inventory estuaries of the United States and to determine whether any areas should be acquired by the federal government for future protection. Under this act, the Secretary of the Interior is required to review all project plans and reports for land and water resource development affecting estuaries and make an assessment of likely impacts and related recommendations for conservation, protection, and enhancement of estuaries.

The federal government also supports a policy of minimizing "the destruction, loss, or degradation of wetlands." Executive Order 11990 (May 24 1977) requires that each Federal agency take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) administers Section 404 of the Clean Water Act (CWA). Section 404 regulates activities in wetlands and "other waters of the United States." Wetlands are a subset of waters of the United States that are defined in the Code of Federal Regulations as waters used for interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide; interstate waters including wetlands; all other waters—such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds—which could affect interstate or foreign commerce; water impoundments; tributaries of waters; territorial seas; and adjacent wetlands.

Section 401 of the CWA requires that applicants obtain an USACE permit to obtain State certification that the activity associated with the permit will comply with applicable State effluent limitations and water quality standards. In California, water quality certification, or a waiver, must be obtained from the Regional Water Quality Control Board (RWQCB), for both Individual and Nationwide Permits.

The USACE also regulates activities in navigable waters under section 10 of the Rivers and Harbors Act. Section 10 of the Federal Rivers and Harbors Appropriations Act of 1899 (RHA) (30 Stat. 1151, codified at 33 U.S.C. Sections 401, 403) prohibits the unauthorized obstruction or alteration of any navigable water (33 U.S.C. Section 403). Navigable waters under the RHA are those "subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce" (33 C.F.R. Section 3294). Typical activities requiring Section 10 permits are construction of piers, wharves, bulkheads, marinas, ramps, floats, intake structures, cable or pipeline crossings, and dredging and excavation. The construction of structures, such as tide gates, bridges, or piers, or work that could interfere with navigation, including dredging or stream channelization, may require a Section 10 permit, in addition to a Section 404 permit if the activity involves the discharge of fill.

State

California Department of Fish and Game

The CDFG administers a number of laws and programs designed to protect fish and wildlife resources, as discussed below.

California Endangered Species Act. The California Endangered Species Act (CESA) (Fish and Game Code Section 2050 et seq.) generally parallels the main provisions of the FESA. CDFG administers the listing and authorizes the "take" of endangered and threatened species under CESA. CDFG may allow take of such a species through its issuance of permits pursuant to Fish and Game Code Section 2081, except for designated "Fully Protected" species. Unlike its federal counterpart, CESA adopts a narrower definition of take, and CESA's protections apply to candidate species that have been petitioned for listing.

> ***Fully Protected Species.*** Fully Protected species may not be taken or possessed at any time, and no licenses or permits may be issued for their take, except for collecting these species for necessary scientific research and relocation of the bird species for the protection of livestock.
>
> ***Nesting Birds.*** California Fish and Game Code Sections 3502 and 3503.5 make it unlawful to take, possess, or destroy the nests or eggs of any bird of prey (i.e., species in the orders Falconiformes and Strigiformes) or to take or possess any migratory non-game bird or bird-part as designated in the MBTA. Disturbance that causes nest abandonment and/or reproductive failure is prohibited under the Fish and Game Code. This statute does not provide for the issuance of an incidental take permit.
>
> ***State Species of Special Concern.*** California designates State Species of Special Concern, which are species of limited distribution, declining populations, diminishing habitat, or unusual scientific, recreational, or educational value. These species do not have the same

legal protection as State-listed species or Fully Protected species, but may be added to official lists in the future. CDFG intends the Species of Special Concern list to be a management tool for consideration in future land use decisions.

Native Plants Protection Act. California Fish and Game Code Sections 1900 through 1913, also known as the Native Plant Protection Act, are intended to preserve, protect, and enhance endangered or rare native plants in California. Vascular plants identified as rare or endangered by the California Native Plant Society (CNPS), but which may have no designated status or protection under federal or State endangered species legislation, are defined as follows:

- **List 1A:** Plants presumed extinct;
- **List 1B:** Plants rare, threatened, or endangered in California and elsewhere;
- **List 2:** Plants rare, threatened, or endangered in California, but more numerous elsewhere;
- **List 3:** Plants about which more information is needed (a review list); and
- **List 4:** Plants of limited distribution (a watch list).

In general, plants appearing on CNPS Lists 1A, 1B, or 2 are considered to meet the criteria of endangered, rare, or threatened under CEQA Guidelines.

Wetlands Regulations. CDFG regulates activities that would interfere with the natural flow of, or substantially alter, the channel, bed, or bank of a lake, river, or stream. The regulatory definition of a stream is a body of water that flows at least periodically or intermittently through a bed or channel having banks, and supports wildlife, fish, or other aquatic life. These activities are regulated under California Fish and Game Code Section 1600 et seq. Requirements to protect the integrity of biological resources and water quality are often conditions of Streambed Alteration Agreements. Requirements may include avoidance or minimization of the use of heavy equipment, limitations on work periods to avoid impacts on wildlife and fishery resources, and measures to restore degraded sites or compensate for permanent habitat losses.

Fisheries. Within California, most of the legislative authority over fisheries management is enacted within the Marine Life Management Act (MLMA). This law directs CDFG and the Fish and Game Commission to issue sport and commercial harvesting licenses, as well license aquaculture operations. CDFG, through the Commission, is the State's lead biological resource agency and is responsible for enforcement of the State endangered species regulations and the protection and management of all State biological resources.

Lempert-Keene-Seastrand Oil Spill Prevention and Response Act. This act created the Office of Oil Spill Prevention and Response (OSPR) and made the CDFG the lead State agency in spill response. The Act requires that persons causing a spill begin immediate cleanup, follow approved contingency plans, and fully mitigate impacts to wildlife. An Interagency Agreement between OSPR and the California Coastal Commission (CCC) has OSPR operating an oil spill program and maintaining an oil spill staff. Before and after a spill, CCC staff are involved in review and comment to both State (e.g., OSPR) and federal (e.g., USCG) agencies on contingency plans and regulations related to marine vessels, marine facilities, and marine vessel routing.

California State Lands Commission

The State Lands Commission (CSLC) administers lands owned by the State, which includes the beds of all naturally navigable waterways, such as major rivers, streams and lakes, and tidal and submerged lands below the high tide line. The CSLC issues Land Use Leases or Permits for use of State lands that are determined to be consistent with the public trust values for fisheries, navigation, public access, recreation, wildlife habitat and open space. CSLC recently granted Shell a new 30-year lease to continue to operate the MT as described in the project description in Section 3.4.3.1, *Terminal Lease Status.* Increased use of the MT with implementation of the Project would result in an estimated one additional crude oil ship call per week to achieve up to 120 thousand barrels (MBbl) per day compared to the current 27 MBbl per day average. This increase was accounted for in the CSLC EIR analysis conducted for the new lease application.

California State Lands Act and Coastal Ecosystems Protection Act of 2006. The Coastal Ecosystems Protection Act of 2006 directed the CSLC to adopt performance standards for discharging ballast water by January 1, 2008, and prepare a report assessing the availability of treatment technologies to meet those standards (Falkner *et al*., 2009). The CSLC completed the rulemaking process and adopted the standards in October 2007 as part of its Marine Invasive Species Program. The technology assessment report was completed in December 2007. In response to the report's recommendations, the California Legislature passed Senate Bill 1781 (Chapter 696, Statutes of 2008), which delayed initial implementation of the performance standards from January 1, 2009, to January 1, 2010, and required an update of the technology assessment report by January 1, 2009. CSLC staff are currently conducting the necessary studies and developing rulemaking actions including: (1) establishing ballast water treatment technology testing guidelines; (2) promulgating regulatory language to specify the selection of sampling points (i.e., location) and sampling facilities (i.e., equipment) on vessels; and (3) identifying procedures and protocols for use by CSLC Marine Safety personnel to verify vessel compliance with the performance standards.

The CSLC is also mandated to adopt regulations governing the management of vessel fouling by January 1, 2012, specifically, introduction of nonindigenous invasive species via vectors other than ballast water. Two studies are currently underway to guide the development of these regulations. In January 2008, Hull Husbandry Reporting Forms were used to gather data on fouling-related husbandry practices of the commercial vessel fleet visiting California waters. In addition, ongoing fouling-related research conducted by the CSLC's Marine Invasive Species Program will better define how husbandry practices and voyage characteristics affect the quantity and quality of fouling biota associated with vessels operating in California.

California Marine Invasive Species Act of 2003. Established in 2003, the California Marine Invasive Species Act was created to ultimately eliminate the discharge of non-indigenous species into the waters of the State or into waters that may impact the waters of the State, based on the best available technology economically achievable. Since its passage, the Act has been amended with the most recent amendment in 2009.

The Act requires mid-ocean exchange or retention of all ballast water and associated sediments for all vessels over 300 gross register tons, United States and foreign, carrying ballast water into

the waters of the State after operating outside the waters of the State. For all vessels over 300 gross register tons arriving at a California port or place carrying ballast water from another port or place within the Pacific Coast Region, the Act mandates near-coast exchange or retention of all ballast water. The Act requires completion and submission of a Ballast Water Report Form upon departure from each port of call in California, annual submittal of a hull husbandry reporting form, the keeping of a ballast management plan and logs, and the application of "Good Housekeeping" Practices designed to minimize the transfer and introduction of invasive species.

Lempert-Keene-Seastrand Oil Spill Prevention and Response Act. Enactment of the Lempert-Keene-Seastrand Oil Spill Prevention and Response Act of 1990 expanded the CSLC's responsibilities, resulting in creation of the Marine Facilities Division. The Marine Facilities Division is responsible for ensuring that all marine terminals and other oil and gas facilities within the CSLC's jurisdiction use the best achievable methods to prevent accidents and resulting oil spills. Management responsibilities extend to activities within three nautical miles (six kilometers) seaward of mean low water.

Regional Water Quality Control Board

Responsibility for the protection of State waters resides with the RWQCB. All waters of the United States that are also within the borders of California are "waters of the State." They may be defined as "any surface water or groundwater, including saline waters, within the boundaries of the State" under the Porter-Cologne Water Quality Control Act. The Federal government, through the USACE, may have concurrent jurisdiction over such waters, but California still retains authority to regulate discharges. California Water Code Section 13260 requires any person discharging, or proposing to discharge, waste within any region that could affect "waters of the State" to file an application and obtain a permit.

Water Quality Control Plan for the San Francisco Region (Basin Plan). The applicable basin plan is the *San Francisco Bay Basin Water Quality Control Plan* (Basin Plan), which is currently being updated to reflect amendments adopted since 2006. The RWQCB is responsible for developing and implementing the Basin Plan, which documents approaches to implementing State and federal policies in the context of actual water quality conditions. The RWQCB's other activities include permitting of waste discharges, and implementing monitoring programs of pollutant effects. For more information about the State and RWQCB regulations and permits that affect the Project, see Section 4.10, *Hydrology and Water Quality*.

Bay Conservation and Development Commission

The Bay Conservation and Development Commission (BCDC) is authorized by the McAteer Petris Act to analyze, plan, and regulate San Francisco Bay and its shoreline. It implements the San Francisco Bay Plan, and regulates filling and dredging in the Bay, its sloughs and marshes, and certain creeks and tributaries. BCDC jurisdiction includes Suisun Bay and a shoreline band that extends inland 100 feet from the high tide line. In addition, the Federal Coastal Zone Management Act (CZMA) of 1972, as amended, set forth the national policy that state coastal management programs should provide for public access to the coasts for recreational purposes and that federal

activities within the Coastal Zone be conducted in accordance with state environmental policies. While boating and associated activities, such as marinas, are an important means of public access, they may also pose a threat to the health of aquatic systems if poorly planned or managed. In 1990, The CCC assumed jurisdiction for CZMA implementation throughout the State except within the Bay-Delta where the San Francisco Bay Conservation and Development Commission (BCDC) has authority for implementation of the CZMA within its jurisdictional area, which includes the Project site. BCDC permits would be required for any work within either the Bay or the shoreline band.

Suisun Marsh Habitat Management, Preservation, and Restoration Plan. The proposed Suisun Marsh Habitat Management, Preservation, and Restoration Plan (SMP) would be a comprehensive 30-year resource plan for the 51,000 acre Suisun Marsh. The public comment period for the Draft EIS/EIR for the plan prepared by the USFWS, Bureau of Reclamation (Reclamation), and CDFG ended December 28, 2010. If approved, the plan would incorporate multiple agencies and their interests in the restoration of tidal wetlands and the enhancement and management of wetlands and their functions while balancing the needs of the California Bay-Delta Program (CALFED), the Suisun Marsh Preservation Agreement, and other plans by protecting the brackish water marsh. The principal agencies involved include USFWS, Reclamation, NMFS, CDFG, State of California Department of Water Resources, Suisun Resource Conservation District, and the CALFED.

Local

Contra Costa County General Plan

The Contra Costa County General Plan designates 41 areas as Significant Ecological Resource Areas. These areas are defined by the presence of rare, threatened, or endangered species; unique natural areas; or wetlands and marshes. Of the designated areas, four are within the regional Project vicinity. Near the Project are areas of tidal marsh supporting salt marsh harvest mouse, California clapper rail, and potentially black rail (Area 14, northwest and northeast of the Project); and grasslands, oak woodland, riparian, and creek features supporting a variety of species (Areas 13, 16, and 15 southwest, south, and southeast of the Project, respectively).

The Contra Costa County General Plan contains numerous goals, policies, and programs related to the protection of wildlife and vegetation. Goals and policies include: protection of rare, threatened, and endangered species and their habitats (Goals 8-D and 8-E); recognition and protection of the critical ecological characteristics of rangelands and wildlands (Policy 8-13); identification and protection of seasonal wetlands in grassland areas (Policy 8-27); conservation of upland habitat areas adjacent to wetlands that are critical to the survival of wetland species (Policy 8-24); protection of marshes, wetlands, and riparian corridors from the effects of potential industrial spills (Policy 8-25); thorough evaluation of the environmental impacts of using poisons to control ground squirrel populations in grasslands (Policy 8-26); and retention of existing vegetation and wildlife habitat areas in large open areas sufficient to support wildlife populations (Policy 8-15) (Contra Costa County, 2010).

San Francisco Bay-Delta Regional Conservation Plans

San Francisco Bay Plan

In 1968, the Bay Plan was completed and adopted by the BCDC. The Bay Plan has been periodically amended during the past 40 years. In 1975, BCDC, City and County of San Francisco, and the Port adopted the San Francisco Waterfront Special Area Plan. The Special Area Plan, together with the McAteer-Petris Act and the Bay Plan and subsequent amendments to all three documents, prescribes a set of rules for non-maritime shoreline development along the San Francisco Waterfront. Several policies of the Bay Plan are aimed at protecting the Bay's water quality, ecology, and guiding the dredging activities of the Bay's sediment

San Francisco Bay Subtidal Habitat Goals

The BCDC, California Ocean Protection Council (OPC)/California State Coastal Conservancy (SCC), NOAA, and the San Francisco Estuary Partnership (SFEP), in collaboration with each other and the broader scientific community, managers, restoration practitioners, and stakeholders published in 2010 a set of restoration planning goals and guidelines for the subtidal areas and habitats of the Bay-Delta.

Subtidal habitats include all of the submerged area beneath the bay water's surface and include mud, shell, sand, rocks, artificial structures, shellfish beds, submerged aquatic vegetation, macroalgal beds, and the water column above the bay bottom. Submerged habitats are important for threatened species such as green sturgeon and Chinook salmon, commercial species like Dungeness crab and Pacific herring, and a host of other fish, shrimp, crabs, migratory waterfowl, and marine mammals.

The Subtidal Goals Project takes a Bay-wide approach in setting science-based goals for maintaining a healthy, productive, and resilient ecosystem. Where possible, these subtidal goals are designed to connect with intertidal habitats and with goals developed by other projects, including goals for Baylands and uplands habitats. The goals and recommendations contained within the Subtidal Goals Project are not regulatory binding but rather are intended to serve as guidance to local, State, and federal agencies when evaluating projects and their potential ecological affects, and when issuing permits.

4.4.3 Project Baseline

4.4.3.1 Terrestrial Habitats

Terrestrial baseline conditions reflect the current operations and maintenance activities of the Refinery at the Project component locations including crude oil storage and petroleum refining. Existing operations are not known to directly affect wildlife and plant species due to the lack of habitat within the Refinery complex.

Terrestrial Habitats in the Project Vicinity

Several terrestrial plant communities/habitat types described below were identified within a two-mile radius from the crude tank Project site and classified by the CDFG CalVeg database, under

wildlife habitat relationship – vegetation types (WHRTYPE), derived from aerial photographs, and ground truthing. While none of these plant communities/habitat types occur within the existing Project site, these plant communities/habitat types present within the Refinery complex include: Urban (URB); Water (WAT); Annual Grassland (AGS); and Valley Oak Woodland (VOW). Habitats found adjacent to or within two miles of the Refinery include: Saline Emergent Wetland (SEW); Freshwater Emergent Wetland (FEW); Blue Oak Woodland (BOW); and Coastal Oak Woodland (COW). These habitat types are drawn in part from Myer and Laudenslayer (1988) and the CalFlora Database (2010). Figure 4.4-1 displays the habitats located in the Project vicinity. Since none of these plant communities/habitat types occurs on the Project site, but rather just in the vicinity of the Project, they are not discussed further herein.

Urban

The most abundant habitat type within the Project site is urban. This habitat generally consists of tree groves, street strips, and other landscaped features in an urban setting; however, most of the Refinery habitat is highly disturbed, paved, barren, or dominated by industrial equipment. Urban habitat also exists to the northeast of the Refinery.

Water

Aquatic habitats are present in offshore estuarine areas consisting of permanently or periodically flooded areas of semi-enclosed coastal waters where tidal seawater and flowing freshwater intermingle to the north and northwest of the Refinery; and fresh open-water ponds in upland areas both within and in the vicinity of the Refinery. Bay-Delta marine habitats are presented in more detail in Section 4.4.3.2 below.

Saline Emergent Wetland

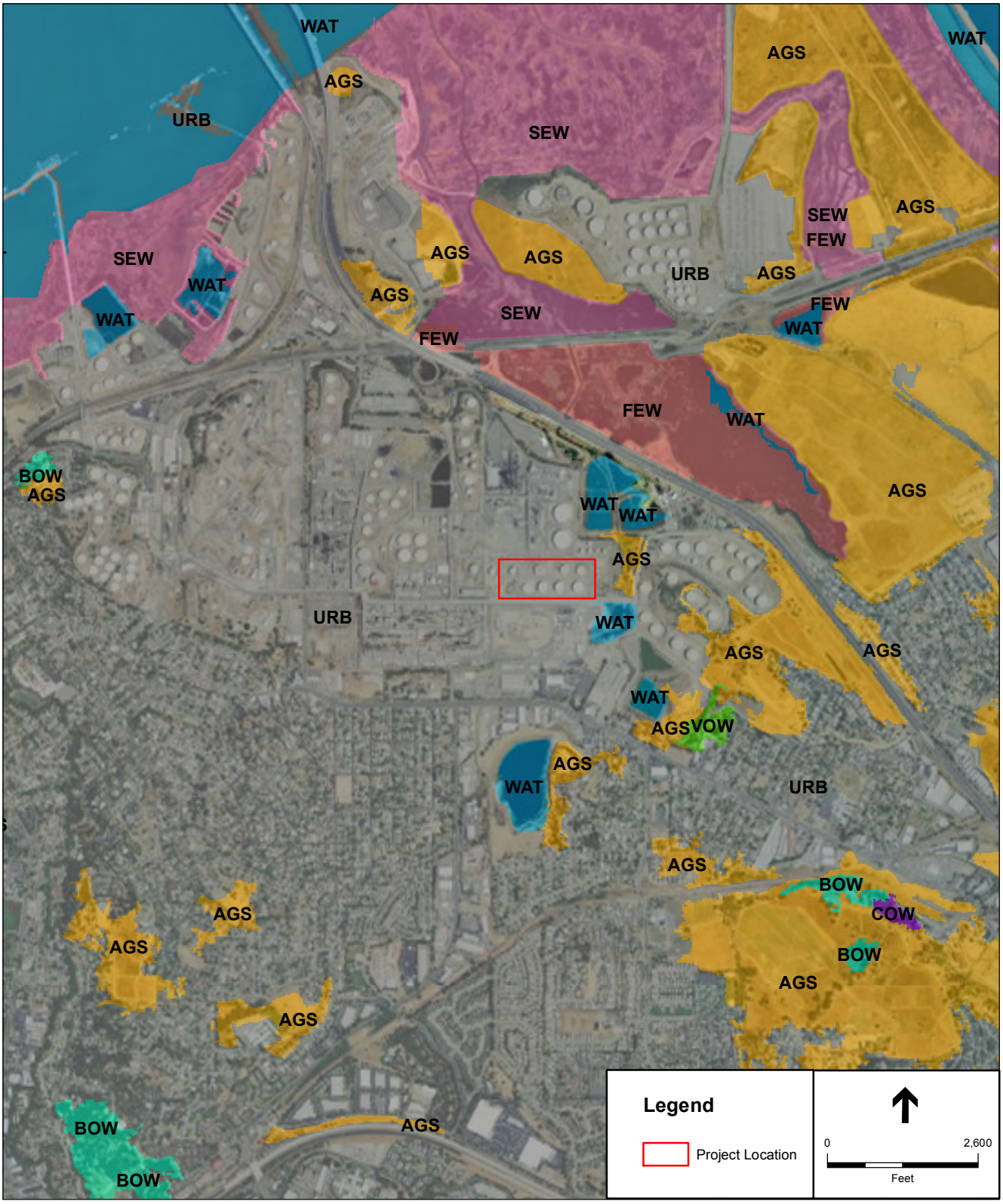
Located outside of the Refinery, adjacent to the MT to the north, and present to the northeast, the saline emergent wetlands are characterized by salt or brackish marshes dominated by, for example, cordgrass *(Spartina* sp.*)*, pickleweed *(Salicornia virginica)*, alkali heath *(Frankenia salina)*, seashore saltgrass *(Distichlis spicata)*, California bulrush *(Scripus californicus)*, and common cattail *(Typha latifolia)*.

Freshwater Emergent Wetland

Also located outside of the Refinery and to the northeast, freshwater emergent wetlands are characterized by saturated or periodically flooded soils. The habitat supports several moist soil plant species including big leaf sedge *(Carex amplifolia)*, baltic rush *(Juncus balticus),* and saltgrass. More saturated sites support additional species including common cattail and tulle bulrush *(Schoenoplectus* sp.*)*.

Special-Status Species

A comprehensive list of special-status plant and wildlife species in the Project area was compiled to assess the likelihood of species occurrences and potential Project impacts to these species. Sources used in preparing this list include the California Natural Diversity Database (CNDDB)



SOURCE: US Forest Service, 2000; ESRI, 2010; ESA, 2010

Shell Crude Tank Replacement Project ADEIR. 209669

Figure 4.4-1

Habitats within the Project Vicinity

(CDFG, 2010a), the USFWS endangered species program electronic database (USFWS, 2010), and the California Native Plant Society's (CNPS) electronic database (CNPS, 2010). A brief description of those special-status plant and wildlife species that have been identified, or are expected to occur in the Project vicinity based on local sightings and/or available habitat (but may not necessarily be impacted by the Project), is provided below. Figure 4.4-2 presents special-status species recorded in the Project vicinity and Table 4.4-1 lists special-status species known to occur within the Project vicinity or with potential to be affected by Project activities.

Special-Status Terrestrial Species in the Project Vicinity

Included in this list are several terrestrial species that could be subject to impact if they are present during construction. However, as the Project would occur on already disturbed, industrial lands within the Refinery, potential species occurrence is moderate, low, or absent. Normally, a low or moderate impact on species with potential to occur within the Project vicinity would necessitate further analysis; however, it is unlikely that any species listed in Table 4.4-1 would be impacted by the Project.

4.4.3.2 Marine Habitats

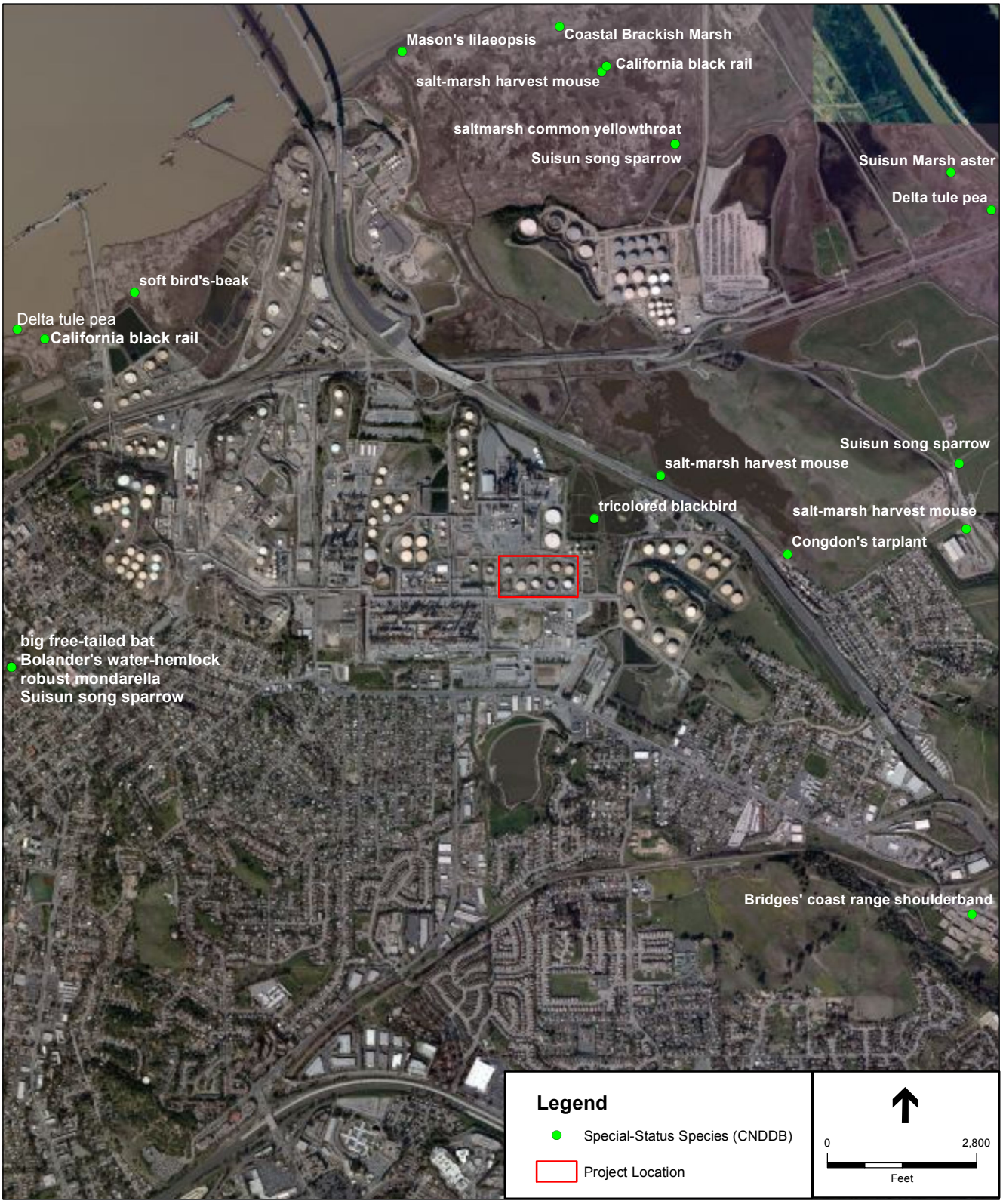
The predominant habitat types in the Bay-Delta include open water (pelagic), soft sediment subtidal and intertidal, and hard bottom subtidal and intertidal environments (NOAA, 2007). The following section provides brief descriptions of each of these habitats and associated biological communities in the vicinity of the MT. More detailed information can be found in Appendix D concerning the marine habitats and communities in other regions of the Bay.

Open Water (Pelagic) Habitat

The open water (pelagic) environment is the predominant habitat of the Bay and includes the region between the water surface and the seafloor. The physical conditions of the open water environment are constantly changing with tidal flow and season. Each of the main basins of the Bay-Delta (South Bay, Central Bay, North/San Pablo Bay, and Suisun Bay) is heavily influenced by ocean water brought into the Bay by the daily tidal cycle and by freshwater flow from the many rivers and tributaries that flow to the Pacific Ocean through the Bay-Delta. The water column provides habitat for floating plants (phytoplankton), invertebrates (zooplankton), fishes, birds, and marine mammals.

Plankton Communities

The phytoplankton community in San Pablo Bay and Suisun Bay is dominated by diatoms, dinoflagellates, and cryptophores that are tolerant of broad temperature and salinity ranges and can be found throughout the Bay-Delta (NOAA, 2007). Commonly observed species include both freshwater taxa (e.g., *Skeletonema potamos*) as well as the marine red alga, *Polysiphonia denudata* (NOAA, 2007). The zooplankton community consists of small invertebrate organisms that spend all or a portion of their life cycle in the water column and will change seasonally with a few species being present year-round. These include microzooplankton (tintinnids, rotifers, and copepod nauplii), larger copepods (small crustaceans), cladocerans (small crustaceans, or water



SOURCE: California Department of Fish and Game, 2010; ESRI, 2010; ESA, 2010

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Figure 4.4-2

Special-Status Species in the Project Vicinity

TABLE 4.4-1
TERRESTRIAL AND AQUATIC SPECIAL-STATUS SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO BE AFFECTED BY THE PROJECT

Scientific Name **Common Name**	**Listing Status* USFWS/ CDFG/ CNPS/MMPA**	**General Habitat**	**Potential for Species Occurrence in the Project Area**	**Period of Identification or Blooming Period**
INVERTEBRATES				
Federal or State Threatened and Endangered Species				
Branchinecta conservatio Conservancy fairy shrimp	FE/--/--/--	Endemic to the northern two-thirds of the Central Valley grasslands and found in large, turbid pools, swales, and ponds filled by winter/spring rains.	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Year-round (eggs in dry season, adult shrimp in winter)
Branchinecta lynchi Vernal pool fairy shrimp	FT/--/--/--	Vernal pools or other areas capable of ponding water seasonally	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Year-round (eggs in dry season, adult shrimp in winter)
Desmocerus californicus dimorphus Valley elderberry longhorn beetle	FT/--/--/--	Riparian habitat, levee and riprap lined stream banks containing its host plant, elderberry shrubs (*Sambucus* spp.)	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Year round, emergence March-June
Syncaris pacifica California freshwater shrimp	FE/SE/--/--	Endemic to Solano, Napa, and Marin counties. Found in low elevation, low gradient streams where riparian cover is moderate to heavy. Shallow pools away from main streamflow. Winter: undercut banks w/exposed roots. Summer: leafy branches touching water.	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Breeds in fall; emergence in early spring
Federal or State Species of Special Concern				
Danaus plexippus Monarch butterfly	Wintering sites protected by CDFG	Winter roost sites along coast from northern Mendocino to Baja California, Mexico; roosts located in wind-protected tree groves (eucalyptus, Monterey pine, cypress), with nectar and water sources nearby.	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Breeds four times a year between February and October
Helminthoglypta nickliniana bridgesi Bridges' coast range shoulderband	FSC/--/--/--	Inhabits open hillsides of Alameda and Contra Costa counties; tends to colonize under tall grasses and weeds.	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery. Nearest record is 1.951 miles southeast of the Project location.	Year-round
FISH				
Federal or State Threatened and Endangered Species				
Eucyclogobius newberryi Tidewater goby	FE/SE/--/--	Coastal lagoons, estuaries, and marshes in coastal California from the Smith River (Del Norte County) to Aqua Hedionda Lagoon (San Diego County).	**No Potential.** Species presumed to be extirpated from San Francisco Bay-Delta.	N/A

TABLE 4.4-1 (Continued)
TERRESTRIAL AND AQUATIC SPECIAL-STATUS SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO BE AFFECTED BY THE PROJECT

Scientific Name **Common Name**	**Listing Status* USFWS/ CDFG/ CNPS/MMPA**	**General Habitat**	**Potential for Species Occurrence in the Project Area**	**Period of Identification or Blooming Period**
FISH (cont.)				
Federal or State Threatened and Endangered Species (cont.)				
Hypomesus transpacificus Delta smelt	FT/ST/--/--	Shallow, open waters of the estuary where salinities range from 2-7ppt. Spawn and rear in sloughs and shallow edge waters and channels in upper Delta and Sacramento River, Suisun Marsh and Bay.	**Moderate-High.** Suitable habitat exists in waters adjacent to Refinery marine terminal and in Suisun and San Pablo Bays.	Spawning variable annually between December and July,
Oncorhynchus kisutch Coho salmon – Central California Coast Distinct Population Segment	FE/SE/--/--	Accessible Bay Area and coastal rivers and streams with cover, cool water and sufficient dissolved oxygen. Require beds of loose, silt-free gravel for spawning	**Low-None.** Closest known Bay-Delta accessible suitable streams are in Marin County.	Spawns in January
Oncorhynchus mykiss irideus Steelhead – Central California Coast Distinct Population Segment	FT/CSC/--/--	San Francisco & San Pablo Bay basins; unlocked Bay Area and coastal rivers and streams, requires clear, cool water and clean gravels for spawning	**Moderate-High.** Carquinez Straight constitutes a migration corridor between spawning area and Pacific Ocean**.**	Spawns between December and April; mature at 2-5 years; Juveniles present year round and adults present in winter.
Oncorhynchus mykiss Steelhead – Central Valley Distinct Population Segment	FT/--/--/--	Spawn in the Sacramento and San Joaquin Rivers and their tributaries	**Moderate-High.** Carquinez Straight constitutes a migration corridor between spawning area and Pacific Ocean.	Spawns late December-April; mature at 4-5 years; juveniles present year-round.
Oncorhynchus tshawytscha Chinook salmon – Sacramento River winter run Evolutionarily Significant Unit	FE/SE/--/--	Spawning restricted to the Sacramento River. Require clean, cool water with gravel beds.	**Moderate-High.** Carquinez Straight constitutes a migration corridor between spawning area and Pacific Ocean.	Mature at 2-7 years; Adults present November and December and juveniles fall and winter.
O. tshawytscha Chinook salmon – Central Valley spring-run ESU	FT/CT/-/--	Spawning restricted to Sacramento-San Joaquin river systems. Require clean, cool water with gravel beds.	**Moderate-High.** Carquinez Straight constitutes a migration corridor between spawning area and Pacific Ocean.	Mature at 2-7 years; Adults present March through September; juveniles migrate late fall or later
Acipenser medirostris Green sturgeon – Southern Distinct Population Segment	FT/CSC/--/--	Inhabit near-shore marine waters from Mexico to the Bering Sea and are commonly observed in bays and estuaries along the west coast of North America. Southern Distinct Population Segment is only known to spawn in upper Sacramento River	**Moderate-High.** Suitable foraging habitat exists at Refinery marine terminal. Main channel through Carquinez Straight used as migration corridor between spawning ground and Pacific ocean.	Spawns in spring; females at 3-7 years intervals; mature at 17 years

TABLE 4.4-1 (Continued)
TERRESTRIAL AND AQUATIC SPECIAL-STATUS SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO BE AFFECTED BY THE PROJECT

Scientific Name **Common Name**	**Listing Status* USFWS/ CDFG/ CNPS/MMPA**	**General Habitat**	**Potential for Species Occurrence in the Project Area**	**Period of Identification or Blooming Period**
FISH (cont.)				
Federal or State Species of Special Concern				
O. tshawytscha Chinook salmon – Central Valley fall and late fall run	FSC/CSC/-/--	Spawning restricted to Sacramento-San Joaquin river systems. Require clean, cool water with gravel beds.	**Moderate-High.** Carquinez Straight constitutes a migration corridor between spawning area and Pacific Ocean.	Mature at 2-7 years; Adults present June through April; juveniles March through June
Archoplites interruptus Sacramento perch	FSC/CSC/--/--	Slow moving sloughs, streams, rivers and lakes of the Central Valley	**Moderate.** Suitable habitat exists at Refinery marine terminal.	Spawns late March-early August; mature at 2-3 years
Pogonichthys macrolepidotus Sacramento splittail	--/CSC/--/--	Endemic to the lakes and rivers of the Central Valley, but now confined to the Delta, Suisun Bay and associated marshes; enjoys slow moving river sections, dead end sloughs. Requires flooded vegetation for spawning & foraging for young.	**Moderate.** Suitable habitat exists at Refinery marine terminal.	Spawns late winter-early summer
Longfin smelt *Spirinchus thaleichthys*	FSC/ST/--/--	Throughout the nearshore coastal waters and open waters of San Francisco Bay-Delta including the river channels and sloughs of the Delta. Spawns in Delta areas similar to Delta smelt and migrate to deeper cooler waters of Central and San Pablo Bay.	**Moderate-High.** Suitable habitat exists in waters adjacent to Refinery marine terminal and in Suisun and San Pablo Bays.	Spawning variable annually between December and July,
AMPHIBIANS				
Federal or State Threatened and Endangered Species				
Ambystoma californiense California tiger salamander	FT/ST/--/--	Wintering sites occur in grasslands occupied by burrowing mammals; breed in ponds and vernal pools	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Winter rains and March-April
Rana draytonii California red-legged frog	FT/CSC/--/--	Breed in stock ponds, pools, and slow-moving streams	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Year-round
REPTILES				
Federal or State Threatened and Endangered Species				
Masticophis laterals euryxanthus Alameda whipsnake (striped racer)	FT/ST/--/--	Coastal ranges, in chaparral and riparian habitat and adjacent grasslands	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Year-round
Thamnophis gigas Giant garter snake	FT/--/--/--	Prefers freshwater marsh and low gradient streams. Has adapted to drainage canals and irrigation ditches	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Mates between March and April; hatch 10-46 young between July and September

TABLE 4.4-1 (Continued)
TERRESTRIAL AND AQUATIC SPECIAL-STATUS SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO BE AFFECTED BY THE PROJECT

Scientific Name **Common Name**	**Listing Status* USFWS/ CDFG/ CNPS/MMPA**	**General Habitat**	**Potential for Species Occurrence in the Project Area**	**Period of Identification or Blooming Period**
REPTILES (cont.)				
Federal or State Species of Special Concern				
Actinemys marmorata Western pond turtle	--/CSC/--/--	Lakes, ponds, reservoirs, and slow-moving streams and rivers, primarily in foothills and lowlands	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Year-round
BIRDS				
Federal or State Threatened and Endangered Species		*[Nesting Potential within the Project Area]*		
Buteo swainsoni Swainson's hawk	--/ST/--/--	Nests in large trees, often near water, open grasslands, or agricultural lands; forages over open grasslands	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Summer
Charadius alexandrines nivosus Western snowy plover	FT/CSC/--/--	Sandy beaches, salt pond levees and shores of large alkali lakes; needs sandy, gravelly or friable soils for nesting	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Winter
Haliaeetus leucocephalus Bald eagle	BEPA-FD/SE-CFP/--/--	Winter foraging at lakes and along major rivers; a fish specialist restricted to foraging in lakes and rivers	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Winter
Laterallus jamaicensis coturniculus California black rail	--/ST/--/--	Nests and forages in tidal emergent wetland with pickleweed	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery. Nearest record is 1.832 miles north of the Project location.	Year-round
Pelecanus occidentalis californicus California brown pelican	--/SE/--/--	Migratory; in early May, disperse from breeding colonies in Mexico and Channel Islands; colonial nester on coastal islands just outside the surf line	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Intermittent
Rallus longirostris obsoletus California clapper rail	FE/SE/--/--	Nests and forages in emergent wetlands with pickleweed, cordgrass, and bulrush	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Year-round
Sternula antillarum browni California least tern	FE/SE/--/--	Nests along the coast from San Francisco Bay south to northern Baja California; colonial breeder on bare or sparsely vegetated, flat substrates: sand beaches, alkali flats, land fills, or paved areas	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Intermittent

TABLE 4.4-1 (Continued)
TERRESTRIAL AND AQUATIC SPECIAL-STATUS SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO BE AFFECTED BY THE PROJECT

Scientific Name **Common Name**	**Listing Status* USFWS/ CDFG/ CNPS/MMPA**	**General Habitat**	**Potential for Species Occurrence in the Project Area**	**Period of Identification or Blooming Period**
BIRDS (cont,)				
Federal or State Species of Special Concern			*[Nesting Potential in the Project Area]*	
Agelaius tricolor Tricolored blackbird	--/CSC/--/--	Nests in freshwater marshes with dense stands of cattails or bulrushes, occasionally in willows, thistles, mustard, blackberry brambles, and dense shrubs and grains	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery. Nearest record is 0.274 miles northeast of the Project location.	Year-round
Athene cunicularia hypugea Western burrowing owl	FSC/CSC/--/--	Nests and forages in low-growing grasslands with burrowing mammals	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Year-round
Aquila chrysaetos Golden eagle	BEPA/CSC-CFP/--/--	Nests in canyons and large trees in open habitats; a contour flier, this species forages over grasslands	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Year-round
Asio flammeus Short-eared owl	--/CSC/--/--	Inhabits open fields, meadows, and marshes	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Winter
Circus cyaneus Northern harrier	--/CSC/--/--	Ground nester found in grasslands and in adjacent wetlands or upland/wetland areas; forages over marshlands, tidal flats, fields, and open grasslands	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Year-round
Elanus leucurus White-tailed kite	--/CFP/--/--	Nests in shrubs and trees next to grasslands; forages over grasslands and agricultural lands	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Year-round
Geothlypis trichas sinuosa Saltmarsh common yellowthroat	FSC/CSC/--/--	Breeds in moist saltmarsh habitats with dense, low cover	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery. Nearest record is 1.613 miles north of the Project location.	Year-round
Melospiza melodia maxillaris Suisun song sparrow	FSC/CSC/--/--	Endemic to Suisun Bay. Inhabits brackish marshes, perching and nesting in stands of bulrush along tidal channels, distribution ditches and permanent ponds where brackish conditions exist and foraging in bulrush and on exposed tidal mudflats	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery. Nearest records are 1.613 miles north, 1.530 miles northeast, and 1.908 miles southwest of the Project location.	Year-round
Melospiza melodia samuelis San Pablo song sparrow	FSC/CSC/--/--	Endemic to tidal marshes of San Pablo Bay	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Year-round

TABLE 4.4-1 (Continued)
TERRESTRIAL AND AQUATIC SPECIAL-STATUS SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO BE AFFECTED BY THE PROJECT

Scientific Name **Common Name**	**Listing Status* USFWS/ CDFG/ CNPS/MMPA**	**General Habitat**	**Potential for Species Occurrence in the Project Area**	**Period of Identification or Blooming Period**
BIRDS (cont.)				
Federal or State Species of Special Concern (cont.)		*[Nesting Potential in the Project Area]*		
Xanthocephalus xanthocephalus Yellow-headed blackbird	--/SCS/--/--	Nests in freshwater emergent wetlands with dense vegetation & deep water. Often along borders of lakes or ponds; nests only where large insects such as odonata are abundant, nesting timed with maximum emergence of aquatic insects	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Summer
Ardea herodias Great blue heron	--/--/--/--	Common California resident of estuaries, wetlands, riparian corridors, croplands, and grasslands	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery. Rookeries are listed as special resources on CDFG's special resource list and protected by CDFG.	Year-round
MAMMALS				
Federal or State Threatened and Endangered Species				
Reithrodontomys raviventris raviventris Salt marsh harvest mouse	FE/SE/--/--	Saline emergent marshlands with dense pickleweed	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery. Nearest records are 1.810mi north, 0.552 miles northeast, and 1.516 mile east of the Project location.	Year-round
Federal or State Species of Special Concern				
Antrozous pallidus Pallid Bat	--/CSC/--/--	Roosts in buildings, caves, or cracks in rocks	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Spring/summer
Microtus californicus sanpabloensis San Pablo vole	--/CSC/--/--	Grassy habitats associated with salt-marshes	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Year-round
Nyctinomops macrotis Big free-tailed bat	FSC/CSC/--/--	Low-lying arid areas in southern California; need high cliffs or rocky outcrops for roosting sites. Feeds principally on large moths	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery. Nearest record is1.908 miles southwest of the Project location.	Intermittent
Sorex ornatus sinuosus Suisun ornate shrew	FSC/CSC/--/--	Tidal marshes, require dense low cover above the mean tide line for nesting and foraging	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Year-round

TABLE 4.4-1 (Continued)
TERRESTRIAL AND AQUATIC SPECIAL-STATUS SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO BE AFFECTED BY THE PROJECT

Scientific Name **Common Name**	**Listing Status* USFWS/ CDFG/ CNPS/MMPA**	**General Habitat**	**Potential for Species Occurrence in the Project Area**	**Period of Identification or Blooming Period**
MAMMALS (cont.)				
Federal or State Species of Special Concern (cont.)				
Sorex vagrans halicoetes Salt marsh wandering shrew	FSC/CSC/--/--	Salt marsh habitat 6-8 feet above sea level, with abundant pickelweed and driftwood	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Year-round
Taxidea taxus American badger	--/CSC/--/--	Dry, open grasslands	**Low**. Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	Spring/summer
California sea lion *Zalophus californicus californianus*	/--/--/--/FP	Shallow coastal and estuarine waters in the eastern north Pacific Ocean. In CA, haul out on marina docks, jetties, and buoys.	**Moderate**. May forage in the vicinity of the terminal. May rest on dock or buoys.	Year-round
Pacific harbor seal *Phoca vitulina*	--/--/--/FP	Temperate coastal habitats, use rocks, reefs, and beaches, for haul out and pupping.	**Moderate.** May forage in the vicinity of the terminal. May rest on dock or buoys.	Year-round
Gray whale *Eschrichtus robustus*	FD/--/--/FP	Predominantly coastal waters, although occasional individuals enter the Bay-Delta	**Low**. Known to occasionally swim through San Pablo Bay and up into the Delta.	During migrations between Alaska and Baja California; December to April
Humpback whale *Megoptera noveangliae*	FD/--/--/FP	Predominantly coastal waters, although occasional individuals enter the Bay-Delta	**Low**. Known to occasionally swim through San Pablo Bay and up into the Delta.	Present offshore Central California April through early December
PLANTS				
Federal or State Threatened and Endangered Species				
Arctostaphylos pallid Pallid Manzanita	FT/SE/1B.1	Broadleafed upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, coastal scrub; grows on uplifted marine terraces on siliceous shale or thin chert. May require fire. 185-465 meters	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	December-March
Castilleja affinis ssp. neglecta Tiburon paintbrush	FE/ST/1B.2	Valley and foothill grassland; rocky serpentine sites. 75-400 meters	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	April-June
Cirsium hydrophilum var. hydrophilum Suisun thistle	FE/--/1B.1	Salt marsh; grows with scirpus, distichlis near small watercourses within salt marsh. 0-1 meters	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	June-September
Cordylanthus mollis ssp. mollis Soft bird's beak	FE/SR/1B.2	Valley and foothill grassland, alkali grassland, chenopod scrub	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	May-October

TABLE 4.4-1 (Continued)
TERRESTRIAL AND AQUATIC SPECIAL-STATUS SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO BE AFFECTED BY THE PROJECT

Scientific Name **Common Name**	**Listing Status* USFWS/ CDFG/ CNPS/MMPA**	**General Habitat**	**Potential for Species Occurrence in the Project Area**	**Period of Identification or Blooming Period**
PLANTS (cont.)				
Federal or State Threatened and Endangered Species (cont.)				
			Nearest record is 1.766 miles northwest of the Project location.	
Holocarpha macradenia Santa Cruz tarplant	FT/SE/1B.1	Coastal scrub, coastal sand dunes, openings in oak woodlands with sandy or gravely soil	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	June-October
Lasthenia conjugens Contra Costa goldfields	FE/--/1B.1	Vernal pools and seasonal wetlands in grassland and woodland	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	March-June
Suaeda californica California seablite	FE/--/1B.1	Marshes and swamps; margins of coastal salt marshes. 0-5 meters	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	July-October
Trifolium amoenum Showy Indian clover	FE/--/1B.1	Valley and foothill grassland, coastal bluff scrub; sometimes on serpentine soil, open sunny sites, swales. Most recently sited on roadside and eroding cliff face. 5-560 meters	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	April-June
Federal or State Species of Special Concern				
Amsinckia lunaris Bent-flowered fiddleneck	--/--/1B	Grasslands, coastal bluff scrub, woodland	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	March-June
Astragalus tener var. *tener* Alkali milk-vetch	--/--/1B	In poor draining low ground of alkali playa, grasslands and vernal pools; usually in dry adobe soil	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	March-June
Auster chilensis lentus Suisun marsh aster	FSC/--/1B.2	Occurs along levees of rivers and sloughs in Suisun and Napa marshes and around Delta islands	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery. Nearest record is 2.032 miles northeast of the Project location.	May-November
Atriplex joaquiniana San Joaquin spearscale	--/--/1B	Alkaline seasonal wetlands and sinks in grasslands, chenopod scrub, and alkali grasslands and meadows	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	April-September
Balsamorhiza macrolepis var. *macrolepis* Big-scale balsamroot	--/--/1B	Valley and foothill grassland, chaparral, cismontane woodland	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	March-June
Blepharizonia plumosa Big tarplant	--/--/1B	In annual grasslands of dry hills and plains; soils are clay to clay-loam; often found in burned areas and usually on slopes	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	July-October

TABLE 4.4-1 (Continued)
TERRESTRIAL AND AQUATIC SPECIAL-STATUS SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO BE AFFECTED BY THE PROJECT

Scientific Name **Common Name**	**Listing Status* USFWS/ CDFG/ CNPS/MMPA**	**General Habitat**	**Potential for Species Occurrence in the Project Area**	**Period of Identification or Blooming Period**
PLANTS (cont.)				
Federal or State Species of Special Concern (cont.)				
Dirca occidentalis Western leatherwood	--/--/1B.2	Numerous mesic vegetation types including riparian forest and woodland	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	January-March
California macrophylla Round-leaved filaree	--/--/1B	On clay soils in woodland and grasslands; may occur in disturbed areas where competition from non-native annuals has been reduced	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	March-May
Calochortus pulchellus Mt. Diablo fairy-lantern	--/--/1B	Valley and foothill grassland, cismontane woodland, chaparral, riparian woodland	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	April-June
Calystegia purpurata ssp. saxicola Coastal bluff morning-glory	--/--/1B.2	Coastal dunes, coastal scrub; 15-105 meters.	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	May-September
Centromadia parry var. parryi Congdon's tarplant	--/--/1B	Alkaline soils in grasslands	**Low.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery. Nearest record is 0.875mi east of the Project location.	May-October
Centromadia parryi ssp. congdonii papoose tarplant	--/--/1B.2	Coastal prairie, meadows and seeps, coastal salt marsh, valley and foothill grassland; vernally mesic, often alkaline sites. 2-420 meters	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	May-November
Cicuta maculate var. bolanderi Bolander's water-hemlock	--/--/2.1	Marshes, fresh or brackish water; 0-200 meters	**Low.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery. Nearest record is 1.908 miles southwest of the Project location.	July-September
Cirsium andrewsii Franciscan thistle	--/--/1B.2	Coastal bluff scrub, broadleaved upland forest, coastal scrub; sometimes serpentine seeps. 0-135 meters	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	March-July
Cordylanthus maritimus ssp. palustris Point Reyes bird's beak	--/--/1B.2	Coastal salt marsh; usually in coastal salt marsh with salicornia, distichlis, jaumea, spartina, etc. 0-15 meters	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	June-October
Downingia pusilla dwarf downingia	--/--/2.2	Valley and foothill grassland (mesic sites), vernal pools; vernal lake and pool margins with a variety of associates. In several types of vernal pools. 1-485 meters	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	March-May

TABLE 4.4-1 (Continued)
TERRESTRIAL AND AQUATIC SPECIAL-STATUS SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO BE AFFECTED BY THE PROJECT

Scientific Name **Common Name**	**Listing Status* USFWS/ CDFG/ CNPS/MMPA**	**General Habitat**	**Potential for Species Occurrence in the Project Area**	**Period of Identification or Blooming Period**
PLANTS (cont.)				
Federal or State Species of Special Concern (cont.)				
Eriogonum truncatum Mt. Diablo buckwheat	--/--/1B.1	Chaparral, coastal scrub, valley and foothill grassland; dry, exposed clay or sandy substrates. 100-600 meters	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	April-September
Fritillaria liliacea fragrant fritillary	--/--/1B.2	Coastal scrub, valley and foothill grassland, coastal prairie; often on serpentine; various soils reported though usually clay, in grassland. 3-410 meters	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	February-April
Helianthella castanea Diablo helianthella (rock-rose)	FSC/--/1B.2	Forest, woodland, chaparral, coastal scrub, riparian woodland, and grassland; usually in chaparral/oak woodland ecotone	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	April-June
Lathyrus jepsonii var. jepsonii Delta tule pea	FSC/--/1B.2	Natural edges of estuarine marshes, sloughs, and rivers in the Sacramento – San Joaquin Delta	**Low.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery. Nearest records are 2.050 miles northeast and 2.045 miles northwest of the Project location.	May-July
Legenere limosa legenere	--/--/1B.1	Vernal pools. Many historical occurrences are extirpated; in beds of vernal pools. 1-880 meters	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	April-June
Lilaeopsis masonii Mason's lilaeopsis	FSC/SR/1B.1	Brackish and freshwater marshes	**Low.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery. Nearest record is 1.934 miles north of the Project location.	April-November
Meconella oregano Oregon meconella	--/--/1B/1	Coastal prairie, coastal scrub; open, moist places. 250-500 meters	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	March-April
Mondardella villosa globosa Robust monardella	FSC/--/1B.1	Coastal scrub, cismontane woodland, valley and foothill grassland; openings in broadleafed upland forest and chaparral	**Low.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery. Nearest record is 1.908 miles southwest of the Project location.	June-July
Polygonum marinense Marin knotweed	--/--/3.1	Marshes and swamps; coastal salt marshes and brackish marshes. 0-10 meters	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	May-August

TABLE 4.4-1 (Continued)
TERRESTRIAL AND AQUATIC SPECIAL-STATUS SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO BE AFFECTED BY THE PROJECT

Scientific Name **Common Name**	**Listing Status* USFWS/ CDFG/ CNPS/MMPA**	**General Habitat**	**Potential for Species Occurrence in the Project Area**	**Period of Identification or Blooming Period**
PLANTS (cont.)				
Federal or State Species of Special Concern (cont.)				
Senecio aphanactis Chaparral ragwort	--/--/2.2	Chaparral, cismontane woodland, some alkaline scrub	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	January-April
Trifolium depauperatum var. hydrophilum saline clover	--/--/1B.2	Marshes and swamps, valley and foothill grassland, vernal pools; mesic, alkaline sites. 0-300 meters	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	April-June
Viburnum ellipticum oval-leafed viburnum	--/--/2.3	Chaparral, cismontane woodland, lower montane coniferous forest; 215-1,400 meters	**Absent.** Suitable habitat exists within the Project vicinity but no habitat exists within the Refinery.	May-June

*LISTING STATUS CODES:

Federal (U.S. Fish and Wildlife Service):
BEPA = Bald Eagle Protection Act
FE = Listed as Endangered by the Federal Government
FT = Listed as Threatened by the Federal Government
FSC = Former Federal Species of Special Concern (list is no longer maintained)
FD = Federal Delisted Species
FP = Federal Protected (Marine Mammal Protection Act)

State (California Department of Fish and Game):
SE = Listed as Endangered by the State of California;
SR = Listed as Rare by the State of California (plants only);
CFP = California Fully Protected species
ST = Listed as Threatened by the State of California
CSC = California species of special concern

California Native Plant Society :
List 1A = Plants believed extinct;
List 1B = Plants rare, threatened, or endangered in California and elsewhere;
List 2 = Plants rare, threatened, or endangered in California but more common elsewhere;
List 3 = Plants for which data are lacking on distribution, endangerment, ecology, taxonomic validity, and are under review for placement on other lists.

SOURCES: CNPS, 2010; CDFG, 2010a

fleas), and the larvae of benthic and pelagic invertebrate animals and fish (meroplankton). Bay meroplankton is dominated by the northern anchovy (*Engraulis mordax*), longfin smelt (*Spirinchus thaleichtys*), Pacific herring (*Clupea pallasi*), plainfin midshipman (*Porichthys notatus*), the *ctenophore Pleruobranchia bachei*, the isopod *Syndotea laticauda*, the shrimps *Palaemon macrodactylus, Crangon franciscorum* and *C. nigricauda*, the mysid *Neomysis kadiakensis*, and the medusa *Polyorchis spp*. (NOAA, 2007).

Pelagic Fish Community

The most common fish species inhabiting the water column of Carquinez straight and San Pablo and Suisun Bays include the northern anchovy (*E. mordax*), Striped bass (*Morone saxatilis*), Pacific herring (*C. pallasi*), American shad (*Alosa sapidissima*), longfin smelt (*S. thaleichthys*), Chinook

salmon (*Oncorhynchus tshawytscha*), and threadfin shad (*Dorosoma petenense*). Northern anchovy, striped bass, Pacific herring, American shad, and longfin smelt collectively account for more than 93 percent of the 25 fish species observed to be annually present as reported by CDFG census studies for years 2005 through 2009 (CDFG, 2011) and presented in Table 4.4-2.

TABLE 4.4-2
PELAGIC FISH COMMUNITY COMPOSITION AND ESTIMATED SPECIES DENSITY FOR BAY-DELTA WATERS IN CARQUINEZ STRAIGHT BETWEEN 2005 AND 2009

Species*	Common Name	(fish/hectare-meter)						% Total
		2005	2006	2007	2008	2009	Mean	
Engraulis mordax	Northern anchovy	4	29	7	18	9	13	61%
Morone saxatilis	Striped bass	2	1	3	4	2	2	11%
Clupea pallasii	Pacific herring	1	0	1	6	1	2	8%
Alosa sapidissima	American shad	3	3	1	1	1	2	8%
Spirinchus thaleichthys	Longfin smelt	2	1	1	<1	1	1	5%
Oncorhynchus tshawytscha	Chinook salmon	<1	<1	<1	<1	<1	<1	1%
Dorosoma petenense	Threadfin shad	<1	1	<1	<1	0	<1	1%

* Other species present but in very low abundance include: yellowfin goby, splittail, topsmelt, starry flounder, plainfin midshipman, jacksmelt, delta smelt, white croaker, common carp, Pacific staghorn sculpin, white sturgeon, shimofuri goby, steelhead, shiner perch, threespine stickleback, shokihaze goby, Mississippi silverside, and Pacific pompano.

SOURCE: CDFG, 2011.

Chinook salmon, delta smelt, and longfin smelt are both federal and State listed special-status fish species, with winter-run Chinook salmon listed as endangered and spring-run Chinook salmon listed as threatened. Delta smelt and longfin smelt are listed as endangered and threatened, respectively, by the State of California. The USFWS is in the process of considering the listing status of longfin smelt (USFWS, 2011) and in 2010 determined that the delta smelt should be reclassified as endangered from threatened under the FESA. Northern anchovy are also protected under the Coastal Pelagic Fishes Management Plan (PFMC, 2011) as well as Chinook salmon under the Salmon Fisheries Management Plan. Finally, the Project area is located within the established migration corridor for adults and smolts of steelhead (*Onchorhynchus mykiss*), a State and federal protected species. Both the main shipping channel and adjacent shallows are used by steelhead for migration and foraging (NOAA, 2005. Although CDFG data (CDFG, 2011) do not indicate that steelhead are present in the Project area in any significant numbers, individuals can be expected to be present during migration times. Similarly, Chinook salmon is another State and federal protected species and San Pablo Bay, Suisun Bay, and the Carquinez Straight are identified as an essential habitat for migration and foraging of this species (NOAA, 2009).

Marine Mammals

Seven species of marine mammals use the pelagic water column habitat in the Bay for migrating and foraging (NOAA, 2007). Marine mammals frequently observed in San Pablo and Suisun Bays include harbor seals (*Phoca vitulina*), California sea lions (*Zalophus californianus*), and the

harbor porpoise (*Phocoena phocoena*). California gray whales (*Eschrichtius robustus*) and humpback whales (*Megaptera novaeangliae*) occasionally swim into San Francisco, San Pablo, and Suisun Bays on their annual migrations between Mexico and Alaska (NOAA, 2007). Harbor seals and California sea lions feed primarily on fish within San Francisco Bay, including schooling northern anchovy and Pacific herring, but also feed on migratory Pacific eels, lamprey, salmonids, and mysid shrimp and other invertebrates within the water column (NOAA, 2007). All of these marine mammal species are protected under the Federal Marine Mammal Protection Act. There are no major haul-outs or rookeries in San Pablo Bay for any marine mammals, but individuals may still use various structures.

Birds

Dominant marine birds inhabiting or utilizing San Pablo and Suisun Bays and the Project area include cormorants (*Phalacrocorax spp*.), the pigeon guillemot (*Cepphus columba*), the herring gull (*Larus argentatus*) and the mew gull (*L. canus*) (NOAA, 2007). The California brown pelican (*Pelecanus occidentalis californicus*) can also frequent San Pablo and Suisun Bays and osprey (*Pandion haliaetus*) are known to inhabit the Project area (NOAA, 2007).

Subtidal (Demersal) Habitat

The subtidal habitats found in San Pablo and Suisun Bays include soft sediments composed of mud/silt/clay, sand, pebble/cobble, and shell mixes, as well as artificial hard substrate composed of concrete or steel breakwalls, wood, steel, and concrete pilings, and concrete or quarried rock rip-rap. Exposure to wave and current action, temperature, salinity, and light penetration determines the composition and distribution of organisms inhabiting both of these substrates.

Soft Sediment Substrate Communities

The soft sediments of the Bay can be subdivided into channel, channel edge, slough channel and shallow subtidal habitats. Most surveys and other information sources indicate unconsolidated sediments are present throughout the Bay-Delta and are the most common substrate type in the Bay (NOAA, 2007). The MT is located along the main channel though the Carquinez Straight connecting Suisun Bay with San Pablo Bay. The benthic infaunal community inhabiting the channel habitat in Suisun Bay is dominated by the non-native invasive Asian clam *Corbula amurensis*. Also abundant are the polychaete worms *Heteromastus filiformis* and *Marenzellaria viridis*, and the surface dwelling Cumacean *Nippoleucon hinumenisis* (NOAA, 2007).

Marine biota expected to be present in the deeper water channel adjacent to the MT is similar to that described above with one major distinction. Because of the high currents present in the waters adjacent to the MT as a result of its siting within the Carquinez Straight, the instability of bottom sediments and reduced organic content would result in reduced species diversity and abundance than may be present elsewhere in San Pablo Bay. Likewise, propeller wash from tankers and tug boats act in a similar manner as high currents, keeping bottom sediments in a constant state of disturbance. Propeller wash also winnows away finer sediment particles (e.g., fine sand, silts, and clays) and organic matter resulting in a seafloor consisting of coarser sediments and exposed rock habitat. Dominant mobile invertebrates in Suisun Bay and the

Carquinez Straight are the exotic oriental shrimp, *Palaemon macrodactylus*, and the California bay shrimp, *Crangon franciscorum*.

Hard Substrate Communities

Artificial and natural (exposed rock) hard substrate areas provide habitat for an assemblage of marine algae, invertebrates and fishes, similar to habitats found for hard substrate in the lower intertidal zone. Submerged hard bottom substrate is typically covered with a mixture of turf organisms that include a hydrozoan, bryozoan, several encrusting sponges, an anemone, the hybrid mussel *Mytilus trossulus/galloprovencialis*, the barnacle *Amphibalanus improvisus*, and a filter feeding polychaete worm that make up the suspension and filter feeding components of this community. In addition, multiple species of amphipods and isopods make up the mobile components of the community (NOAA, 2007). There are no known natural hard substrate areas near the Project site or in Suisun or San Pablo Bays.

Demersal Fish Community

More than 30 fish taxa have been observed inhabiting or utilizing the benthic habitat of Carquinez Straight between 2005 and 2009 (CDFG, 2011). Of these 30 species, nine account for approximately 95 percent of all fish species present and characterize the demersal fish community in the waters adjacent to the Refinery and MT. These include the Pacific staghorn sculpin (*Leptococottus armatus*), striped bass (*Morone saxatilis*), shokihaze goby (*Tridentiger barbatus*), starry flounder (*Platichthys stellatus*), yellowfin goby (*Acanthogobius flavimanus*), plainfin midshipman (*Porichthys notatus*), English sole (*Parophrys vetulus*), longfin smelt (*S. thaleichthys*), and bay goby (*Lepidogobius Lepidus*) (see Table 4.4-3).

TABLE 4.4-3
DEMERSAL (SEAFLOOR) FISH COMMUNITY COMPOSITION AND ESTIMATED SPECIES DENSITY FOR BAY-DELTA WATERS IN CARQUINEZ STRAIGHT BETWEEN 2005 AND 2009

Species*	Common Name	(fish/hectare-meter)						% Total
		2005	2005	2005	2005	2005	2005	
Leptocottus armatus	Pacific staghorn sculpin	23	9	28	147	51	52	33%
Morone saxatilis	Striped bass	13	10	25	46	32	25	16%
Tridentiger barbatus	Shokihaze goby	15	12	38	33	21	24	15%
Platichthys stellatus	Starry flounder	9	15	28	18	5	15	10%
Acanthogobius flavimanus	Yellowfin goby	17	13	16	9	2	12	7%
Porichthys notatus	Plainfin midshipman	2	<1	8	29	8	9	6%
Parophrys vetulus	English sole	0	0	0	2	32	7	4%
Spirinchus thaleichthys	Longfin smelt	5	7	1	2	2	3	2%
Lepidogobius lepidus	Bay goby	0	0	0	15	0	3	2%

* Other species present but in very low abundance include: shimofuri goby, cheekspot goby, American shad, river lamprey, threadfin shad, white croaker, California halibut, splittail, white catfish, Pacific herring, shiner perch, Pacific lamprey, diamond turbot, threespine stickleback, sand sole, prickly sculpin, speckled sanddab, white sturgeon, brown smoothhound, green sturgeon, and Pacific sanddab.

SOURCE: CDFG, 2011.

Several of the groundfish listed above, such as English sole and starry flounder, as well as other occasional inhabitants such as sand sole, California halibut, diamond turbot, and sanddabs are covered by the Pacific Groundfish Fish Management Plan, which identifies the Bay-Delta as essential fish habitat for these species (NMFS, 2011). The green sturgeon (*Acipenser medirostris*), an FESA listed threatened species, is known to inhabit the waters and seafloor habitat of Carquinez Straight (CDFG, 2011), which it uses for both foraging and as a migration corridor between its spawning grounds on the upper Sacramento river and the Pacific Ocean. Finally, longfin smelt (*S. thaleichthys*) are frequent inhabitants of Carquinez Straight, San Pablo and Suisun Bays, and throughout the Bay-Delta. Although primarily characterized as a pelagic species that inhabits the water column, they utilize the entire water column between the surface and the sediment.

Aquatic Vegetation

Submerged aquatic vegetation (SAV) refers to all underwater plants. In the Bay-Delta, SAV includes sago pondweed (*Stuckenia pectinata*), eelgrass (*Zostera marina*), and other species of seagrass, including the surfgrasses (*Phyllospadix torreyi* and *P. scouleri*), and widgeongrass (*Ruppia maritima*) (NOAA, 2007). Several freshwater plant species, mostly introduced, are also found mainly in the Delta (e.g., the Brazilian waterweed *Egeria densa*). In the Bay, eelgrass is much more extensive than other SAV, and its role and restoration potential are understood the best. The largest eelgrass beds in the Bay-Delta are in shallow subtidal regions of San Pablo Bay and Richardson Bay, with smaller beds scattered in shallow areas mainly between Carquinez Strait and Hayward (Subtidal Habitat Goals Project, 2011). The largest bed in the Bay is located between Point San Pablo and Point Pinole, and contains about half of the total Bay-Delta acreage. Eelgrass beds are not reported east of Carquinez Straight. Other common aquatic plants that can be found in the Carquinez Straight and San Pablo and Suisun Bays include the green alga *Ulva* spp. that can be observed on shallow mud flats, pier pilings, bulkheads, and rocky intertidal areas.

Threats to SAV in the Bay-Delta include activities associated with shipping and boating, which can disrupt seagrass beds directly through destruction of plants by boat propellers, anchors and anchor chains, dredging, and construction of facilities (e.g., docks, harbors, breakwaters, ports). Indirect effects on SAV health arise through increased suspended sediments due to dredging and boat wakes, or shading from structures such as docks. Hardening of the shoreline can reflect waves, increasing wave action and limiting or destroying beds (Subtidal Habitats Goals Project, 2011). Rapid changes in salinity, turbidity, and sediment composition from Delta and Bay rivers can also have an effect on eelgrass bed condition.

Intertidal Habitat

Intertidal habitat, or the region of the Bay-Delta marine environment that lies between low and high tides, includes sandy beaches; natural and artificial rock (quarried rip rap), concrete bulkheads, concrete, composite, steel, and wood pier pilings, and mud flats. These intertidal habitats provide highly diverse and varied locations for marine flora and fauna. Little scientific documentation is available that describes the intertidal communities within the Bay-Delta. Many of the invertebrate species that inhabit the soft sediment and hard substrate areas discussed above will be found inhabiting the mid to lower intertidal zones where they remain underwater most of

the day. The green algae, *Ulva spp*. and barnacles generally occupy the upper intertidal zone. Because of the freshwater influence in Carquinez Straight, the intertidal community is typically less diverse than that observed in Central Bay and even San Pablo Bay where the influence of marine coastal water is greater.

Non-native and Invasive Species

The introduction of non-native and invasive species[2] represents a serious threat to the Bay-Delta marine subtidal and intertidal habitats. It has been reported that over 230 taxa have been introduced to the Bay-Delta, which has been described as the most invaded estuary in North America (Ray, 2005). Introduced species now dominate all benthic communities within the Bay-Delta and make up more than 95 percent of the biomass and total abundance of organisms (Ray, 2005). New species of estuarine and marine animals are inadvertently or intentionally introduced into California waters regularly. It is currently estimated that a new aquatic species is introduced into the Bay-Delta every 14 weeks, whereas prior to 1960 the rate was once every 55 weeks (Roman, 2010). Estuaries and sheltered coastal areas, such as the Bay, appear to be among the most invaded habitats as a result of being naturally disturbed, low-diversity systems with historic anthropogenic disturbance from shipping, industrial development, and urbanization (Ray, 2005). Historically, the principal organisms introduced into the Bay have been fouling, boring, and ballast-dwelling organisms. In addition, many invasive species, such as striped bass (*Morone saxatilis*), channel catfish (*Ictalurus punctatus*), white catfish (*Ameiurus catus*), and giant pacific oysters (*Crassostrea gigas*) have been deliberately introduced into California waters. Introduced species within the Bay include snails, shrimp, plankton, fish, and crabs.

The introduction of non-native species into the Bay-Delta ecosystems can result in large-scale changes to the aquatic community. While most invasive species fail to survive and become established, posing little or no threat to native ecosystems or biological communities, a few have the potential to severely disrupt local ecosystems, fisheries, and human infrastructure (Ray, 2005). A few of the most damaging in the Bay-Delta include the Chinese mitten crab (*Eriocheir sinesis*), the European green crab (*Carcinus maenas*), the Asian clam (*Corbula amurensis*), and the isopod *Sphaeroma quoyanun*. The Asian clam *Corbula* has completely changed the subtidal benthic infaunal community in the western Delta and because of its voracious feeding on bacterioplankton, phytoplankton, and copepod larvae, it has been credited with reducing the phytoplankton community in San Pablo Bay and Western Delta, resulting in reduced zooplankton and fish abundances and distributions (Ray, 2005; Kimmerer, 2006; and Thompson and Parchaso, 2003). *Corbula* is one of the attributing factors to population declines in the delta smelt and longfin smelt populations in the Bay-Delta (AFS, 2007).

Invasive organisms are introduced by a variety of methods, the most prevalent being shipping, of which the largest single source is discharged ballast water. Other methods of introduction relevant to the Project include fouling organisms (such as the Asian kelp, *Undaria pinnatifida*) that have attached themselves to ship hulls, navigation buoys, anchors, and anchor chains (Ray, 2005).

[2] Often referred to as invasive, introduced, non-indigenous, alien, non-native, or exotic species.

Additionally, invasive species may be located in ship bilges, drains, through-hull connections, and other locations on visiting ships.

Special Status Species and Habitats

Special-Status Aquatic Species in Carquinez Straight

A comprehensive list of terrestrial and marine special-status plant and wildlife species in the Project area is provided in Table 4.4-1 along with summarized information on their use and presence in the Project area. Specifically, the waters of Carquinez Straight and adjacent San Pablo and Suisun Bays and its marshes provide critical habitat for the federally endangered Sacramento river-winter run Chinook salmon (*Oncorhynchus tshawytscha*) as well as the federally threatened delta smelt (*Hypomesus transpacificus*), Central Valley steelhead trout (*Oncorhynchus mykiss*), green sturgeon (*Acipenser medirostris*), and Central Valley spring-run Chinook salmon (*O. tshawytscha*). Other species of special concern that occur in the area include Sacramento perch *(Archoplites interruptus)*, Sacramento splittail (*Pogonichthys macrolepidotus*), Central Valley fall and late fall-run Chinook salmon (*O. tshawytscha),* and longfin smelt (*Spirinchus thaleichthys)*, which USFWS has recently begun to consider for FESA threatened status.

Managed U.S. Fisheries Species

Under the Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-297), the NMFS, Fishery Management Councils, and federal agencies are required to cooperatively protect essential fish habitat for commercially important fish species such as Pacific coast groundfish, three species of salmon, and five species of coastal pelagic fish and squid. As defined by Congress, essential fish habitat includes “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” Those fish species present in the Carquinez Straight and San Pablo and Suisun Bays included in Fish Management Plans prepared by regional Fishery Management Councils under the Magnuson-Stevens Act include northern anchovy, speckled and Pacific sanddabs, Pacific halibut, English and sand soles, and Chinook salmon.

Commercial & Recreational Fisheries

Many important commercial and recreational fish species are known to spend a portion of their life history within coastal estuaries such as the Bay-Delta. Some (e.g., Dungeness crab, Pacific herring, Chinook salmon, steelhead, white and green sturgeon) reside predominantly as adults in the ocean waters beyond the Golden Gate but spend their juvenile life stage or a portion of their adult life stage within the estuary itself. Others (e.g., Bay shrimp) spend their entire life histories within the Bay-Delta proper. As a result, activities that can have a negative effect on juvenile or adult fish and macroinvertebrate populations that are targeted by either commercial or recreational fishers can have a greater geographic impact than just within the Bay region. For the purposes of this analysis, the environmental setting area encompasses primarily Central and North/San Pablo Bays, and those fish and invertebrate species that are harvested in the nearshore coastal areas of central California and whose life history has a key relationship with these portions of the estuary.

Commercial Fisheries

For inland marine landings specific to the Bay, only San Francisco landing data were used for this analysis. It should be noted that commercial fishing is a constantly changing endeavor. Although many species of fish or invertebrates (e.g., Chinook salmon, Dungeness crab, sablefish, herring) may be commercially caught on an annual basis, other fisheries, such as rock cod and Pacific herring, may only be commercially caught for a few years in a given region as a result of short-term environmental conditions, market shifts, population declines in one species that prompt harvesting of a less desirable species, and other factors. Each of these issues associated with specific fisheries is discussed in more detail below.

At present, only three species of fish and macroinvertebrates are harvested commercially in the Bay-Delta, including: (1) Bay shrimp (*Crangon franciscorum*), (2) Pacific herring (*Clupea pallasi*), and (3) Northern anchovy (*Engraulis mordax*). Brine shrimp (*Artemia spp.)* are raised in most of the South Bay salt ponds but do not use Central or San Pablo Bay at any stage of their life history and are therefore not included in this analysis. Finally, the Bay-Delta, especially the Central Bay region, provides a critical rearing and nursery habitat for Dungeness crab (*Cancer magister*) (Baxter *et al*, 1999).

CDFG commercial ocean fishing landing data, reported in pounds, for the San Francisco region was compiled for the five-year period from 2005 to 2009 (see Table 4.4-4). The following sections provide brief descriptions of each fishery.

TABLE 4.4-4
COMMERCIAL LANDINGS AND VALUE OF KEY SPECIES LANDED IN SAN FRANCISCO BAY FOR THE YEARS 2005 TO 2009

Taxa	2005	2006	2007	2008	2009
Pacific herring	0 pound	0 pound	0 pound	0 pound	0 pound
	$0	$0	$0	$0	$0
Pacific herring eggs on kelp	0 pounds	520 pounds	18,726 pounds	32,038 pounds	6,654 pounds
	$0	$130	$225	$6,408	$41,588
Pacific herring roe	289,481 pounds	1,490,853 pounds	576,210 pounds	1,379,997 pounds	1,013,610 pounds
	$61,969	$416,239	$108,741	$587,852	$479,438
Dungeness crab	3,668,533 pounds	3,773,768 pounds	1,493,123 pounds	1,872,916 pounds	1,961,901 pounds
	$6,693,840	$7,553,057	$4,127,528	$6,073,363	$4,700,599
Bay shrimp	52,055 pounds	38,457 pounds	50,114 pounds	45,873 pounds	69,527 pounds
	$199,567	$159,745	$225,505	$194,220	$299,779
Northern anchovy	29 pounds	155,400 pounds	0 pound	91 pound	0 pound
	$29	$4,662	$0	$32	$0

SOURCE: California Department of Fish and Game (CDFG). 2011. Commercial Ocean Fishing, Final data for Years 2005 through 2009. http://www.dfg.ca.gov/marine/fishing.asp#Commercial***)***

Pacific Herring (Herring, Herring Roe, and Herring Eggs on Kelp). Pacific herring (*Clupea pallasi*) spawn on vegetation in intertidal and shallow subtidal areas in the Bay and school as juveniles within the Bay. After a period of several months to more than a year, juveniles migrate to offshore areas to continue maturing until reaching adulthood and returning to the Bay to spawn.

The Pacific herring population and the size of the fishery depend on oceanic and Bay conditions. As a result, population sizes can fluctuate widely from year to year. According to CDFG, these fluctuations appear to be linked to El Niño events (Barnhart, 1988). Reported increases in eelgrass (*Zostera marina*) bed acreage in Central Bay (Merkel & Assoc., 2010) could also assist in increased spawning and populations of Pacific herring. In addition, Pacific herring landings have varied greatly over the past century with fluctuating market demand that has shifted among its uses for fishmeal, human consumption, bait, and pet food. In 1973, the market came into its most recent configuration in primarily supplying roe (fish eggs) for Japanese consumption. Since then, herring in the Bay has been harvested primarily for its roe, with only small amounts of whole herring marketed for other purposes (CDFG, 2011).

Pacific herring landed in the Bay are currently marketed in one of three forms: whole fish, sac-roe and roe on kelp (or herring eggs on kelp (HEOK)), which are each discussed below. Landing data for the period of 2005 through 2009, summarized in Table 4.4-4, indicate that herring roe dominated the market. Whole herring fish were not reported as landed within this reporting period, and were last reported landed in the Bay in January 2004, when 77,040 pounds were landed at a value of over $20,000 (CDFG, 2011).

The herring sac-roe fishery in California is limited to the four largest herring spawning areas: San Francisco Bay, Tomales Bay, Humboldt Bay, and Crescent City Harbor. San Francisco Bay has the largest spawning population of herring and produces more than 90 percent of the State's annual herring catch (CDFG, 2011). This fishery is managed through a limited entry system that began with 17 permits in the 1973-1974 season, peaked with over 450 permits in the 1990s, and declined to 185 permits issued for the 2010-2011 season (CDFG, 2010b).

Beginning with the 1984-1985 season, a sac-roe permittee received a permit on an experimental basis, to harvest "Herring Eggs On Kelp" using fronds of giant kelp (*Macrocystis spp*.) suspended from unenclosed floating rafts. The kelp is brought into the Bay from the coast. The end product is also marketed to the Japanese food industry. For the 2010-2011 season, four HEOK permits were issued (CDFG, 2010b), which are available to permittees willing to trade in their sac-roe permits. Pacific herring spawning grounds are almost exclusively restricted to Central Bay and the southern portions of San Pablo Bay around Pinole Point (NOAA, 2011).

This fishery is closely monitored and controlled so that, barring catastrophic events, it can be expected to continue fluctuating with annual oceanographic conditions and market demand. Based on the low numbers of herring returning from the 2003-2004, 2004-2005, and 2005-2006 year classes, emergency regulatory action by the California Fish and Game Commission was taken in 2009 to close the ocean waters fishery to protect the San Francisco Bay Pacific herring

stock. CDFG also recommended a zero harvest or no fishery option to the commission for the 2009-2010 San Francisco Bay gill net and HEOK fisheries, and a closure of the 2010 ocean waters fishery (CDFG, 2007). The herring fishery was re-opened for the 2010-2011 season, with a total quota set at 1,920 tons, divided among the different markets (CDFG, 2010b).

Bay Shrimp. The Bay shrimp (*Crangon franciscorum*) is the dominant shrimp in most Pacific coast estuaries, and the largest and most abundant large shrimp in the Bay. Bay shrimp are primarily found in the lower South Bay, San Pablo Bay, and Suisun Bay. Juveniles migrate upstream to rear in shallow brackish water for several months. Maturing shrimp migrate downstream to cooler, higher salinity areas for reproduction. Abundance of Bay shrimp has been directly linked to freshwater outflow from the Delta (IEP, 2008). The Interagency Ecological Program (IEP) abundance index for Bay shrimp reached a decade high in 2006, associated with high spring outflow that year (IEP, 2008). Despite the increased abundance of Bay shrimp, commercial harvests remained steady, if not decreased slightly in 2006, reflecting market demands.

Beam trawls are used to harvest shrimp in the Bay waters east of the Golden Gate Bridge and in San Pablo Bay. The Bay shrimp fishery between 2005 and 2009 averaged 51,000 pounds per year, with a range of approximately 40,000 to 70,000 pounds per year (see Table 4.4-4). The commercial value of these landings has ranged between approximately $160,000 and $300,000 (see Table 4.4-4). At present, this fishery is market-driven with almost all landings being used for angler bait. Consequently, market demand or fish landings are not expected to change significantly in the foreseeable future.

Dungeness Crab. Although Dungeness crabs (*Cancer magister*) are not commercially harvested within the Bay, they are a valuable commercial and recreational species that is harvested from the nearshore coastal waters adjacent to the Bay Region and the Bay-Delta plays a key role in the growth and development of these juvenile crabs (CDFG, 2004). Dungeness crabs reproduce in the ocean in winter; surviving juveniles then migrate nearer to shore the following spring. Most rearing of juvenile crabs within the region takes place in nearshore coastal waters, but estuaries such as Humboldt Bay and San Francisco Bay (see green / lightly shaded areas shown in Figure 4.4-3) provide important nursery areas for the young (CDFG, 2004). These juveniles return to adjacent coastal waters after approximately eight to ten months (IEP, 2010). Crabs nurtured within the estuary are larger than cohorts who remained in the ocean; they also represent a larger percentage of harvested crabs inhabiting coastal waters off the shore of San Francisco (Pauley *et al*., 1989).

Eureka, San Francisco, and Bodega Bay report the largest Dungeness crab landings in the State (CDFG, 2009). The Central California fishery encompasses a 400-square-mile area, including the Gulf of the Farallones and waters north to the Russian River. During the 1950s, the Dungeness crab fleet consisted of 200 to 250 boats. Many boats left the fleet as the fishery began to decline in the 1960s (CDFG, 2004). Currently, the fleet consists of about 190 vessels (CDFG, 2004). The commercial Dungeness fishery is managed based on crab sex, season, and size; only male crabs may be retained in the commercial fishery. The central California season opens November 15 and continues through June 30. The fishery also imposes a minimum size restriction of 6.25 inches across the widest part of the carapace, the protective covering on the back of the crab.

SOURCE: NOAA, 2011

Figure 4.4-3
Dungeness Crab Habitat within Central Bay and San Pablo Bay

Between 2005 and 2009, Dungeness crab was the highest value commercial landing for San Francisco (see Table 4.4-4). Landings here averaged 2.5 million pounds of crab over those five years with an average landing value of $5.8 million. As mentioned above, Dungeness crab populations undergo periodic cycles. In 2007, the reported landing for crab at San Francisco decreased from 3.8 million pounds in 2006 to 1.5 million pounds in 2007 (Table 4.4-4). Dungeness crab populations and harvests will likely continue to fluctuate on a multi-year cycle and increasing ocean water temperatures could result in a shift in the population northward, since adults and juveniles prefer colder waters (Pauley *et al*., 1989).

Northern Anchovy. The northern anchovy (*Engraulis mordax*) that inhabit the Bay for part of the year are part of the Central California subpopulation (Kucas and Hassler, 1986). They typically winter in deeper waters off the California coast and return to shallower inland waters in the spring, including identified areas of Central Bay (NOAA, 2011). Anchovies stay predominantly in deeper depths during daytime and migrate toward the surface at night (Kucas and Hassler, 1986).

The northern anchovy is the most abundant pelagic fish in the Carquinez Straight and in most of San Francisco Bay (see Table 4.4-2) and an important prey species for many fishes and seabirds. Northern anchovy are harvested in the Bay for use as both live and frozen bait for sport fishermen. Primarily, northern anchovy are harvested in the Central Bay using a purse seine-type net. Like the Bay shrimp fishery, harvests are market-driven by demand by sport fishermen. Northern anchovy landings in the Bay were virtually nonexistent between 2005 and 2009; the one exception to this was in 2006, when more than 150,000 pounds were landed (see Table 4.4-4).

Aquaculture and Ocean Mariculture

Throughout the State, commercial marine aquaculture facilities predominantly raise abalone, oysters, clams, scallops, seaweed, and mussels. Inland-based hatcheries and aquaculture farms raise trout, steelhead, salmon, tilapia, catfish, crayfish, striped bass, sturgeon, and other fish species for market sale and stock replenishment (NOAA, 2007). No mariculture operations currently exist within the Bay, but both Drakes and Tomales Bays, in Marin County to the north, support major oyster farms.

Recreational Sport Fisheries

Recreational sport fishing occurs in all regions of the estuary as well as in the coastal and open ocean areas beyond. Recreational fishing in the estuary and open coast occurs from shore, pier, personal small craft, and charter boat.

To better understand recreational fishing ongoing in the Central and San Pablo Bay, information compiled by the Pacific States Marine Fisheries Commission (PSMFC) as reported through the Pacific Recreational Fishing Information Network (RecFIN) was reviewed for the years 2006 through 2010 (RecFIN, 2011). For this report, estimates of whole catch that were available for review by California Recreational Fisheries Survey (CRFS) interviewers (RecFIN Type A), as well as catch that was not available for review, but was voluntarily reported by anglers (i.e., those caught and released (Type B2) and those caught but not released (Type B1)) were included in our review. These data are limited in that they rely upon a limited number of CRFS interviewers to generate Type A results and unknown representativeness of voluntary reports (Type B), but as the only consistent, ongoing database recording recreational fishing activity, they can be considered an indicator of recreational fishing effort and catch.

Recreational fish catches as reported by RecFIN for the marine inland waters of the estuary during the period 2006 to 2010 are summarized in Table 4.4-5. It should be noted that some species represented within RecFIN results for marine inland waters do not inhabit either Central or San Pablo Bay. However, these data do provide an indicator of the breakdown of fish caught by recreational fisherman over this period in the estuary. In addition to well-publicized declines in some of the sensitive species inhabiting the estuary, estimated populations of some of the more popular sport fish have declined in recent decades. Descriptions of trends within a few select sport fish are presented below.

Jacksmelt (Atherinopsis californiensis). The jacksmelt seasonally migrates from nearshore coastal waters to bays and estuaries to spawn and rear. Most reproduction within the San Francisco Bay Estuary occurs from September to April. Juvenile jacksmelt rear in shallow areas of South, Central, and San Pablo Bays in late spring and summer, then migrate to deeper waters within the Bay before migrating out of the estuary in the fall.

In 2009, jacksmelt were recovered in IEP trawls from South Bay north to lower San Pablo Bay; over 50 percent of the total was captured in the Central Bay (IEP, 2010). The 2009 CDFG age-0 jacksmelt abundance index was the second highest index on record and marks the third consecutive year of above average indices for this species; which follows the general trend of increased abundance in years of low Delta outflow (IEP, 2010). Sport landings reflect these higher abundances, as jacksmelt were the most frequently reported sport fish landed in the Bay inland marine waters (see Table 4.4-5).

TABLE 4.4-5
ESTIMATED SAN FRANCISCO BAY MARINE INLAND WATERS RECREATIONAL FISH LANDINGS FOR THE PERIOD 2006-2010

Species	Total, 2006-10	% of All Species
Jacksmelt	970,827	24.1%
Northern Anchovy	562,303	14.0%
Shiner Perch	242,026	6.0%
California Halibut	210,159	5.2%
Leopard Shark	189,174	4.7%
Pacific Sardine	188,285	4.7%
Striped Bass	174,508	4.3%
American Shad	167,581	4.2%
Bat Ray	147,949	3.7%
Silverside Family	130,979	3.3%
Dungeness Crab	76,170	1.9%
Pacific Staghorn Sculpin	71,436	1.8%
Unidentified (Sharks)	64,932	1.6%
Red Rock Crab	63,538	1.6%
Pacific Herring	59,950	1.5%
Brown Smoothhound	58,752	1.5%
Chub (Pacific) Mackerel	50,016	1.2%
Surfperch Family	48,833	1.2%
White Croaker	43,519	1.1%

Identified species make up at least 1 percent of the total fish reported. Estimates include number of fish examined by surveyors (A) plus number reported by anglers, both dead (B1) and live (B2). Numbers reported for individual years represent estimates for the months of August and September only, and the resultant percentage of total catch represents the proportion of the species landed during those months over the five-year period.

SOURCE: RecFIN, 2011.

Northern Anchovy (Engraulis mordax). The northern anchovy is the most common fish in the lower Estuary and is an important prey species for many fishes and seabirds. Within Bay inland marine waters, the northern anchovy is second only to jacksmelt in the number of landings reported by recreational fishermen (see Table 4.4-5).

The 2009 IEP abundance index for northern anchovy was the fourth lowest on record for that species, and only half of the study-period mean (IEP, 2010). This marks the fourth consecutive year of declining indices, following the trend of colder ocean temperatures since 2006. For the estuary as a whole, CDFG collected northern anchovies in tows in each month of 2009, the latest year for which data have been analyzed to date. CDFG reported catch per unit effort for the year was highest in the Central Bay followed by San Pablo Bay, but was highest in San Pablo Bay for the late summer period when the fishery was at its peak (IEP, 2010).

Shiner Perch (Cymatogaster aggregata). Shiner perch live in marine and estuarine environments, including the San Francisco Bay Estuary. They have a wide salinity tolerance, although they typically inhabit areas above 10 parts per thousand (University of California, 2011). During winter or periods of high river flow, shiner perch migrate toward coastal areas and return to the estuary in summer to spawn.

While collected in IEP trawls from South Bay north through San Pablo Bay, Shiner perch were most commonly found in tows in the Central Bay (IEP, 2010). CDFG abundance indices for shiner perch in recent years were calculated at the lowest levels since 1994 and approximately one-quarter of the historic mean (IEP, 2010). Still, shiner perch were the third most frequently landed sport fish for the San Francisco marine inland region (see Table 4.4-5).

California Halibut (Paralichthys californicus). The California halibut is a member of a subtropical faunal group that became common in the Bayin the 1980s and 1990s, concurrent with the most recent warm-water regime. Since that time, the California halibut has supported a valuable recreational fishery for the Bay Area, reporting the fourth most landings from 2006 to 2010 (see Table 4.4-5). In the spring, adults migrate from deepwater offshore wintering grounds to shallow coastal areas to spawn. Juveniles may remain within the Bay for up to two years before out-migrating to deeper waters (Kucas and Hassler, 1986). California halibut, although present in the Carquinez Straight, are primarily found in the Central Bay (CDFG, 2011).

In 2009, the CDFG adult abundance index for California halibut declined for the third consecutive year to reach the lowest level since 2004 (IEP, 2010). Significant increases in the number of California halibut caught by sport fishermen in 2007 through 2009 were likely a direct result of the closure of sport fishing for salmon in the Bay and have placed considerable pressure on the fishery. This fishing pressure and associated harvest mortality have likely been key contributors to the 2009 adult California halibut abundance index decline.

Pacific Sardine (Sardinops sagax). Like the California halibut, the Pacific sardine is a member of the subtropical faunal group that became common in the Bay during the most recent warm-water regime, 1977-1998 (IEP, 2010). Pacific sardines are found in estuaries along the Pacific

Coast but are more common in coastal and offshore areas. From 2006 to 2010, the Pacific sardine was reported as the sixth most frequently landed sport fish for the Bay recreational fishermen. Landings for the five-year study period are skewed by the nearly 103,000 Pacific sardines reported caught in the period August to September 2009, representing over 50 percent of the approximately 190,000 Pacific sardines landed over the entire five-year period (see Table 4.4-5).

4.4.4 Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause significant adverse impacts to biological resources if it would:

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service;

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service;

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;

e) Conflict with any local policies or ordinances protecting biological resources, such as tree preservation policy or ordinance; or

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan.

4.4.5 Discussion of No Biological Resources Impacts

Review and comparison of the setting circumstances and Project characteristics with each of the six significance criteria stated above, clearly show that no impacts to biological resources would result for most of the criterion. The following discusses the reasoning supporting this conclusion:

a) Would the Project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

Terrestrial Resources. As the Project would occur within the boundaries of the existing Refinery complex where habitat is classified as urban and is situated on previously disturbed lands or occupied by existing Refinery equipment, there would be no impact on special status, sensitive,

or candidate species in local and/or regional plans, policies, or regulations, or by the CDFG or USFWS as no habitat supporting such species is present within the Refinery complex.

Marine Resources. Potential effects to marine habitats and associated biological communities from the Project fall into two categories. Those from normal, routine operations and those that would occur as a result of an accident, such as an oil spill. Although Central Valley steelhead trout, Chinook salmon, green sturgeon, and delta and longfin smelt inhabit the Bay-Delta waters adjacent to the Shell MT, they are not expected to be adversely affected by any increased ship noise, incidental and short-term shading of Bay-Delta waters, or increased water turbidity from vessel prop wash during the routine visit of one additional tanker per week. Similarly, these activities would not be expected to have any impact on commercial or recreational fish or invertebrate populations. No dredging is proposed at the MT since the additional tanker per week would be accommodated by the two main berths that, as a result of their proximity to the main channel through Carquinez Straight, do not require maintenance dredging. The potential adverse effects to protected, managed, or commercial/recreational fish and invertebrate species as a result of the introduction or spread of non-native invasive species during routine vessel visits at the MT and the affects of an accidental oil spill are discussed in detail in Section 4.4.6, below.

b) Would the Project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

Terrestrial Resources. While natural habitat communities such as estuarine, annual grassland, valley oak woodland, saline emergent wetland, freshwater emergent wetland, blue oak woodland, and coastal oak woodland exist in the Project vicinity, all Project components would be located within the existing Refinery complex and on previously disturbed lands classified as urban or occupied by existing Refinery operations. As a result, there would be no impact to any riparian habitat or any other sensitive natural community existing outside of the Refinery complex, and included in any local and/or regional plans, policies, or regulations, or by CDFG or USFWS.

Marine Resources. Routine MT operations are not expected to have any effect on any riparian habitat or other sensitive natural community from increased ship noise, incidental and short-term shading of Bay-Delta waters, or increased water turbidity from the routine visit of one additional tanker per week. Similarly, these activities are not expected to have any impact on commercial or recreational fish or invertebrate populations managed by CDFG. The potential adverse effects to riparian habitat, other sensitive natural community, or commercial/recreational fish and invertebrate species as a result of the introduction or spread of non-native invasive species during routine vessel visits at the MT and the affects of an accidental oil spill are discussed in detail in Section 4.4.6, below.

c) Would the Project have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

Terrestrial Resources. While marshland is present on either side of the existing MT with Martinez Waterfront Park to the northwest and Martinez Regional Shoreline to the northeast, collectively situated outside of the Refinery, the Project would not impact these or any other federally protected wetlands defined by Section 404 of the Clean Water Act by the direct removal, filling, hydrological interruption, or by any other means as none of these lands exists within the Refinery complex or would be impacted by the Project at its planned location.

Marine Resources. As stated above, although marshland is present on either side of the existing MT, the Project would not impact adjacent or nearby wetlands through direct removal, filling, hydrological interruption, or other means. As a result of the MT being sited on the Carquinez Straight channel, no maintenance dredging would be required to maintain water depth for the new tankers calling at the MT nor is any expansion of the MT anticipated that would require dredging. The potential adverse effects to Section 404 designated wetlands as a result of the introduction or spread of non-native invasive species during routine vessel visits at the MT and the affects of an accidental oil spill are discussed in detail in Section 4.4.6, below.

d) Would the Project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

Terrestrial Resources. There would be no impact to any wildlife species or any established native resident or migratory wildlife corridors within the Project vicinity and the Project would not impede the use of native wildlife nursery sites as all Project components would exist within the boundaries of the Refinery complex, which does not support habitat of this nature.

Marine Resources. Although the Shell Martinez MT is located on the Carquinez Straight channel, which is used by Central Valley steelhead trout, spring and fall run Central Valley chinook salmon, winter run Sacramento river chinook salmon, and green sturgeon to migrate to and from the Pacific Ocean and spawning areas as well as by longfin smelt to move between Delta spawning areas and colder Central Bay water, the normal routine operations associated with the addition of one tanker per week is not expected to result in any impacts to these species or their migration corridors. The potential to disrupt seasonal migrations or native wildlife nursery sites, especially longfin and delta smelt, as a result of an accidental oil spill or the introduction of or spread of non-native invasive species during routine vessel visits at the MT, is discussed in Section 4.4.6 below.

e) Would the Project conflict with any local policies or ordinances protecting biological resources, such as tree preservation policy or ordinance?

Terrestrial Resources. Although the Project is located within an unincorporated area of Contra Costa County, the Contra Costa Country Tree Ordinance would not apply to the Project as no trees would be removed.

Marine Resources. The routine operation of the MT and the addition of one tanker per week would not conflict with any local Contra Costa County policies or ordinances protecting biological resources.

f) Would the Project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan?

Terrestrial Resources. While the Project may be located within the vicinity of an adopted or approved local, regional, or State habitat conservation plan, including the proposed Suisun Marsh Habitat Management, Preservation, and Restoration Plan, the Project components would be located within the boundaries of the existing Refinery and situated on previously disturbed lands and would not fall under the jurisdiction of said plans nor would they conflict with said plans.

Marine Resources. The routine operation of the MT and the addition of one tanker per week would not conflict with any Conservation Plan, such as the San Francisco Bay Plan or the San Francisco Bay Subtidal Habitats Goals Project/Report, which are intended to provide regulatory agencies with guidance to protect and preserve Bay-Delta marine habitats and biological communities. The potential adverse effect of the introduction or spread of non-native invasive species during routine vessel visits at the MT and the affects of an accidental oil spill on subtidal habitats and their associated biological communities as discussed in the Subtidal Habitats Goals Project and report are discussed in detail in Section 4.4.6, below.

4.4.6 Discussion of Impacts and Mitigation Measures

Criteria a) through d), and f) are applicable to impacts associated with invasive species and accidental oil spills.

a) Would the Project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

b) Would the Project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

c) Would the Project have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

d) Would the Project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

f) Would the Project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan?

Impact 4.4-1: Potential impacts to biological resources from the introduction of invasive species from hull fouling or ballast water. (*Significant and Unavoidable).*

The release of non-native aquatic organisms attached to or associated with the submerged portion of a vessel or its appurtenances, including, but not limited to, sea chests, propellers, anchors, and associated chains (collectively called hull fouling) or from the discharge of ballast water into Bay-Delta waters could impair Bay-Delta habitats and associated biological communities, fish migration, and the preservation of rare and endangered species, fish spawning, and wildlife habitat essential for protected and managed fish species.

As discussed above, the introduction of non-native species into the Bay-Delta ecosystems can result in ecosystem-wide changes to the aquatic community. California has the largest number of known introduced estuarine and marine animals in North America. Through strict adherence to federal (National Invasive Species Act (1996)) and State (California Marine Invasive Species Act of 2003, as amended in 2009) regulations concerning ballast water exchanges, the potential threat of ballast water-introduced non-native species is severely reduced. Additionally, compliance with water quality and biological mitigation measures imposed by the CSLC for the recently approved 30-year lease renewal of the MT would further reduce the impact related to the potential for invasive non-native species to be introduced to Bay-Delta water to less than significant. These mitigation measures include:

> **WQ-2 Segregated Ballast Water:** Following the adoption of the Mitigation Monitoring Program for the proposed Project, Shell will advise both agents and representatives of shipping companies having control over vessels that have informed Shell of plans to call at the Shell Terminal about the California Marine Invasive Species Act and associated implementing regulations. Shell will ensure that all vessels submit required reporting forms, as applicable for each vessel, to the California State Lands Commission (CSLC) Marine Facilities Division, including but not limited to, the Ballast Water Reporting Form, the Hull Husbandry Reporting Form, the Ballast Water Treatment Technology Reporting Form, and/or the Ballast Water Treatment Supplemental Reporting Form a Questionnaire containing the following questions is provided to the Vessel Operator, and inform the Vessel Operator that the Questionnaire should be completed on behalf of the vessel, by its Captain or authorized representative, and provided to the CSLC's Marine Facilities Division's Northern California Field and Sacramento Offices, either electronically or by facsimile, prior to the vessel's entry into San Francisco Bay or in the alternative, at least 24 hours prior to the vessel's arrival at the Shell Terminal.
>
> **WQ-4 Non-Segregated Ballast Water:** Shell shall not discharge any non-segregated ballast water received at the Shell Terminal to San Francisco Bay. If Shell needs to unload non-segregated ballast water, it shall be unloaded into a tanker truck or other suitable waste-handling vehicle and disposed of at an appropriate facility.

However, the potential introduction of non-native species from hull fouling still remains from vessels that call upon the MT. Implementation of an effective anti-fouling program, including use

of anti-fouling hull coatings, regular hull inspections, and additional cleaning of hull surfaces, are critical to the prevention of non-native species introduction to the Bay-Delta. Strict compliance with California Public Resources Code sections 71203 to 71207 by vessels using the MOT would significantly reduce the potential for the introduction of non-native species to Bay-Delta waters. To address this concern, as discussed above, CSLC mitigation measure WQ-2 –*Segregated Ballast Water* was imposed on operations of the MT as part of the 30-year lease renewal, which requires the inclusion of a Hull Husbandry Reporting form as a means of informing ship owners and operators of the importance of hull maintenance and the removal of fouling organisms. Also, keeping informed on the condition of vessels entering the Bay-Delta would be expected to improve hull maintenance and the removal/control of hull fouling and therein reduce the potential risk of introducing non-native organisms to the Bay-Delta.

Despite these cumulative efforts to combat and control the introduction of non-native organisms, the possibility of introducing non-native species from hull fouling still remains, even with strict adherence to State regulations. Impacts would remain significant and unavoidable even with implementation of the above mitigation measures. As a result of the unavoidable significant nature of this impact, the CSLC imposed the following additional mitigation measure on the operations of the MT concerning invasive species.

> **BIO-4b Introduction of Non-indigenous Species:** Shell shall participate and assist in funding ongoing and future actions related to invasive nonindigenous species and identified in the October 2005 Delta Smelt Action Plan (State of California 2005). The funding support shall be provided to the Pelagic Organism Decline Account or other account identified by the California Department of Water Resources (DWR) and California Department of Fish and Game (CDFG), lead Action Plan agencies. The level of funding shall be determined through a cooperative effort between the CSLC, and the DWR, and the CDFG, and Shell, and shall be based on criteria that establish Shell's commensurate share of the Plan's invasive species actions costs.

Mitigation Measure 4.4-1, *Implementation of CSLC Invasive Species Mitigation Measures Notification,* would ensure that Contra Costa County would be appraised of the implementation of, and any changes to, CSLC-imposed mitigation measures WQ-2, WQ-4, and BIO-4b.

> **Mitigation Measure 4.4-1: Implementation of CSLC Invasive Species Mitigation Measures Notification**. Shell shall notify the Contra Costa County Department of Conservation & Development, Community Development Division in writing of implementation of the CSLC measures and any changes to the requirements contained within of CSLC mitigation measures WQ-2, WQ-4, and BIO-4b within 30 days of the change.

Significance after Mitigation: The possibility of introducing non-native species from hull fouling remains, even with strict adherence to State regulations and with implementation of CSLC BIO-4b and Mitigation Measure 4.4-1. Impacts would remain *significant and unavoidable*.

Impact 4.4-2: Potential impact to biological resources from the accidental release of crude oil. (*Significant and Unavoidable*)

A spill of crude oil destined for the Refinery has the potential to affect marine and estuarine biota inhabiting the Bay-Delta waters including all intertidal and subtidal habitats, and in some cases fringing emergent wetland habitat. Especially at risk are marine birds, marine mammals, intertidal and shallow subtidal communities, as well as special-status fish, bird, plant, and marine mammal species. The impact of an oil spill would be a function of:

- The chemical composition of the spilled oil, its specific gravity, and the volume of the spillage;
- The behavior of the spilled oil in the environment as controlled by weather, currents, waves, and tides
- The manner in which organisms are exposed to the hydrocarbons from the oil;
- The toxicity of the chemicals in the oil to the biota;
- The fouling properties of the crude oil as it contacts biota;
- The concentrations of petroleum compounds in water, sediment, and air; and
- The residence time of the oil in the environment, as controlled by evaporation, photo-degradation, physical dispersion, and microbial degradation.

Crude oil contains several thousand separate chemical compounds that are nearly all combinations of carbon and hydrogen, although some may also contain oxygen, sulfur, and nitrogen. Crude oil also contains some metals, mainly nickel and vanadium. Simple molecules of carbon and hydrogen can be one of the following classes:

- Alkanes (straight or branched chains and non-aromatic rings of carbon with attached hydrogens);
- Aromatic compounds containing one to five aromatic rings that may also have side chains of carbon and hydrogen; and
- Heterocycles, molecules containing oxygen, sulfur or nitrogen in addition to carbon and hydrogen.

Whether the individual hydrocarbons making up the oil are small and light or large and heavy determines the gross properties of the mixture. Crude oil with a larger proportion of low-molecular-weight molecules is a lightweight liquid that would float on water. Heavier crude oils (Class V) are more viscous and are composed of molecules with a higher average molecular weight. Tars and asphalts are heavy solids composed of high-molecular-weight compounds.

The fate of crude oil in the environment is determined in large part by its chemical composition. Light crude oils spread quickly after spilling to form a thin slick on the water's surface, and a large proportion of its components evaporate rapidly on the water's surface. Light crudes have a

relatively higher solubility in water due to a large proportion of one and two-ring aromatic ring compounds. That is, much of the light crude oil disperses quickly in the environment. Crude oil with a higher specific gravity does not spread as fast, forms thicker slicks, does not evaporate or dissolve in water to the same extent or speed as light crude oil, and therefore persists longer in the marine environment. Microbial degradation appears to have a more important role for determining the persistence of medium to heavy crude oils in the marine environment relative to lighter crude oils. In general microbes degrade aromatic compounds more slowly than alkanes of an equivalent molecular weight.

The geographic fate of spilled crude oil from its point of origin, e.g., near the MT, would depend on the tides during the release, the wind strength and direction, and waves - all contributing to the amount of turbulent energy in the surface of the Estuary. In general, the more energy in the environment of the spill, the faster crude oil would be broken into smaller and thinner forms and the faster it would disperse and degrade. The ratio of the surface area to the volume of the oil in a spill is a primary determinant of petroleum persistence in the environment. The greater the proportion of the oil that interfaces with the environment, the faster the dispersal and degradation processes would occur and the less persistent the oil would be. That is, small droplets would not last as long as larger paddies or mats of oil. To a large extent this is due to the fact that microbes can access more of the oil faster and that the oxygen and nutrients that they need to decompose the oil are generally more available the thinner, or more discontinuous, the oil is in the environment. If oil and water emulsions form, e.g., mousse, they tend to slow dispersion and degradation and thereby increase persistence of the oil. Mousse formation is very common in crude oils as they begin to weather in the aquatic environment. In the Deep Horizon oil spill that occurred in the Gulf of Mexico in 2010, the light Louisiana crude oil that spilled eventually reached the surface and soon formed long tendrils of red-orange mousse on the water's surface (Spies, 2010).

Due to the large number of variable factors that affect crude oil in the environment, there are many possible outcomes to a spill and each spill is unique in the generation of ecological risk. It is often said that the circumstances of the spill determine the outcome. The circumstances in this case would include the type and volume of oil as well as the environmental conditions at the time of the spill, including the seasonal status of ecosystem. As part of the impact analysis for accidentally released crude oil, a series of accidental spill scenarios were modeled from either the MT or the vessel transporting the crude oil to the marine terminal within the Bay-Delta. The spill scenarios modeled include reasonable worst case, maximum most probable, and average most probable spills at the MT itself, and the reasonable worse case tanker spill.

Organisms can be exposed directly to petroleum, for instance they may be physically coated. They can breathe the fumes, e.g., a seal may breathe the fumes just above an oil slick. They can be exposed to petroleum dissolved in water, or they may ingest oil, often as a result of eating contaminated food. Some intertidal organisms may be exposed from all these routes.

The more toxic hydrocarbons are aromatic hydrocarbons. Metabolism of aromatic hydrocarbons poses two problems to organisms. First, the metabolites of some aromatic hydrocarbons are

extremely toxic as they bind to proteins and nucleic acids and as a result may cause long-term toxic effects. Second, the process of metabolism can create free radicals in the cells of organisms that cause a variety of toxic effects as well, such as lipid peroxidation. Toxic effects of hydrocarbons can include reduced immune competence and disease susceptibility, developmental abnormalities in the eyes, skeleton and heart, reproductive dysfunction, and anemia.

As a consequence of differing behaviors of these classes of toxic compounds, impacts of crude oil spills can conveniently be viewed as occurring in two phases. The first is the acute phase where the spilled material disperses from its source, retaining the full complement of molecular types, and a slick is usually present. The concentrations of volatile hydrocarbons (i.e., gasoline phase) are highest in the water and air, and they begin to rapidly decrease after entering the environment. The second is the chronic phase, where there are no slicks and the volatile hydrocarbons have disappeared or are greatly reduced in concentrations, and the effects of the remaining, less volatile hydrocarbons dominate, typically resulting in impacts that are longer lasting.

Scientifically, more is known about acute phase impacts, especially from volatile hydrocarbons dissolved in water. This fraction of crude oil is typically referred to as “BTEX,” an abbreviation for benzene, toluene, ethyl benzene, and xylene. BTEX from a crude oil spill can cause death to a large variety of aquatic organisms under some circumstances.

The data from testing the short-term toxicity of crude oil indicate a range of acutely toxic concentrations, generally from the very low parts per billion (ppb) concentrations for the most sensitive organisms to hundreds of parts per million (ppm) for resistant organisms (Neff *et al*., 1976; Rice *et al*., 1979; Capuzzo, 1983 NRC, 2003). The reasons for differences in toxic response by different aquatic organisms are not fully understood, but are presumed to result from differences in organism morphology, physiology, and biochemistry, e.g., ability to metabolize hydrocarbons, differences in gill oxygen exchange efficiency, etc. The life stage of the organism can also be a key determinant of toxicity, as the young stages of organisms (eggs, larvae, and juveniles) are generally more sensitive to hydrocarbons (Capuzzo, 1983).

As mentioned above, reduction of hydrocarbon concentrations in water after a crude oil spill is due to the combined effects of evaporation, dilution, photo degradation, physical dispersion, and microbial degradation. The toxicity of the water phase rapidly diminishes in the wake of a crude oil spill as these processes occur. The main exception to this generality is if petroleum becomes stranded in a sponge-like shoreline, e.g., with intertidal, thick vegetative material. In this situation, petroleum can slowly be released into the immediate area, resulting in potentially harmful water concentrations in confined regions for longer periods of time. For example, in the 1989 Exxon Valdez spill, oil stranded on cobble beaches of Prince William Sound, Alaska drained through the beach cobble to an underlying layer of pebbles and sand, resulting in high concentrations of crude oil for years. Water circulation was restricted to these interstices and so limited the supply of oxygen and nutrients necessary for microbial degradation. In addition, oil tended to pool in lenses in the gravel/sand substrate limiting the surface area available for degradation by microbes, the presumed main process for returning these areas to pre-spill condition.

Combined with model outputs that predict concentrations by area and time, acute lethal toxicity data can help define the acute effects that would occur in the first few days after a crude oil spill. Such acute impacts due to water-borne exposures are often limited, as sufficient water concentrations are often only reached very briefly and are of limited areal extent (Spies, 1987). This is due in large part to the fact that most spills are limited in volume. However, spill impacts are as individual as the circumstances of any particular spill itself, and less frequent large spills with thick slicks are typically more threatening to pelagic organisms than small or moderate spills. Under the right circumstances petroleum spills can generate a considerable acute toxicity to marine and estuarine organisms. This occurs when the concentrations of low molecular weight aromatic hydrocarbons (e.g., benzene, toluene, ethyl benzene, naphthalene, and phenanthrene) range into the ppb and higher concentrations. Higher concentrations and longer exposures of aromatic hydrocarbons result in greater toxicity and a higherrange of species that are affected. It would be expected that more sensitive species would be affected more often as result of exposure to small spills with transitory aromatic hydrocarbon exposures. Some crustacean species and larval fish are known to be especially sensitive to water-borne aromatic hydrocarbon exposures (Capuzzo, 1983).

What must also be considered in the acute phase of a spill is direct petroleum contact with animals and plants. The intersection of surface slicks with seabirds, marine ducks, neuston (organisms that float on the top of water or live right under the surface), and intertidal communities may result in a greater threat than dissolved hydrocarbons. Seabirds that swim on the surface or dive into the water to obtain their food depend on the insulating properties of their feathers to maintain body temperatures, and direct contact with petroleum can compress plumage and compromise insulation resulting in hypothermia and eventual death. While attempting to clean their feathers, birds would ingest hydrocarbons resulting in gastrointestinal upsets, dehydration, and starvation. In addition, their ability to fly can also be affected if feathers would become too matted with crude oil. Large numbers of sea birds have succumbed to spills along the Pacific Coast in the past, including spills in the Bay, apparently due to compromised feathers and insulation (Page *et al*., 1990; Rice *et al*., 2007).

Because crude oil floats on water and spreads to form slicks that move under the influence of the tide and wind, shoreline habitats would be at a high risk of impact by most small spills and by all large spills originating on or near the shoreline within estuarine and most coastal environments. Acute effects on a wide variety of intertidal organisms are common in petroleum spills where substantial slicks form and impact shoreline habitat (Spies, 1987). Soft-bodied invertebrates (e.g., polychaete worms, starfish, crabs, anemones, bryozoans, hydroids, and tunicates) are very vulnerable to direct contact with oil; small crustaceans, such as amphipods, are particularly susceptible. Barnacles and mussels, because they can close up and not pump water or feed for a substantial number of hours, can resist short-term toxic effects better than most organisms, but there are limits to their ability to physically isolate themselves from toxins as they must eventually respire and eliminate wastes via exchange with ambient water. However, other invertebrates and intertidal fish can be killed within hours if there is a substantial quantity of spilled crude oil in the intertidal zone (Rice *et al*., 1977; Rice *et al.*, 2007).

The long-term effects of crude oil in various benthic habitats are directly related to the persistence of petroleum in those environments. The energy from tides and waves in the intertidal zone forces oil into spaces between rocks and cobbles, sand, mud, and vegetative material, where it can persist for years due to limited water circulation, as mentioned above. The persistence of sediment-associated oil is a function of the chemical composition of the hydrocarbon mixture in a habitat, as well as the water energy, oxygen supply, nutrient supply at the surface of the remaining oil, and the surface area-to-volume relationships of the solid or liquid phase of the hydrocarbons. Because of the above considerations, hydrocarbon mixtures are most persistent where they are trapped with little water kinetic energy, lack a supply of oxygen and nutrients, and where they have a low surface-area-to-volume ratio. The lower concentration limits that result in long-term toxic effects are in the lower ppb range in water for the most sensitive organisms, which are three orders of magnitude lower than for acute exposures (Capuzzo, 1983; Rice *et al*., 2007; NRC, 2003)

The most vulnerable estuarine and marine environments are those on or near the surface of the water, or in contact with bottom sediments where particle-associated oil has settled. As mentioned above, effects on open-water organisms are generally acute and short lived, while petroleum penetration of low-energy habitats makes long-term persistence a distinct possibility in the intertidal zone, depending on the particular circumstances of the spill. At greatest risk are intertidal marshes and mudflats where the crude oil can be worked into the sediments (e.g., during a storm), mussel beds, and any aquatic vegetation with extensive roots or holdfasts that petroleum can penetrate.

Crude oil spills have been modeled for this impact assessment because crude oil would be transported to the MT. The spill modeling does not include the fuel oil that would be used by the tanker or tug/barge. Fuel oil spills have occurred in the past in the Bay; e.g., the Cosco Busan spill in November 2007, at the Bay Bridge that spilled 54,000 gallons (approximately 1,300 bbl) of fuel oil (Lemkau *et al.*, 2010). While a fuel oil spill may differ in impacts from a crude oil spill[3], it would also have broad similarities in potential impact and so is considered to have the same possible outcomes of a crude oil spill.

Effects of Spills on Open Water (Pelagic) Habitat and Associated Biota

As mentioned above, the greatest impact to marine biota from an oil spill occurs at the oil-water interface. In the open-water, pelagic environment, animals at or near the sea surface are at greatest risk. This means that seabirds, marine mammals, and fish species that typically swim very near the sea surface or in the shallows of the Bay-Delta are of greatest concern.

Seabirds, especially diving species such as grebes, scoters, cormorants, murres, pigeon guillemots, puffins, and other species that spend considerable time on the surface of the water, would be at greatest risk from petroleum slicks, mainly from direct contact. Plunge divers, such as pelicans and gulls, would also be at risk to the degree they spend time on the water's surface.

[3] In general, fuel oils would tend to volatize over time while crude oils would not and would tend to weather and sink over time.

The most recent large petroleum spill in the Bay, the Cosco Busan in November 2007, was 58,000 gallons of fuel oil and killed many birds. Two thousand carcasses were recovered, representing 57 bird species. The most numerous victims of the spill were 300 surf scoters and 200 western grebes (*Aechmophorus occidentalis*). Most of the other species that were well represented in the carcass count were diving birds, including: common murres (Uria aalage), Clark's grebes (*Aechmophorus clarkii),* Brant's cormorants (*Phalacrocorax penincillatus*), greater scaups (*Aythya marila*), and eared grebes (*Podiceps nigricolus*) (Lemkau *et al*., 2010). A crude oil spill associated with the Project of similar magnitude and circumstances would likely have a similar impact despite the chemical differences between fuel oil and crude oil.

Marine mammals that spend much of their time at the ocean surface, such as harbor seals, sea lions, whales, and dolphins are also at risk from direct contact with crude oil slicks, or breathing fumes just above the slick. The most common marine mammals in the area of a potential spill in the Bay are harbor seals and California sea lions (NOAA, 2007), which regularly occur in the Bay and along the outer open Central California coast (BLM, 1981). These species are not as susceptible to spills as sea birds, as they have a layer of blubber for insulation, rather than relying solely on external plumage to keep them warm, which helps them avoid hypothermia from oil exposure as occurs with birds. However, they are not immune to hydrocarbon toxicity from fumes or ingestion. Direct oiling of the fur and skin of harbor seals and sea lions can sicken them if they swim through a slick. In the case of a crude oil spill, "oiling" of a harbor seal's coat might persist for a matter of days, as occurred in the Exxon Valdez oil spill. Some hydrocarbons can be expected to be absorbed through the skin, but the exact amount is controlled by many factors, including the amount of oiling that occurs and whether the seal haul out areas are oiled. Several hundred harbor seals were likely killed as a result of the 1989 Exxon Valdez oil spill in Alaska (Frost *et al*., 1994), but there were more than 100,000 sea birds killed. Harbor seals in the area of the heavy slick behaved in a lethargic manner, and such behavior could have made them more susceptible to predators, or possibly drowning in the case of extreme exposures. A large crude oil spill in Central or San Pablo Bays would be expected to have a deleterious influence on both harbor seals and sea lions.

Whales and dolphins, although not very common in the Bay and especially in San Pablo Bay, would be affected by a slick of crude oil if they swam through it. It is thought that following the Exxon Valdez oil spill, two pods of killer whales (*Orcinus orca*) lost some individuals as a result of breathing fumes from the slick. However, the evidence for this is circumstantial (Matkin *et al*., 1994).

Pelagic fish would be minimally exposed to hydrocarbons from a spill, but the potential severity of their exposure would be dependent on the concentration of the hydrocarbons they encounter and the length of time they would be exposed. Those pelagic fish species that predominantly inhabit the mid-regions of the water column, such as Chinook salmon, steelhead, American shad, etc., would be expected to have the lowest exposure and potential impact. More severe hydrocarbon exposure would be expected to occur where there would be heavier slicks and limited water circulation, near the surface and in shallower water. The younger juvenile life stages of some fish, such as Pacific herring, northern anchovy, Pacific sardines, and delta and longfin smelt, are more susceptible to spills than adults because they regularly swim near the water surface where they could be exposed

to relatively high concentrations of hydrocarbons from the slick itself, as well as any hydrocarbons in the surface microlayer. In addition, the young stages of fish are more sensitive than adults to hydrocarbon exposures. Concentrations of low molecular weight hydrocarbons in the range of 3to 50 ppb could occur under slicks and such concentrations are in the effects range for eggs and larvae of some species of pelagic fish. Even after the slicks have dissipated, the surface microlayer would continue to have elevated concentrations of hydrocarbons (Payne et al., 1983). The petroleum-enriched, surface microlayer could come from the slow release of shore-stranded crude oil when the tide and wind would favor this process and affect eggs that float at the surface of the estuary. In addition, petroleum hydrocarbons trapped in the surface microlayer are susceptible to chemical oxidation from sunlight (Payne et al., 1983), which could render them more reactive, and therefore more toxic than the parent compound.

One extensive review of scientific research from the 1970s and 1980s on the biological effects of hydrocarbon spills (Capuzzo, 1983), showed the range of sub-lethal effects for petroleum to marine organisms, as follows:

- 3 to 10 ppb: Decreased larval fish viability, antennae function in crabs, and decreased photosynthesis in algae;
- 10 to 300 ppb: Abnormalities in egg development, reduced larval heart beat in fish, and suppression of flagellate motility; and
- 200 to 800 ppb: Effects on juvenile fish and lobsters, larval crustaceans, and larval fish.

In some circumstances, long exposures to aromatic hydrocarbons in the low ppb range (less than 10 ppb) has been shown to result in subtle damage that compromises larval fish and fish egg survival (Heintz *et al.*, 1999, 2000) and is not evident in more conventional acute and chronic toxicological testing (Moles *et al*., 1979).

The effects of petroleum on phytoplankton and zooplankton are often assumed to be less than significant due to the limited exposure times under most spill conditions in open water, especially from small spills (Spies, 1987). However, evidence suggests that in large petroleum spills, such as the 1978 Amoco Cadiz spill on the Brittany Coast, in which millions of gallons of crude oil were released to the marine environment, effects on zooplankton can occur (Spies, 1987). Fish larvae are considered zooplankton and would be expected to be affected by low ppb concentrations of aromatic hydrocarbons, as mentioned above.

What has not been fully appreciated in past toxicological studies is the role that sunlight plays in aromatic hydrocarbon toxicity. Once aromatic hydrocarbons are accumulated in the tissues of translucent pelagic organisms, these compounds can capture the energy of the ultraviolet portion of sunlight and become highly reactive, leading to photo-enhanced toxicity (Baron, 2007). Exposure to sunlight can result in 10 to 1,000 times greater toxicity of polycyclic aromatic hydrocarbons at equivalent concentrations in animals not exposed to sunlight.

The greatest risk to plankton from crude oil would be expected to occur in calm or still water environments, particularly shallow waters, where large amounts of crude oil would be spilled,

where mixing and dissolution would be minimized, and where exposure to higher hydrocarbon concentrations for longer periods of time would occur. Exposures during the late winter and spring might be more damaging as there would be larval forms of key pelagic species, e.g., Pacific herring, in the plankton. Also, Chinook salmon smolts are migrating through the Carquinez Straight and San Pablo Bay during this time and they would be susceptible to the effects of large spill of crude oil. Evidence from the Exxon Valdez oil spill shows that juvenile pink salmon were exposed to oil, that as a result of the exposure, some biomarkers were activated, and later laboratory studies indicated reduced lifetime survival of pink salmon exposed as eggs to low ppb aromatic hydrocarbons (Heintz *et al*., 1999, 2000).

Effect of Spills on Soft and Hard Substrate Intertidal Habitat and Associated Biota

The greatest environmental impact to intertidal habitats would be expected to occur where petroleum slicks would come ashore. The larger and thicker the slick, the more hydrocarbon material there would be to spread over a larger surface area of the shoreline and the more marine and estuarine organisms that would come into contact with the spilled material. As with open water exposure, intertidal areas with lower kinetic energy (i.e., wave action) have the greatest impact potential due to limited mixing, dilution, evaporation, and increased exposure time.

A range of potential outcomes for petroleum contamination from a large spill with thick slicks in intertidal areas exist, ranging from no measurable impact to severe impact. Recovery of intertidal areas would typically be much slower than for open water or subtidal habitats, usually requiring at least two years and in some cases decades. The recovery period depends on the amount of oiling that occurs, the biological community effected, and the persistence of the spilled hydrocarbons in the habitat after soaking into porous rocks, driftwood, peat-like sediments, soft silts and clays, decaying algae, etc. (Duncan and Hooten, 1996; Highsmith *et al*., 1996; Stekholl *et al*., 1996).

Many well established intertidal communities, especially those in hard-substrate areas, are typically dominated by long-lived organisms that take years to become established. These communities can be expected to require many years to recover to pre-disturbance conditions. In many cases where an impact would be significant, the communities would have to go through a succession of stages, with a variety of organisms, to return to its original state. In addition, these communities would not be considered recovered until the full component of age classes have been established.

On natural rock or artificial rip-rap shorelines, crustaceans (e.g., crab, shrimp, barnacles, amphipods, and isopods), polychaete worms, and mollusks (especially limpets, snails and burrowing or nestling bivalves) are susceptible to the toxic, narcotic effects of low- molecular-weight fraction of crude oil, or the long-term effects of the higher molecular weight aromatic fraction. Damage would likely last as long as significant quantities of sequestered petroleum would be present.

On pilings, common along the Bay-Delta shoreline, biota attached to the vertical surfaces would be the most at-risk community. These communities have the greatest potential to be exposed and

re-exposed to spilled crude oil during daily tidal cycles. They would be continually exposed to low-level concentrations from slicks and from hydrocarbons that have been absorbed by the wood or concrete pilings themselves as well as the abyssal thread mats of mussels commonly found on pilings.

If a crude oil spill would occur in San Pablo Bay in late winter during the time periods when Pacific herring (*Clupea pallasi*) are spawning in Central and San Pablo Bay, then impacts to herring spawning and larval development would be anticipated since Pacific herring frequently spawn on pilings and rip-rap as well as on Eelgrass beds, which are a critical spawning substrate and habitat for Pacific herring (Merkel, 2008). Eelgrass beds can also be at risk since they occur in the shallower regions of the Bay-Delta and are partially exposed during most low tides and therefore susceptible to floating oil.

Crude oil floating on the water surface could come into direct contact with herring eggs. Herring eggs exposed to hydrocarbon spills could develop significant morphological abnormalities at low exposure petroleum hydrocarbon concentrations (less than 10 ppb) (Carls *et al.*, 1998). Exposure of adult herring in the laboratory to similarly low concentrations of weathered crude oil resulted in increased expression of hemorrhagic septicemia virus (Carls *et al*., 1998).

Invertebrates on the pilings, such as barnacles, mussels, small crustaceans, hydroids, and bryozoans would also be affected by direct contact with crude oil. Crude oil would not be expected to adhere to pilings in large quantities for very long once a hydrocarbon slick would have passed. Therefore, high exposures would likely be short-lived unless there would be a very large spill, a piling was reoiled many times by a slick, or there would be limited water movement in the vicinity of the pilings. It can also be anticipated that daily tidal washing of the area with cleaner water after the spill would continue to dilute and remove any residual hydrocarbons, but still low-level exposures from oil trapped in the interstices between mussels could occur for some days or weeks. Recovery would likely be more rapid on pilings than along rip-rap and natural rocky intertidal habitat because of less exposure during low tides and relatively rapid recruitment of larvae from the plankton. Typically, large bivalves such as mussels and oysters would be able to survive small and moderate-sized spills since they are naturally conditioned to closing their shells tightly to avoid desiccation during low tide periods, which would also limit exposure to hydrocarbons.

In tidal mudflats and salt marshes, like the intertidal areas discussed above, biological impacts would be the direct result of the physical exposure, concentrations, and the length of time they would be exposed. Salt marshes and tidal wetlands, in particular, would be at greatest risk from petroleum spills since any spilled hydrocarbons that would come into contact with the wetland would have the potential to soak into the peat and silt substrate, allowing the hydrocarbons to remain unaltered for years. This condition could lead to a long-term chronic exposure of associated biota to the spilled hydrocarbons.

Two past oil spills into tidal marshlands provide some insight into the effects of hydrocarbons on marsh habitat and associated biota. The first was in April 1988, at the Refinery, when 400,000 gallons of crude oil leaked from a storage tank into the McNabney Marsh (SOSLC, 2001).

The leaked oil flowed into the marsh to a depth of about four inches and then into the Carquinez Strait, where it was subsequently carried west into San Pablo Bay and east into Suisun Bay, on successive tides. Damage to the marsh was extensive from the oil and the cleanup operations that ensued. Without immediate cleanup, the oil would have remained in relatively high concentrations within the tidal marsh for years. Recovery of a marsh ecosystem is a long-term process typically requiring years for small spills and decades for larger spills as a result of the massive death of the marsh vegetation itself, which is the foundation of the ecosystem (SOSLC, 2001).

Another well-studied spill into tidal marshlands occurred in 1969 when No. 2 fuel oil leaked into Buzzard's Bay, Massachusetts during a storm. Oil slicks floated into Wild Harbor and the fuel oil was worked into marsh sediments to a depth of more than 10 centimeters by a storm. There was an immediate mortality of invertebrates and fishes from the acute toxicity of the oil (Hampson and Sanders, 1969). However, because the fuel oil was buried in an anoxic environment in the marsh sediments, its decomposition was slowed appreciably (Sanders *et al*., 1980), with remaining oil and detectable effects on burrowing invertebrates, such as fiddler crabs, for many years (Teal *et al.*, 1992).

There is extensive intertidal soft bottom habitat in the Bay whose flora and fauna could be damaged by a spill of crude oil. A large spill of crude oil originating in the vicinity of the MT or at one of the trans-bay bridges would most likely intersect some soft-bottom intertidal habitat because of the strong tidal current in these areas. The most damaging situation would be for a thick slick to reach the shore during a receding tide and have direct contact with intertidal invertebrates during one or more tidal cycles. This would likely result in the death of a portion of the intertidal infaunal and epifaunal communities, including polychaetes, bivalves, amphipods, isopods, and crabs.

Effect of Spills on Soft and Hard-Substrate Subtidal Habitat and Associated Biota

Some impacts to subtidal benthic habitats would be likely from crude oil spills. Contact with the spilled oil or high concentrations in water would be necessary for acute impact, and consistent exposure to elevated concentrations for prolonged time periods would be necessary for chronic effects to occur (Neff, 1976). While most fresh crude oil is lighter than water, as it weathers it loses lighter hydrocarbons and becomes heavier. Also, in the Bay it would quickly attract suspended sediments and become heavy enough to sink to the bottom and be incorporated into subtidal habitats. In shallow water under an extensive slick and with limited wind and wave action, concentrations of hundreds of ppb and into the ppm concentration range would be possible in Bay sediments (Spies, 1987). These concentrations would be high enough to affect sensitive organisms. In past spills, the subtidal benthos has been affected by oil contamination, with crustaceans, particularly some genera of amphipods, being the most affected (Spies, 1987). In the massive Exxon Valdez spill in Prince William Sound, concentrations of petroleum hydrocarbons in subtidal sediments never reached concentrations greater than 0.5 ppm (Rice *et al.*, 2007). This would be a concentration that would affect only very sensitive marine organisms, whereas the majority of organisms in the subtidal community would be unaffected. However, Prince William

Sound, where the spill occurred, had very little suspended matter in comparison to the Bay and the outcome in the Bay would likely put more oil in the subtidal environment because of the great deal of suspended material in the water.

Potential Impact to the Bay-Delta Marine Habitat from Spills

As presented in the biological characterization discussion above, the Bay-Delta contains open water pelagic habitats, subtidal soft and hard substrate, and intertidal soft and hard substrate in all of its regions. Depending on the source of the spill, the hydrocarbon product, and the path of the release, many of the habitats and associated biota would be potentially impacted as discussed above. To determine where within the Bay-Delta accidental releases of crude oil would be expected to accumulate and what potentially sensitive habitats could be affected, eight spill scenarios, ranging between 50 bbl and 20,000 bbl, were modeled as presented in Section 4.9, *Hazards and Hazardous Materials*. Based on these spill model trajectories, an analysis of NOAA Environmental Sensitivity Index (ESI) atlas maps for the Bay-Delta was conducted. Table 1 of Appendix D.1 lists the spill model scenarios, projected areas of the Bay-Delta that could be affected, the NOAA ESI atlas map number for potential spill impact areas (see Appendix D.2 for the ESI atlas maps), the species of concern located within the spill impact areas, and special-status species that may be present.

The NOAA ESI atlas maps and the NOAA Trajectory Analysis Planner II (TAPII) spill model primarily focus on shoreline (intertidal), marsh/wetland, and subtidal impacts from hydrocarbon spills. As indicated in the discussion above, the potential impacts to open water pelagic habitat and biological communities are limited. However, all of the spills modeled for the MT operations would travel along Bay-Delta open waters, and as such, would have the potential for some impact to open water biota. Affected biota would include marine birds, marine mammals, and near-surface swimming fish (e.g., delta and longfin smelt, threadfin shad, Pacific herring, Northern anchovy, and Pacific sardines).

The average most probable (i.e., 50 bbl) and maximum most probable (i.e., 168 bbl) spills for crude oil shipped to the MT were modeled. The projected trajectories indicate that the most probable areas of the Bay-Delta to be impacted by these releases would be the shoreline and open water areas immediately adjacent to the Project site and immediately across the Carquinez Strait, some areas along the northeast shoreline of San Pablo Bay, and in Suisun Bay. Daily tidal flow would be expected to potentially spread the releases slightly east and west of the Project site. As indicated in Appendix D.1 Table 1, the Bay-Delta habitats that predominate in this region consist of open water, sand and gravel beaches, shallow sheltered subtidal flats, tidal marshes, artificial shore armoring, rip-rap, docks, and pilings. The taxa most at risk include diving and wading birds, marsh vegetation, and intertidal communities. Because the crude oil transported to the MT is classified as heavy crude, if released, some would sink to the Bay floor where it would become mixed with sediment.

Modeling results for a potential tanker collision at the Carquinez Bridge indicate that the accidental release of 20,000 bbl of crude oil would have the potential to affect some areas of

Central and San Pablo Bays, but would predominantly affect the eastern shorelines of San Pablo Bay, both shorelines in Carquinez Straight, and Suisun Bay. The speed to which Shell, OSPR, the USCG, and the Marine Spill Response Corporation MSRC Oil Spill Response personnel could respond to the release and boom/recover released crude oil would greatly affect the spreading of the oil and the areal extent of shoreline, open water, and subtidal impacts.

The MT has a USCG approved Oil Spill Response Plan capable of responding to spills ranging between 50 and 1,680 bbl of oil. A key part of this plan is the placement of 2,000 feet of oil boom onsite at the MT with onsite deployment boats. This boom is capable of being deployed within 30 minutes. It is intended for the immediate containment of small spills (less than 50 bbl) to prevent its spread. Combined with contracted spill response equipment and personnel located at the adjacent Martinez marina, the spread of crude oil from the MT or a tanker en route to the MT, would be reduced but would be expected to still result in some areas of the Bay-Delta intertidal, pelagic, and subtidal habitats and associated biological communities being impacted, including protected species.

Compliance with CSLC Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS), especially improved fendering systems, use of Allision Avoidance Systems, and improved vessel fire response and control capability, would further reduce the potential for accidental oil releases at the MT due to docking, offloading of crude oil, fire, earthquakes, etc. Additionally, the implementation of CSLC mitigation measures BIO-6b, BIO-6c, BIO-6d, and BIO-7 from the certified EIR for the approved Shell Martinez 30-year lease renewal (CSLC, 2011) would further reduce the potential for impact to marine habitats and associated biological communities from the accidental release of crude oil from the MT or a tanker in route to the MT. The requirements of these mitigation measures are as follows:

> **BIO-6b Potential for Fires and Explosions and Response Capability:** Shell shall identify a source of sonic hazing devices to scare birds away from Suisun Shoal and demonstrate to the satisfaction of the California Department of Fish and Game-Office of Spill Prevention and Response (CDFG OPSR) that these devices can be deployed within 3 hours of a spill at the Shell Terminal.
>
> **BIO-6c Potential for Fires and Explosions and Response Capability:** When a spill occurs, develop procedures for cleanup of any sensitive biological areas contacted by oil, in consultation with biologists from California Department of Fish and Game (CDFG) and U.S. Fish and Wildlife Service (USFWS), to avoid damage from cleanup activities.
>
> **BIO-6d Potential for Fires and Explosions and Response Capability:** Shell shall work with the Natural Resource Damage Assessment (NRDA) team, if invited, to work as a single team toward determination of the extent of damage and loss of resources, cleanup, restoration and compensation. Shell shall keep the California State Lands Commission (CSLC) informed of their participation in such efforts, by providing copies of memos, meeting agendas, or other appropriate documentation, including e-mails. Shell shall be responsible for cleanup, restoration and compensation of damages to resources if Shell is determined to be the responsible party.

BIO-7 Biological Resources Impacts from Accidental Spills from Vessels in Transit in Bay or along Outer Coast: Shell shall implement MMs OS-7a and OS-7b of Section 4.1, Operational Safety/Risk of Accidents, addressing potential participation in U.S. Coast Guard Port and Waterways Safety Assessment (PAWSA) workshops for the San Francisco Bay area, VTS upgrade evaluations, and Shell's response actions for spills at or near the Shell Terminal.

Mitigation Measure 4.4-2, *Implementation of CSLC Oil Spill Mitigation Measures Notification,* would ensure that Contra Costa County would be appraised of the implementation of, and any changes to, CSLC-imposed mitigation measures BIO-6b, BIO-6c, BIO-6d, and BIO-7. However, as with preventing the introduction of non-native species by tankers arriving at the MT, despite existing and required in-place spill response capability to respond to an accidental spill and the actions required to prevent or reduce the likelihood of an accidental crude oil spill, if a large crude oil spill (more than 50 bbl) were to occur either at the MT or as a result of a tanker collision in the Bay, marine subtidal, pelagic, and intertidal habitats would be affected and their associated biological communities, which include protected plant and fish species, managed fish species, and species and habitats of special concern, would be impacted. Although the recovery of these habitats and marine communities would be expected to occur over time, the initial impact of a major volume spill would remain significant and unavoidable.

Mitigation Measure 4.4-2: Implementation of CSLC Oil Spill Mitigation Measures Notification. Shell shall notify the Contra Costa County Department of Conservation & Development, Community Development Division in writing of implementation of the CSLC measures and any changes to the requirements contained within of CSLC mitigation measures BIO-6b, BIO-6c, BIO-6d, and BIO-7 within 30-days of the change.

Significance after Mitigation: A review of accidental spills associated with the MT indicate that there have been four spill events between 1984 and 2009 of volumes between 1 and 25 bbl, and no significant environmental impact was documented (Shell, 2011). Given this history and because the Project would add only one additional ship weekly, the likelihood of a spill occurring in a large volume would be very low and regular operational protocols, including the use of secondary containment, would minimize the potential effects of a release on biological resources. Although the risk would be low, the impact would be *significant and unavoidable* even with implementation of the County and CSLC mitigation measures.

4.5 Cultural Resources

4.5.1 Introduction

This section analyzes the Project's relationship to cultural resources. Discussed are the physical and regulatory setting, the baseline for determining environmental impacts, the significance criteria used for determining environmental impacts, and potential impacts associated with construction, operation, and maintenance of the Project. Cultural resources include historic-period architectural/structural resources, archaeological resources, paleontological resources,[1] and human remains.

4.5.2 Setting

4.5.2.1 Regional and Local Setting

Shell's Martinez Refinery (Refinery) is located approximately 25 miles northeast of San Francisco (see Project Description Figure 3-1) adjacent to the City of Martinez. Approximately 20 percent of the Refinery is located within the corporate limits of the City of Martinez. The remainder of the Refinery is in an unincorporated area of Contra Costa County. All of the Project components would be constructed within the County.

Prehistoric Setting

Radiocarbon dates from a site near San Jose indicate that the San Francisco Bay Area was occupied as early as 8000 B.C., although more extensive human settlement is not seen in the archaeological record until the period from 5000 to 2000 B.C. (Moratto, 1984). Cultural materials recovered from these early sites indicate that occupants of the region were foragers who likely moved in a seasonal round between the Bay or coast and hills. Population densities were low and people probably moved to where food and other resources could be easily obtained. Shellfish were collected, but were not as important as in later times. Large projectile points indicate that hunting was a major activity, and the presence of millingstones suggests that the processing of vegetal foods (seeds, nuts, and roots) also took place. During this period, the occupants of the area probably spoke a language belonging to the Hokan linguistic family (Moratto, 1984).

After about 2000 B.C., large shell middens indicate more intensive use of marine resources from the Bay. Sites dating from 2000 B.C. to 500 A.D. contain artifacts indicative of the Berkeley Pattern, which may represent an influx of Utian speakers from the Central Valley (Moratto, 1984). By 1 A.D., many Berkeley Pattern settlements in the Bay Area can be characterized as permanently occupied villages. Increased sedentism was made possible by reliance on acorns, an abundant and storable source of dietary carbohydrate, fats, and shellfish (a protein source available year-round). Burial data indicate that there was little social stratification among

[1] Paleontology is the science of the forms of life existing in prehistoric times, as represented by fossilized animals and plants.

villagers, and material remains do not show highly developed ceremonialism. Trade goods from other regions were few and consisted of finished specimens (such as obsidian tools), rather than raw materials.

The late prehistoric Augustine Pattern (500 A.D. until Spanish contact) is thought to represent cultural continuity with the earlier Berkeley Pattern. Material culture includes many of the same artifact forms as earlier site components, with the addition of the bow and arrow, the harpoon, and tubular tobacco pipes. Pre-interment grave burning was also practiced (Moratto, 1984). During this period, populations grew; there was increased evidence of social stratification, greater trade and exchange using shell bead "money," and the spread of secret societies, cults, and associated ceremonialism.

Ethnographic Setting

Martinez is within the broad territory occupied by the Native American group known to the Spanish and twentieth-century ethnographers as the Costanoan (Levy, 1978). Costanoan peoples occupied the coast of California from San Francisco to Monterey, and inland to include the coastal mountains from the southern side of the Carquinez Straits to the eastern side of the Salinas River south of Chalone Creek. Costanoan actually refers to a group of eight related languages belonging to the Penutian linguistic family. Each language was spoken by a different ethnic group within a recognized geographical area. The contemporary descendants of the Bay Area branches of this group are members of the Ohlone Indian Tribe, and the name Ohlone is used in this document to include the members of several Bay Area ethnic groups, including those from the immediate Project area. Martinez is in the area that was occupied by speakers of the Karkin (or Carquin) language. Karkin was the largest of the four villages where this language was spoken, and the name of the village was given to both the language and the Straits upon which the villages were located (Cook, 1957).

As in most of California, the politically autonomous units within each Ohlone ethnic group have been classified as "tribelets," as per ethnographer Alfred L. Kroeber's influential *Handbook of the Indians of California* (1925). Tribelet population varied from 50 to 500 with the average being about 200 people. Each Ohlone tribelet had one or more permanent villages and several temporary camps within its territory. Collecting and hunting parties lived in temporary camps when obtaining seasonally available resources within the tribelet territory away from the village. Tribelet territorial boundaries were strictly observed, with infringement of territorial rights being the most frequent cause of war between tribelets. Members of each tribelet identified themselves with the principal village; there was no overarching recognition of multiple tribelets belonging to a larger Ohlone group. Each tribelet had a chief, whose office was inherited patrilineally. The chief's duties included feeding visitors, directing ceremonial activities, organizing hunting, fishing, and gathering activities, and directing warfare expeditions. The chief generally did not have coercive powers, except during times of war. The chief and a council of elders advised the people and attempted to achieve consensus in important community matters (Levy, 1978).

Trade between the Ohlone groups and their inland Yokuts neighbors involved the exchange of coastal products such as mussels, abalone shells, dried abalone meat, and salt for inland products such as piñon nuts. Acorns from four species of oak were the most important plant food. Other nuts, berries, seeds, and roots were also important food resources. The Ohlone managed their lands by burning chaparral to encourage sprouting of desirable seed plants and to improve browsing for deer and elk. Deer and rabbit were the most important game animals, although elk, antelope, bear, mountain lion, and other smaller game were also hunted. Sea mammals, salmonids and other fish, waterfowl, and coastal shellfish were also important in the Ohlone diet, and provided shell, feathers, and other materials for a variety of uses. Principal villages in each tribelet would have included sweathouses, dance enclosures, and an assembly house in addition to the thatched, dome-shaped family dwellings. Bundled tule reed balsas were piloted through the Bay and Delta, and artfully twined and woven baskets were employed for many tasks. Flaked-stone knives, arrow points, scrapers and other tools were made from locally obtained chert or from obsidian obtained through trade with other groups (Levy, 1978).

Seven missions were established by the Spanish in Costanoan territory between 1770 and 1797. Missions at San Jose, Santa Clara, and San Francisco (Mission Dolores) attempted to Christianize the Bay Area Ohlone groups, including the Karkin speakers that inhabited the Project area. Between November 1794 and May 1795, a large wave of Ohlone people were baptized and moved into Missions Santa Clara and Dolores, including 360 people to Mission Santa Clara and entire populations of East Bay villages to Mission Dolores. This migration was followed almost immediately by catastrophic epidemics of European diseases, as well as food shortages, resulting in alarming death rates among the mission inhabitants. Many fled the missions, returning to their home villages despite efforts by the Franciscan fathers and Spanish soldiers to bring them back to the missions. This had the unfortunate consequence of spreading the European diseases to those who had never left their homes, further decimating the populations of the remaining Ohlone villages. Later epidemics proved equally disastrous to the Ohlone population: it is estimated that one-quarter of San Francisco Bay Area Mission Indians died of measles or related complications in the spring of 1806 (Milliken, 1995). Due to introduced European diseases, a declining birth rate and high infant mortality, the overall Costanoan population decreased from at least 10,000 (pre-contact) to approximately 2,000 by 1832, and no more than 1,000 by 1852 (Cook, 1976).

Historic Setting

The Mexican government secularized the missions in the early 1830s. Former mission lands were granted to soldiers and other Mexican citizens, primarily for use as cattle ranches. The Martinez area was originally part of two Mexican land grants. The Rancho El Pinole was granted to Ygnacio Martinez in 1824 (Martinez Historical Society, 2010). The eastern boundary of this grant was Alhambra Creek, which runs through the modern city of Martinez. The area east of Alhambra Creek was provisionally granted to Scotsman William Welch in 1844 as part of Rancho Las Juntas, or the Welch Rancho (Diablo Valley College, 2010). Ranching widely continued following the signing of the Treaty of Guadalupe Hidalgo granting Alta California to the United States in 1848.

The Gold Rush of 1849 brought large numbers of Anglo-Americans to the Bay Area, resulting in the rapid expansion of San Francisco, which became the commercial hub for the region. Other towns in the Bay Area, such as Oakland and San Jose, developed quickly after the arrival of the Southern Pacific transcontinental railroad in 1869 (Beck and Haase, 1974). These Bay Area towns provided commercial, warehousing, financial, and manufacturing services for the agricultural and mining areas further east.

The origins of the city of Martinez can be traced to the 1847 establishment of ferry service across Carquinez Strait between what would later become Martinez and Benicia. The ferry was operated by Dr. Robert Semple, a dentist who had served as a lieutenant in the California Bear Flag Revolt. During the Gold Rush in 1849, the ferry was an integral part of the main route from San Francisco to the gold mining areas in the Sierras. Col. William Smith, who had married into the Martinez family, established a townsite at the ferry crossing on the west side of the mouth of Alhambra Creek. The Welch family expanded the townsite onto their land east of Alhambra Creek. The town developed rapidly by providing supplies and other services to the gold miners using the ferry route. Further development ensued when the legislature designated Martinez as the county seat of Contra Costa County in 1851 (Martinez Historical Society, 2010).

Although the initial growth of the Martinez area was based on the Gold Rush, sustained development came from agriculture. The principal commodities were wheat and fruit, as well as cattle. By 1869, a farm had been established by Martin Woolbart on lands including the Project area (Anonymous, 1882). Local wine production began in the 1880s, with the completion of the Christian Brothers School and planting of associated vineyards. The establishment of rail service through Martinez in 1877 facilitated widespread shipping of local agricultural products (Martinez Historical Society, 2010).

Martinez became an industrial center in the early twentieth century when chemical and petroleum facilities were built. The Mountain Copper smelter was built at Bull’s Head Point in the early years of the twentieth century to smelt metals and produce chemical fertilizers. The Royal Dutch/Shell Group (later Shell) opened the Refinery just inland from the smelter in 1915, which became the first Shell refinery in the U.S. Associated Oil opened their refinery at Avon (east of Martinez) a few years later. The Martinez location provided a deep water harbor and rail connections for these facilities. As industrial businesses grew, local agricultural lands were converted to housing for refinery and chemical plant workers. Martinez grew from a population of 875 in 1880 to over 30,000 in 1990 (Martinez Historical Society, 2010).

Paleontological Setting

Paleontological resources are the fossilized remains of plants and animals, including vertebrates (animals with backbones), invertebrates (e.g., starfish, clams, ammonites, and coral marine), and fossils of microscopic plants and animals (microfossils). The age and abundance of fossils depend on the location, topographic setting, and particular geologic formation in which they are found. Fossil discoveries not only provide a historic record of past plant and animal life, but may also assist geologists in dating rock formations.

The potential for fossils to be preserved in a particular rock formation depends on the environmental conditions under which it formed. For example, sedimentary rocks formed in marine environments are more likely to preserve the remains of organisms than metamorphic rocks which form under intense heat and pressure. Unit descriptions in geologic maps may explicitly describe the paleontological potential of a particular rock unit, though more often, review of fossil locality records and published literature is required.

In the Project area, the underlying rock units are mapped as water saturated mud, with sandstone, mudstone, and metasandstone of the Franciscan Complex occurring in narrow south-to-north oriented belts (USGS, 1997). These marine sedimentary rock formations are of varying thicknesses (USGS, 1994). The Refinery tank farm area is located on soils mapped as urban land, which appears to consist of artificial fills within the tidal slough/marsh adjacent to the side of a bedrock ridge. The thickness of the artificial fill is variable, but is estimated to be as much as 25 feet. Natural soils within the Refinery property consist of thick sediments overlying bedrock. Millsholm series soils are the shallowest, with approximately 12 inches of well-drained clay, silty, and gravelly loams overlying sandstone, shale, and mudstone bedrock. These soils are found only in a small part of the southeast portion of the Refinery property. Other soil series found in the Project vicinity occur in deposits more than 80 inches thick (NRCS, 2010).

4.5.2.2 Regulatory Setting

Federal Statutes and Regulations

Archaeological and architectural resources (buildings and structures) are protected through the National Historic Preservation Act (NHPA) of 1966, as amended (16 USC 470f) and its implementing regulations, Protection of Historic Properties (36 CFR Part 800), the Archaeological and Historic Preservation Act of 1974 (16 U.S.C.469-469c), and the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470aa-mm).

Prior to implementing an “undertaking” (e.g., issuing a federal permit), Section 106 of the NHPA requires federal agencies (e.g., the U.S. Army Corps of Engineers) to consider the effects of the undertaking on historic properties and to afford the Advisory Council on Historic Preservation (ACHP) and the State Historic Preservation Officer (SHPO) a reasonable opportunity to comment on any undertaking that would adversely affect properties eligible for listing on the National Register. NHPA Section 101(d)(6)(A) allows properties of traditional religious and cultural importance to a tribe to be determined eligible for inclusion in the National Register. Under the NHPA, a find is significant if it meets the National Register listing criteria at 36 CFR 60.4, as stated below:

> The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and:
>
> a) That are associated with events that have made a significant contribution to the broad patterns of our history, or

b) That are associated with the lives of persons significant in our past, or

c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction, or

d) That have yielded, or may be likely to yield, information important in prehistory or history.

Federal review of projects normally is referred to as the Section 106 process. The Section 106 process normally involves step-by-step procedures that are described in detail in the implementing regulations (36 CFR Part 800) and summarized here:

- Establish a federal undertaking;
- Delineate the Area of Potential Effects;
- Identify and evaluate historic properties in consultation with the SHPO and interested parties;
- Assess the effects of the undertaking on properties that are eligible for inclusion in the National Register;
- Consult with the SHPO, other agencies, and interested parties to develop an agreement that addresses the treatment of historic properties and notify the Advisory Council on Historic Preservation; and
- Proceed with the project according to the conditions of the agreement.

State Statutes and Regulations

The State of California implements the NHPA through its statewide comprehensive cultural resource preservation programs. The California Office of Historic Preservation (OHP), an office of the California Department of Parks and Recreation, implements the policies of the NHPA on a statewide level. The OHP also maintains the California Historical Resources Inventory. The State Historic Preservation Officer is an appointed official who implements historic preservation programs within the State's jurisdiction.

California Environmental Quality Act

CEQA, as codified in Public Resources Code (PRC) Section 21000 et seq. and implemented via the CEQA Guidelines (14 Cal. Code Regs. § 15000 et seq.), is the principal statute governing the environmental review of projects in the State. The CEQA Guidelines define a historical resource as: (1) a resource in the California Register; (2) a resource included in a local register of historical resources, as defined in PRC Section 5020.1(k) or identified as significant in a historical resource survey meeting the requirements of PRC Section 5024.1(g); or (3) any object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California, provided the lead agency's determination is supported by substantial evidence in light of the whole record.

The California Register is "an authoritative listing and guide to be used by state and local agencies, private groups, and citizens in identifying the existing historical resources of the state and to indicate which resources deserve to be protected, to the extent prudent and feasible, from substantial adverse change" (PRC Section 5024.1[a]). The criteria for eligibility to the California Register are based on National Register criteria and set forth in Public Resources Code Section 5024.1(b). Certain resources are determined by the statute to be automatically included in the California Register, including California properties formally eligible for or listed in the National Register.

To be eligible for the California Register as a historical resource, a prehistoric or historic-period resource must be significant at the local, State, and/or federal level under one or more of the following criteria:

1. Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;

2. Is associated with the lives of persons important in our past;

3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or,

4. Has yielded, or may be likely to yield, information important in prehistory or history [14 Cal. Code Regs. § 4852(b)].

For a resource to be eligible for the California Register, it must also retain enough integrity to be recognizable as a historical resource and to convey its significance. A resource that does not retain sufficient integrity to meet the National Register criteria may still be eligible for listing in the California Register.

CEQA requires lead agencies to determine if a Project would have a significant effect on important historical resources or unique archaeological resources. If a lead agency determines that an archaeological site is a historical resource, the provisions of PRC Section 21084.1 and CEQA Guidelines Section 15064.5 would apply. If an archaeological site does not meet the CEQA Guidelines criteria for a historical resource, then the site may meet the threshold of PRC Section 21083 regarding unique archaeological resources. A unique archaeological resource is an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

- Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
- Has a special and particular quality such as being the oldest of its type or the best available example of its type.
- Is directly associated with a scientifically recognized important prehistoric or historic event or person [PRC § 21083.2 (g)].

The CEQA Guidelines note that if a resource is neither a unique archaeological resource nor a historical resource, the effects of the project on that resource shall not be considered a significant effect on the environment (14 Cal. Code Regs. § 15064[c][4]).

Local

Contra Costa County General Plan

The Contra Costa County General Plan contains goals and policies that are applicable to all development projects in the unincorporated areas of the County. The overarching goal for cultural resources is to identify and preserve important archaeological and historic resources within the County. Policies include preserving areas that have identifiable and important archaeological or historic significance, preferably in public ownership and creating compatible and high quality design in developments surrounding areas of historic significance in order to protect and enhance the historic quality of the area (Contra Costa County, 2010).

4.5.2.3 Project Baseline

State and Federal inventories list no historic properties within the Project area (see Figure 3-3 for an overview of the Project area). A records search was conducted at the Northwest Information Center (NWIC) of the California Historical Resources Information System, located at Sonoma State University (File No. 10-0393). The records search showed that there are portions of two cultural resources (CA-CCO-251 and P-07-002685) within the Martinez Shell Oil Refinery land; however, neither of these sites is within or adjacent to any of the locations that would be directly or indirectly impacted by the Project. In addition, a request was sent to the California Native American Heritage Commission (NAHC) on October 21, 2010 for a search of the Sacred Lands Files and a list of local Native American groups or individuals that might have knowledge about important resources in the Project area. No reply has been received to date.

The previously recorded prehistoric site that may extend partly onto the Refinery property (CA-CCO-251) is a shell midden near Suisun Point recorded circa 1910 by Nels Nelson, an archaeologist from the University of California (Nelson, 1910). Very little is known about the site, and subsequent investigations in the area have failed to locate any trace of it, likely due to its destruction during early 20th-Century development. The recorded historic-period resource (P-07-002685) in the Project vicinity is a drainage channel of the Peyton Marsh Drainage System, a mosquito abatement project undertaken by Contra Costa County in the 1920s and 1930s. It is not considered eligible for listing on the National Register of Historic Places (NRHP) (Linn, 1997). An archaeological survey of the Refinery property was undertaken in 1979 by Peter M. Banks (NWIC # S-1582). Banks noted that many of the structures within the Refinery were constructed on imported fill to raise them above the natural ground surface (Banks, 1979).

According to the California State Lands Commission (CSLC) shipwrecks data file (on file at the NWIC), no shipwrecks have been reported in the Project vicinity. The two nearest recorded shipwrecks are the Alden Anderson and the Alpine located near the Avon dock, about 1.5 miles east of the Shell Terminal. Other shipwrecks are located in Carquinez Strait near Port Costa and Benicia.

According to the Historic Property Data File maintained by the Office of Historic Preservation and on file at the NWIC, there are 51 properties in Martinez and three in the vicinity of Martinez that have buildings more than 50 years old that have been evaluated using NRHP criteria. One of these properties is the Shell Martinez Manufacturing Complex (Shell Oil Refinery) at 1801 Marina Vista Way. It was determined ineligible for the NRHP in 1989. The rest of the properties with buildings more than 50 years old are mostly located in central and inland areas of Martinez; none are within the immediate Project vicinity.

A search of the online database maintained by the University of California Museum of Paleontology (UCMP) identified a single specimen collected in 1964 from the Shell Oil locality (UCMP, 2010). This is a Pleistocene-age fossilized bison metatarsal bone found in a sandstone formation.

4.5.3 Significance Criteria

Based on CEQA Guidelines Section 15064.5 and CEQA Guidelines Appendix G, a project would cause adverse impacts to cultural resources if it would:

a) Cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines Section 15064.5;

b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5;

c) Directly or indirectly destroy a unique paleontological resource or site or unique geological feature; or

d) Disturb any human remains, including those interred outside of formal cemeteries.

4.5.4 Discussion of No Impacts on Cultural Resources

As discussed in Section 4.5.5, analysis of the Project characteristics relative to the baseline and significance criteria shows that the Project would have impacts with respect to each of the significance criteria.

4.5.5 Discussion of Cultural Resources Impacts and Mitigation

Review and comparison of the setting circumstances and Project baseline characteristics with each of the four CEQA significance criteria stated above show that impacts to cultural resources resulting from the Project could be reduced with mitigation to a level of *less than significant*. The following discussions include the analyses that support this conclusion:

a) Cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines Section 15064.5

b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5

Impact 4.5-1: Inadvertent discovery of a historical resource or unique archaeological resource. (*Less than Significant with Mitigation*)

There are no recorded historical resources or unique archaeological resources located within the area of direct or indirect impacts for the Project. Most of the areas within the Refinery property that would be affected by ground-disturbing activities related to the Project are located on artificial fill. The likelihood of a historical resource or unique archaeological resource being discovered during ground-disturbing Project activities (e.g., demolition, grading, excavation, etc.) is minimal. However, if an inadvertent discovery were to occur, it could result in damage to the resource that would cause a substantial adverse change in its significance, thereby constituting a significant impact. Ohlone cultural materials might include obsidian and chert flaked-stone tools (e.g., projectile points, knives, scrapers) or toolmaking debris; culturally darkened soil ("midden") containing heat-affected rocks, artifacts, or shellfish remains; and stone milling equipment (e.g., mortars, pestles, handstones, or milling slabs); and battered stone tools, such as hammerstones and pitted stones. Historic-period materials in this locale might include shipwreck remains, including wood, iron, and steel-hulled ships as well as smaller ferrous materials such as anchors, iron ballast, chain, iron hull fasteners, rigging, and fittings of various types. Other historic-period materials could include debris scatters of ceramic, glass, or metal containers; household or personal items; privy pits; or building foundations or other structural remains. The implementation of Mitigation Measure 4.5-1 would reduce to a less-than-significant level any potential impacts from inadvertent discovery of either a historical resource or a unique archaeological resource.

> **Mitigation Measure 4.5-1:** Project personnel shall be alerted to the possibility of encountering archaeological materials during ground-disturbing activities. If an inadvertent discovery is made of items of pre-contact or historic-period archaeological potential, all work activities shall immediately cease in the area of discovery. After cessation of ground-disturbing activity in the vicinity of the find, the contractor shall immediately contact the Project proponent.
>
> Archaeological resources inadvertently discovered during Project activities shall be evaluated by a cultural resources specialist that meets the Secretary of the Interior's standards in the appropriate discipline. If the find is determined to be potentially significant as either a historical resource or a unique archaeological resource, the archaeologist, in consultation with the Project proponent and appropriate Ohlone representatives or historical societies, shall develop a research design and treatment plan outlining management of the resource, analysis, and reporting of the find.

Significance after Mitigation: Less than Significant.

c) Directly or indirectly destroy a unique paleontological resource or site or unique geological feature

Impact 4.5-2: Inadvertent discovery of a unique paleontological resource or site or unique geological feature. ***(Less than Significant with Mitigation)***

There has been a single reported paleontological resource located within the Refinery property. This was a fossil most likely identified during construction of the Light Oil Processing facility, a major expansion project completed in 1966 (EDAW, 2010). No records of unique geological features have been found. The marine sedimentary bedrock units underlying the Project area are considered to have a high potential for significant nonrenewable paleontologic resources. However, the Project would involve minimal ground-disturbing activities that would intrude on areas likely to contain significant fossils. Activities within the tank farm area would occur on thick deposits of artificial fill, with an extremely low potential for discovery of unique paleontological resources. Excavations within areas of the shallower Millsholm soils have a higher likelihood of encountering fossil-bearing rock units; however, no ground-disturbing activities are proposed in this area as part of the Project.

The likelihood of a unique paleontological or geological resource being discovered during Project ground-disturbing activities is minimal. However, such a discovery could potentially lead to damage or destruction of the resource, which would constitute a significant impact. In the event that such a resource is found, the implementation of Mitigation Measure 4.5-2 would reduce any potential impacts to a less-than-significant level.

> **Mitigation Measure 4.5-2:** Project personnel shall be alerted to the possibility of encountering paleontological materials during ground-disturbing activities. If paleontological resources, such as fossilized bone, teeth, shell, tracks, trails, casts, molds, or impressions are discovered during ground-disturbing activities, all such activities within 50 feet of the find shall be halted until a qualified paleontologist can assess the significance of the find and, if necessary, develop appropriate salvage measures in conformance with Society of Vertebrate Paleontology Guidelines (SVP, 1995 and 1996).

Significance after Mitigation: Less than Significant.

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d) Disturb any human remains, including those interred outside of formal cemeteries.

Impact 4.5-3: Inadvertent Discovery of Human Remains. (*Less than Significant with Mitigation*)

There is a low likelihood of encountering buried human remains during ground-disturbing Project activities. None have been reported in the Project vicinity, and the filled and heavily developed former tidal marshland on which the Refinery has been built has a low sensitivity for preservation of such remains. Nonetheless, the accidental disturbance of human remains would constitute a

significant impact. Therefore, Mitigation Measure 4.5-3 is recommended to reduce any potential impacts from an inadvertent discovery to a less-than-significant level.

> **Mitigation Measure 4.5-3:** The treatment of human remains and associated or unassociated funerary objects discovered during any ground-disturbing activity shall comply with applicable State law. Project personnel shall be alerted to the possibility of encountering human remains during Project implementation, and apprised of the proper procedures to follow in the event they are found. State law requires immediate notification of the County coroner, in the event of the coroner's determination that the human remains are Native American, notification of the California Native American Heritage Commission (NAHC), which would appoint a Most Likely Descendent (MLD) (PRC Section 5097.98). The MLD would make all reasonable efforts to develop an agreement for the treatment, with appropriate dignity, of human remains and associated or unassociated funerary objects (CEQA Guidelines Section 15064.5[d]).
>
> The agreement shall take into consideration the appropriate excavation, removal, recordation, analysis, custodianship, curation, and final disposition of the human remains and associated or unassociated funerary objects. The PRC allows 48 hours to reach agreement on these matters. If the MLD and the other parties do not agree on the treatment and disposition of the remains and funerary objects, Shell shall follow PRC Section 5097.98(b), which states that "the landowner or his or her authorized representative shall reinter the human remains and items associated with Native American burials with appropriate dignity on the property in a location not subject to further subsurface disturbance."

Significance after Mitigation: Less than Significant.

4.6 Energy Conservation

4.6.1 Introduction

This section presents analysis relative to the Project's relationship to energy conservation. Discussed are the physical and regulatory setting, the baseline for determining environmental impacts, the significance criteria used for determining environmental impacts, and potential impacts associated with construction, operation, and maintenance of the Project.

4.6.2 Setting

4.6.2.1 Regional and Local Setting

Shell's Martinez Refinery (Refinery) is located approximately 25 miles northeast of San Francisco (see Section 3, *Project Description*, Figure 3-1) adjacent to the community of Martinez. Approximately 20 percent of the Refinery is located within the corporate limits of the City of Martinez. The remainder of the Refinery is in an unincorporated area of the County. All of the Project components would be constructed within the County.

This section provides setting information specific to energy conservation. California's energy system includes electric, natural gas, hydroelectric, nuclear, and petroleum resources. California's energy production system provides 73.2 percent of the electricity, 12.9 percent of the natural gas, and 38.1 percent of the petroleum consumed or used for the State. The rest of the State's energy needs are imported and include: natural gas purchases from Canada (22.1 percent), the Rocky Mountain states (24.2 percent), and the Southwest (40.8 percent); electricity from the Pacific Northwest (8.4 percent, primarily hydroelectric) and the Southwest (18.4 percent, primarily coal and nuclear); and crude oil imported from Alaska (13.4 percent) and foreign sources (48.5 percent) (CEC, 2011a).

The production of electricity requires the consumption or conversion of energy resources, including water, wind, oil, gas, coal, solar, geothermal, and nuclear sources. Of the electricity generated in-State, 59 percent is generated by natural gas-fired power plants, two percent is generated by coal-fired power plants, 10 percent comes from large hydroelectric dams, and 16 percent comes from nuclear power plants. The remaining 13 percent of the in-State total electricity production is supplied by renewable sources, including small hydroelectric generation (1.8 percent), biomass (2.7 percent), geothermal (6.2 percent), solar (0.3 percent) and wind (2.7 percent) (CEC, 2011a). The electricity generated is distributed via a network of transmission and distribution lines commonly referred to as the power grid.

Shell Martinez Refinery Energy Usage

Energy at the Refinery is used to provide power to generate steam and operate furnaces for heating and providing power to operate equipment such as pumps and compressors. For the CTRP, electricity would be used to operate transfer pumps and heating elements associated with

moving and storing crude oil. The energy is derived from electricity, natural gas, refinery fuel gas (RFG), and steam. Electricity is obtained either from Pacific Gas and Electric Company (PG&E) off the electricity grid, or from the on-site cogeneration plant[1] that is owned and operated by Shell. Natural gas supplied by PG&E is used to supplement RFG produced at the Refinery. Both natural gas and RFG are used to fuel furnaces, boilers, and other combustion devices. Steam is produced within the Refinery by a series of boilers and by the heat recovery steam generators associated with the cogeneration plant.

Existing Crude Oil Storage Tanks

Steam is used to heat the contents of the storage tanks to maintain the tank contents at a temperature that facilitates pumping into the mix tank for blending with other crude oils prior to discharge to the Crude Oil Distillation Unit. Some of the existing crude oil storage tanks proposed for replacement are equipped with steam heating coils and none are insulated.

Electricity is used to power in-tank mixers located at the base of the crude oil storage tanks. The electric in-tank mixers are used to maintain a homogenous mixture prior to pumping the crude oil to the mix tank for blending. Table 3-7, in Section 3, *Project Description*, provides listings of the baseline energy consumption for the in-tank mixers.

4.6.2.2 Regulatory Setting

Federal Regulations

Energy Policy and Conservation Act

The Energy Policy Act of 1975 was established in response to the oil crisis of 1973, which increased oil prices due to a shortage of reserves. The Act required that all vehicles sold in the U.S. meet certain fuel economy goals. Since 1990, the fuel economy standard for new passenger cars has been 27.5 miles per gallon. Since 1996, the fuel economy standard for new light trucks (gross vehicle weight of 8,500 pounds or less) has been 20.7 miles per gallon. Heavy-duty vehicles (i.e., vehicles and trucks over 8,500 pounds gross vehicle weight) are not subject to fuel economy standards. This Act indirectly applies to the Project due to its requirements for increased fuel economy standards particularly for the construction equipment to be used.

Energy Policy Act of 2005

The Energy Policy Act of 2005 seeks to reduce reliance on non-renewable energy resources and provide incentives to reduce current demand on these resources. For example, under the Act, consumers and businesses can attain federal tax credits for purchasing fuel-efficient appliances and products, buying hybrid vehicles, building energy efficient buildings, and improving the energy efficiency of residential and commercial buildings. Additionally, tax credits are available for the installation of qualified fuel cells, stationary microturbine power plants, and solar power equipment.

[1] Shell's cogeneration plant consists of two 49.9 megawatt (MW) units, with a combined capacity of approximately 100 MW.

State of California

State of California Integrated Energy Policy

In 2002, the Legislature passed Senate Bill 1389, which required the California Energy Commission (CEC) to develop an integrated energy plan biannually for electricity, natural gas, and transportation fuels, for the California Energy Report. The plan calls for the State to assist in the transformation of the transportation system to improve air quality, reduce congestion, and increase the efficient use of fuel supplies with the least environmental and energy costs. To further this policy, the plan identifies a number of strategies, including assistance to public agencies and fleet operators in implementing incentive programs for Zero Emission Vehicles and their infrastructure needs, and encouragement of urban designs that reduce vehicle miles traveled and accommodate pedestrian and bicycle access.

The latest update – the *2010 Update to the Integrated Energy Policy Report* - was adopted by the CEC on January 12, 2011 (CEC, 2011b). The update focuses on the potential contribution of American Recovery and Reinvestment Act of 2009 (ARRA) funding to California's transition to a clean energy economy. The *2009 Integrated Energy Policy Report* focuses on: anticipated operational and physical changes to California's electric system through 2020; how the State's energy efficiency goals interact with electrical and natural gas demand forecasting methods; recommended changes to electricity procurement; vulnerability of the State's nuclear plants to major seismic events; and other energy issues.

Contra Costa County General Plan

The Contra Costa County General Plan contains goals and policies that apply to development projects, such as the Project, in the unincorporated County (Contra Costa County, 2010). The goals and policies relating to energy and renewable energy resources are summarized as follows:

- Achieve a balance of uses of the County's natural and developed resources to meet social and economic needs of the County's residents.
- Reduce energy use in the County to avoid risks of air pollution and energy shortages which prevent orderly development.
- Achieve utilization of oil and gas resources in a manner beneficial to all County residents.
- Encourage use of renewable resources where they are compatible with the environment.

4.6.2.3 Project Baseline

For the energy conservation analysis, the baseline reflects the existing energy used and produced at the Refinery as it existed at the time of publication of the notice of preparation for this EIR (i.e., February 2010).

4.6.3 Significance Criteria

Appendix F of the CEQA Guidelines provides guidance for assessing energy impacts of projects. The appendix provides three goals:

- Decreasing overall per capita energy consumption;
- Decreasing reliance on natural gas and oil; and
- Increasing reliance on renewable energy sources.

Consistent with Appendix F, environmental impacts evaluated in this analysis include:

a) The Project's energy requirements by amount and fuel type for each stage of the Project including construction, operation, maintenance and/or removal;

b) The effects of the Project on local and regional energy supplies and on requirements for additional capacity;

c) The effects of the Project on peak and base period demands for electricity and other forms of energy;

d) The degree to which the Project complies with existing energy standards;

e) The effects of the Project on energy resources; and

f) The Project's projected transportation energy use requirements and its overall use of efficient transportation alternatives.

4.6.4 Discussion of No Energy Conservation Impacts

Review and comparison of the setting circumstances and Project characteristics with the significance criteria for items b), c), d), and e) clearly show that no impacts related to energy conservation would result for these criteria. The following discusses the reasoning supporting this conclusion:

b) The Project would cause no adverse effect on local and regional energy supplies or requirements for additional capacity.

As discussed in Section 3.4.4, *Energy Consumption*, implementation of the Project would increase the total Refinery electrical energy usage by only approximately 0.4 percent over the current baseline for the Refinery. This incidental amount of change would not be expected to have any adverse effects on existing energy resources available to the local area or the region.

c) Generally, the effects of the Project on peak and base period demands for electricity and other forms of energy would be neutral or beneficial.

The majority of electricity used at the Refinery is provided by the onsite cogeneration facility, and the remainder of the required electricity is obtained from the PG&E grid. As discussed in Section 3.4.4, *Energy Consumption*, the Project would increase the total Refinery electrical

energy usage by only approximately 0.4 percent over the current baseline. This incidental amount of change in electrical energy would not be expected to result in any material effect on peak and base period demands in the local area or the region.

d) The Project complies with existing energy standards by directly supporting and furthering efforts toward achieving those standards.

The Project would replace and upgrade existing facilities in the process of adding crude oil storage capacity to the Refinery to support continued full Refinery operations in years to come. By virtue of the replacement and upgrading of equipment, the Project would be required to comply with current energy standards and policies. This upgrading process by itself would directly support efforts toward achieving current energy standards. However, such policies as the State of California Integrated Energy Policy and the Contra Costa County General Plan do have an emphasis on reducing reliance on non-renewable energy resources and/or increased use of alternative energy resources. As such, the Project would not directly result in any reduction of non-renewable resources or increase the use of alternative energy resources. With this Project, the Refinery would not increase the throughput of crude oil refining and thus would not increase the usage of a non-renewable resource. Rather, the Project would maintain the ability for the Refinery to produce products at existing rates. Consequently, no adverse impact on efforts to achieve existing energy standards would be expected to result.

e) The Project would have no adverse effect on energy resources

As discussed in Section 3.4.4, *Energy Consumption*, the Project would increase the total Refinery electrical energy usage by only approximately 0.4 percent over the current baseline. This incidental increase would not be expected to result in any adverse effects on existing energy resources available to the local area or region.

4.6.5 Discussion of Impacts and Mitigation Measures

The additional energy demand that would be associated with the Project would be expected to be negligible in comparison to current Refinery usage. Current and Project-related energy usage demands are described below.

a) Would the Project's energy requirements by amount and fuel type for each stage of the Project, including construction, operation, maintenance and/or removal, be considered significant?

Impact 4.6-1: Construction and operation of the Project would result in consumption of energy. (*Less than Significant)*

Although construction-related energy consumption would be short-term in duration, it would represent irreversible consumption of finite fossil fuel energy resources. Construction-related energy expenditures would include both direct and indirect uses of energy in the form of fuel (typically diesel and gasoline fuel) and electricity. Indirect energy use typically represents about

three-quarters of total construction-related energy consumption, while direct energy represents about one-quarter of total construction-related consumption (Hannon et al., 1978). Direct energy use would include the consumption of petroleum for operation of construction vehicles and the use of electricity for construction equipment, such as welding machines and power tools. Energy consumed by power equipment used during construction would be relatively minimal, as would be the energy required for any required lighting and operation of ancillary electrical equipment. Indirect energy use includes the energy required to make the materials and components used in construction of the Project. This includes energy used for extraction of raw materials, manufacturing, and transportation associated with manufacturing.

The precise amount of construction-related energy demand is uncertain. Even so, the energy consumption for construction would not result in long-term depletion of non-renewable energy resources and would not permanently increase reliance on energy resources that are not renewable. Further, construction activities would not reduce or interrupt existing electrical or natural gas services due to insufficient supply. Because construction would not interrupt existing local PG&E service and because Project-specific construction-related energy demands are not expected to have a material effect on energy resources, energy consumption by construction activities would be less than significant. Nonetheless, implementation of Mitigation Measure 4.3-2, which is described and analyzed in Section 4.3, *Air Quality*, would ensure that fuel energy consumed in the construction phase would not be wasted through unnecessary idling or through the operation of poorly maintained equipment.

Electricity consumption required for operations and maintenance of the Project would be minimal (approximately 0.4 percent of the total Refinery annual usage over the current baseline, or 3,500 MW-hrs). The source of this energy would be substantially the same as baseline conditions; i.e., most power would be provided by Shell's cogeneration plants with only the occasional use of electricity from the PG&E grid. Therefore, impacts from operations and maintenance of the Project related to the consumption of energy would be less than significant.

Mitigation: None required.

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f) Would the Project's projected transportation energy use requirements be significant, and would the Project's overall use of transportation alternatives be efficient?

Impact 4.6-2: Construction and operation of the Project would require use of transportation energy. (*Less than Significant)*

As discussed Section 4.6.4 and in Impact 4.6-1 above, Project construction and operation would result in the consumption of energy (primarily though fuel usage) during transportation of labor and materials to and from the Project site. This transportation-related energy usage would be greatest during construction activities. For the reasons discussed above, construction-related transportation energy use would be less than significant. During Project operations, transportation-related energy usage in the form of marine fuel used by vessels that call at the MT

would increase by a factor of approximately 30 percent compared to existing conditions (i.e., fuel usage associated with approximately one additional vessel call at the MT each week compared to approximately four vessel calls that currently occur each week). However, given the nature of the world crude oil market, it is speculative to assume that the proposed additional vessel calls would not occur at some other marine terminal in the Bay or on the west coast. Therefore, it is too speculative for this analysis to evaluate Project impacts related to the increased use of marine vessel fuel.

Mitigation: None required.

4.7 Geology and Soils

4.7.1 Introduction

This section presents analysis of the Project's relationship to geology and soils. Discussed are the physical and regulatory setting, the baseline for determining environmental impacts, the significance criteria used for determining environmental impacts, and potential impacts associated with construction, operation, and maintenance of the Project.

ENGEO, Incorporated conducted a preliminary geotechnical and geologic hazard assessment of the tank farm area in the Refinery based on a review of available literature, geologic maps, and previous pertinent geotechnical reports. The geotechnical evaluation determined that there are potential geologic hazards associated with the Project site, including ground shaking, liquefaction, settlement of compressible material, and potential slope instability of existing fills and earthen berms proposed for the project (ENGEO, 2010). The potential of the aforementioned hazards to affect the Project is analyzed below and information from the ENGEO report is incorporated as appropriate.

4.7.2 Setting

4.7.2.1 Geology

Shell's Martinez Refinery (Refinery) is located approximately 25 miles northeast of San Francisco. The Refinery is located in the Coast Range geomorphic province of California (CGS, 2002a). The Coast Range is characterized by a series of northwest-trending valleys and mountain ranges generally parallel to the San Andreas Fault. The Coast Ranges are generally divided in two subprovinces north and south of San Francisco Bay. In the Coast Ranges, older consolidated rocks are characteristically exposed in the mountains but are buried beneath younger, unconsolidated alluvial fan[1] and fluvial[2] sediments in the valleys and lowlands. In the coastal lowlands, these younger sediments commonly interfinger[3] with marine deposits. In this part of the San Francisco Bay Area, the bedrock units include sandstone and shale units that strike north to northwest and dip to the west or southwest respectively (ENGEO, 2010).

The Refinery is underlain by water saturated mud, sandstone, mudstone and Franciscan Complex metasandstone (USGS, 1997a). The rock type is primarily mapped as water saturated mud, with sandstone, metasandstone, and mudstone occurring in narrow south-to-north oriented belts. The bedrock underlying the Refinery is composed of Surficial Deposits as well as a series of sedimentary rock formations (sandstone, siltstone, shale) of varying thicknesses (USGS, 1994) and is mapped as marine sandstone and shale of the Muir Sandstone and Las Juntas Shale (ENGEO, 2010).

1 Unconsolidated mixtures of gravel, sand, clay, and silt deposited by running water (e.g., river or stream).
2 Stream-related.
3 To change laterally from one type to another in a zone where the two types form interpenetrating wedges.

4.7.2.2 Topography

The Refinery is located in northern Contra Costa County, northwest of Mount Diablo. A majority of the Refinery lies between approximately 25 to 80 feet above mean sea level (amsl) and is predominately flat and slightly sloping towards the northwest. The existing relatively level areas within and around the Refinery had been created by grading that included cuts in ridge areas and fills in a former tidal slough. The majority of the grading occurred in the 1960's and the fills were compacted to a minimum of 90 percent of the maximum dry density.

The area within the proposed tank farm site is relatively flat, with elevations ranging from approximately 25 feet to 35 feet amsl. The area adjacent to the eastern side of the tank farm site slopes downward to a marshy lower area at approximately 10 feet amsl. There are slight increases in elevation in the portion of the Refinery just west of Shell Boulevard. Vine Hill is located in the southwestern portion of the Refinery with a peak reaching approximately 215 feet amsl.

4.7.2.3 Soils

Soil characteristics vary based on the proportion of clay, silt, sand and gravel within the soil type, as well as the soil acidity. The U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) has characterized soils beneath the Refinery as well as slopes associated with the soil types (for a discussion on slope and slope stability, see Slope Stability, below) as part of their Soil Survey programs (NRCS, 2010a and 2010b). The Refinery coincides with a variety of soil types and associations. The Refinery soils are grouped into soil series that reflect the bedrock and various alluvial parent materials from which they are derived. Table 4.7-1 summarizes the key characteristics for the soil types at the Refinery:

TABLE 4.7-1
SOIL TYPES IDENTIFIED WITHIN THE SHELL REFINERY

Soil Units at the Refinery	Percent of Refinery	Depth to Bedrock (inches)	Shrink/ Swell Potential[a]	Risk of Corrosion[b]		Erosion and Runoff	
				Uncoated Steel	Concrete	Hydrologic Soil Group[c]	Erosion Factor (Kf)[d]
Millsholm Series	10	12	Low	High	Moderate	D	0.32
Omni Series	15	>80	High	High	Moderate	D	0.20-0.24
Positas Series	6	>80	High	High	Moderate	D	0.24-0.37
Tierra Loam Series	3	>80	Moderate	High	Moderate	D	0.20-0.43
Urban Land (Tank Farm Site)	**66**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

a Soils characterized by their ability to undergo significant volume change (i.e., to shrink and swell) due to variations in soil moisture content.
b "Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete.
c Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups (A through D) according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms. Soils in Group A have low runoff rates and water is transmitted freely through the soil. Soils in Group B have a moderate infiltration rate and a moderate rate of water transmission. Soils in Group C have slow infiltration and transmission rates and consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. Soils in Group D have high runoff potential when thoroughly wet. Water movement through the soil is restricted or very restricted.
d Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

SOURCE: NRCS, 2010b.

A majority of the Refinery is mapped as urban land. These areas are characterized by being predominately paved or highly disturbed due to past and ongoing industrial activities. The tank farm site is located on soils mapped as urban land and appears to be situated on artificial fills within the adjacent tidal slough/marsh on the side of the bedrock ridge. The thickness of the artificial fill is variable and is estimated to be up to 25 feet thick. Borings in the fill generally encountered mixtures of stiff sandy to silty clay and rock fragments but also marsh deposits in some areas (ENGEO, 2010).

Towards the less-disturbed perimeters of the Refinery property, various types of alluvial soils are present. Borings at the tank farm site generally encountered dense brown sandstone and siltstone overlain by several feet of residual soils consisting of stiff clays (ENGEO, 2010). Millsholm loams are localized in the southeastern portion of the Refinery at Vine Hill (NRCS, 2010a). The Millsholm series consists of well drained clay, silty and gravelly loams formed in material weathered from sandstone, mudstone, and shale. Millsholm soils are well drained with moderate permeability. Tierra loams and Positas loams consist of loams and clays, are moderately well drained, and are located north and south of Vine Hill, respectively. Omni Silty Clay is located in the northwestern portion of the Refinery property and consists of poorly drained clay, loamy sand and sandy loam formed from weathered sandstone, mudstone, and shale (NRCS, 2010a).

4.7.2.4 Geologic Hazards

Slope Failure and Slope Stability

Slope failures, commonly referred to as landslides; include phenomena that involve the downslope displacement and movement of material, either triggered by static (i.e., gravity) or dynamic (e.g., earthquake) forces. Exposed rock slopes undergo rockfalls, rockslides, or rock avalanches, while soil slopes experience soil slumps, rapid debris flows, and deep-seated rotational slides. Slope stability can depend on several complex variables, including the geology, structure, and amount of groundwater present, as well as external processes such as climate, topography, slope geometry, and human activity. The factors that contribute to slope movements include those that decrease the resistance in the slope materials and those that increase the stresses on the slope.

Landslides can occur on slopes of 15 percent or less, but the probability is greater on steeper slopes that exhibit old landslide features such as scarps, slanted vegetation, and transverse ridges. Landslides typically occur within slide-prone geologic units that contain excessive amounts of water or are located on steep slopes, or where planes of weakness are parallel to the slope angle.

The best available predictor of where slides and earth flows might occur is the distribution of past movements. There are no known landslide deposits at the Refinery. However, the western portion of the Refinery has scattered areas with slopes exceeding 26 percent as do the slopes of Vine Hill (Contra Costa County, 2010). While these areas are at greater risk of landslide than other portions of the Refinery, neither the tank farm site nor the Tank 967 are adjacent to these slopes. However, the geotechnical assessment conducted for the Project indicates some potential risk for slope deformation on the shallow slopes on the eastern portion of the tank farm site (ENGEO, 2010).

Expansive Soils

Expansion and contraction of expansive soils in response to changes in moisture content can cause differential and cyclical movements resulting in damage and/or distress to shallow founded structures and equipment. Issues with expansive soils typically occur near the ground surface where changes in moisture content typically occur. Often times, grading, site preparations, and backfill operations associated with subsurface structures can eliminate the potential for expansion. Soils with expansive properties at the Refinery are summarized in Table 4.7-1.

Soil Erosion

Erosion is the wearing away of soil and rock by processes such as mechanical or chemical weathering, mass wasting, and the action of waves, wind, and underground water. Excessive soil erosion can eventually lead to damage of building foundations and roadways. Areas exposed during the construction phase, especially along steep slopes, are susceptible to erosion. Soils with a high erosion potential at the Refinery are summarized in Table 4.7-1. Typically, the soil erosion potential is reduced once the soil is graded and covered with concrete, structures, asphalt, or slope protection features.

Corrosivity

Corrosivity refers to potential soil-induced electrochemical or chemical action that could corrode or deteriorate concrete, reinforcing steel in concrete structures, and bare-metal structures exposed to these soils. The rate of corrosion is related to factors such as soil moisture, particle-size distribution, and the chemical composition and electrical conductivity of the soil. The potential corrosivity of soils at the Refinery is summarized in Table 4.7-1.

4.7.2.5 Seismicity

The Refinery is located in a region that contains numerous active faults; however, does not lie within a State Earthquake Fault Hazard zone for known active faults. The nearest known active faults are the Concord-Green Valley fault complex located approximately 1.7 miles east of the Refinery and the northern end of the Calaveras fault located approximately 2.6 miles to the west. Other significant active faults in the vicinity of the Project include the Hayward fault located approximately 12.6 miles to the west and the San Andreas Fault is located approximately 30 miles to the west (ENGEO, 2010).

An earthquake is classified by the amount of energy released, which traditionally has been quantified using the Richter (M) scale[4] (CGS, 2002b). The most commonly used scale today is the moment magnitude (Mw) scale[5] because it provides a more accurate measurement of the size

[4] Richter magnitude (M) is a measure of the size of an earthquake as recorded by a seismograph, the standard instrument that records groundshaking. The reported Richter magnitude for an earthquake represents the highest amplitude measured by the seismograph at a distance of 100 kilometers (62 miles) from the epicenter. Richter magnitudes vary logarithmically, with each whole number step representing a tenfold increase in the amplitude of the recorded seismic waves.

[5] Moment magnitude (Mw) is related to the physical size of fault rupture and the movement or displacement across a fault. This is considered a more uniform measure of the strength of an earthquake.

of major and great earthquakes. Historically, strong earthquakes (>M 7) have occurred in the Bay Area with many low-magnitude earthquakes recorded every year. Between 1836 and 1989, several earthquakes of magnitude M6 or greater were documented in the Bay Area. These earthquakes most likely resulted in moderate to severe ground shaking at the Project site.

The principal regional faults are shown on Figure 4.7-1 and include the San Andreas, Hayward-Rodgers Creek, Calaveras, Concord-Green Valley, and Marsh Creek faults plus the Mount Diablo thrust. Maximum Credible Earthquakes and approximate distance from the Refinery to each of these faults are shown in Table 4.7-2.

TABLE 4.7-2
ACTIVE REGIONAL FAULTS

Fault	Approximate Distance[a]	Fault Classification	Maximum Credible Earthquake[b]
Concord - Green Valley	1.7 miles northeast	Active	7.1
Calaveras	2.6 miles west	Active	7.0
Hayward	12.6 miles west	Active	7.1
Mount Diablo blind thrust	14.5 miles southeast	Active	6.8
Marsh Creek	19 miles southeast	Active	7.0
San Andreas	30 miles west	Active	8.0

[a] Distance from Shell Refinery Property.
[b] The maximum credible earthquake is an estimated moment magnitude (Mw) for the largest earthquake capable of occurring on a fault.

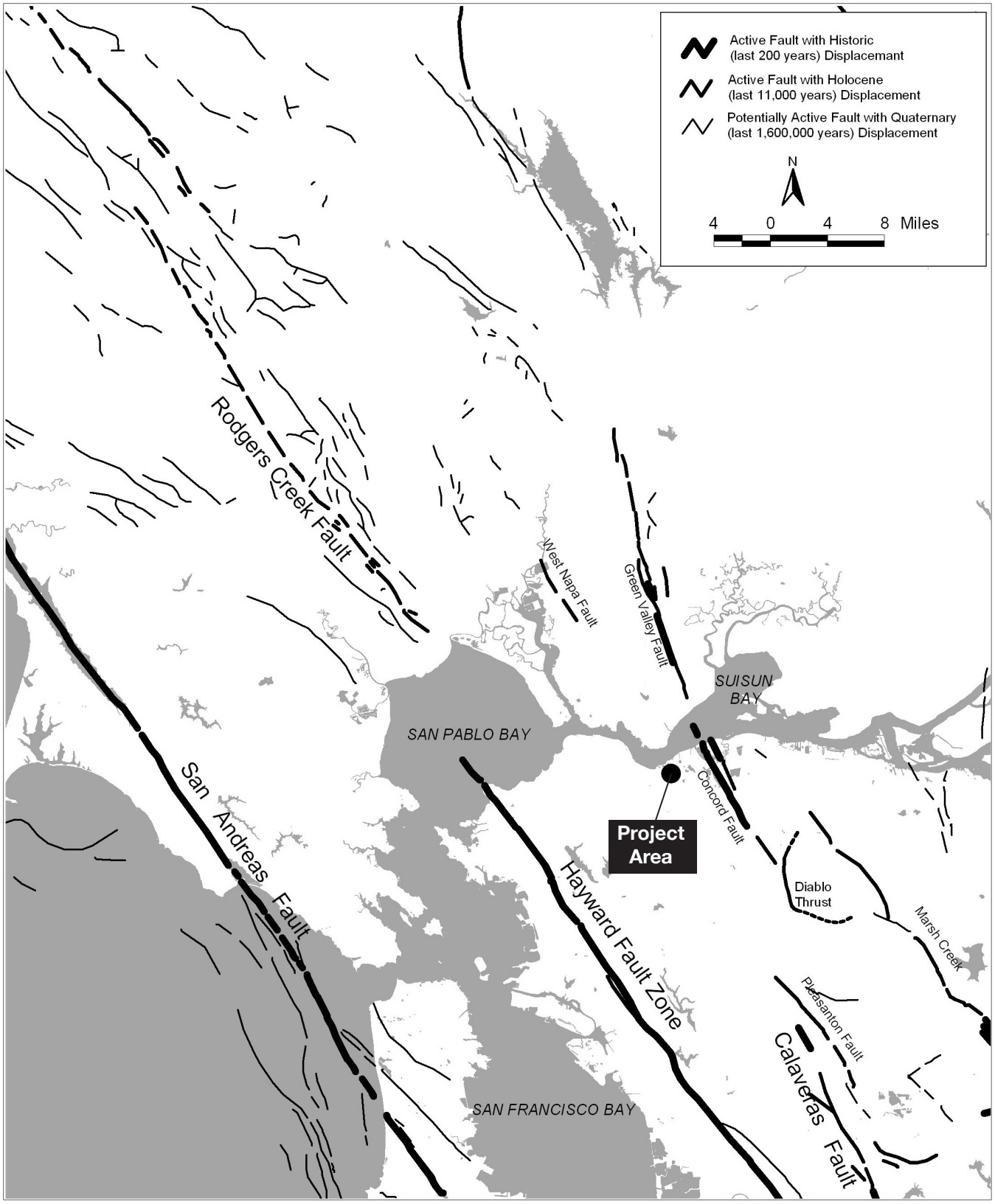
SOURCES: Jennings, 1994; Petersen et al., 1996; Hart, 1997.

The California Working Group on Earthquake Probabilities estimates that there is a 63 percent probability of at least one M6.7 or greater earthquake occurring within the San Francisco Bay Area before 2032 (USGS, 2008). More specifically, the study assigned a 30-year probability for a M6.7 or greater earthquake of 31 percent for the Hayward fault, 21 percent for the Northern San Andreas, and 7 percent for the Calaveras. While a M6.7 or greater earthquake would most likely occur on one of the principal faults, it could also occur on a different known fault or a previously unidentified fault. Therefore, it can be expected that the site would experience one or more episodes of strong ground shaking during the design life of the Project (ENGEO, 2010).

Seismic Hazards

Surface Fault Rupture

Surface rupture occurs when movement on a fault breaks through to the surface. The rupture almost always follows preexisting faults, which are zones of weakness, and may occur suddenly during an earthquake or slowly in the form of fault creep. Sudden displacements are more damaging to structures because they are accompanied by shaking. Where it crosses highly developed areas in Contra Costa and Alameda counties, the Hayward fault exhibits fault creep, which offsets and deforms curbs, streets, buildings, and other structures that lie on the fault trace.



SOURCE: California Department of Conservation, Geological Survey (After Jennings, 1994)

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Figure 4.7-1
Active and Potentially Active Bay Area Earthquake Faults

Seismically-induced surface rupture is defined as the physical displacement of surface deposits in response to an earthquake's seismic waves. The magnitude and nature of fault rupture can vary for different faults, or even along different strands of the same fault. Ground rupture is considered most likely along active faults.

Alquist-Priolo Earthquake Fault Zones indicate areas where surface fault rupture is possible during a seismic event along a particular fault (CDMG, 2001). While the likelihood of fault rupture would be considered higher along active faults, there is potential for fault rupture to occur on faults considered to be inactive. In some cases, seismic events on active faults can trigger responses on nearby inactive faults. The Refinery is not located within an Alquist-Priolo Earthquake Fault Zone, as designated by the Alquist-Priolo Earthquake Fault Zoning Act.

Ground Shaking

A preliminary geotechnical assessment was conducted by a registered geotechnical engineer for the Project. The assessment was based on a review of available literature, geologic maps, and previous geotechnical reports pertinent to the Refinery. The assessment concluded that an earthquake of moderate to high magnitude generated within the San Francisco Bay Region could cause considerable ground shaking at the Project site. Typically, the greater the earthquake magnitude and the closer the fault rupture is to a site, the greater is the intensity of ground shaking. The intensity of the seismic shaking, or strong ground motion in the Refinery during an earthquake would depend on the distance between the Refinery and the epicenter of the earthquake, the magnitude of the earthquake, and the geologic conditions underlying and surrounding the Refinery.

Ground shaking can be described in terms of acceleration, velocity, and displacement of the ground. A common measure of ground motion during an earthquake is the peak ground acceleration (PGA). The PGA for a given component of motion is the largest value of horizontal acceleration obtained from a seismograph. The PGA is a measure of the ground motion that varies with the location, and is dependent on the distance from the epicenter and the character of the underlying geology (e.g. hard bedrock, soft sediments, or artificial fills).

Earthquake intensity is often expressed using the Modified Mercalli (MM) scale, which is a subjective measure of the strength of an earthquake at a particular place as determined by its effects on persons, structures, and earth materials. Unlike measures of earthquake magnitude, the MM intensity scale is qualitative in nature (i.e., it is based on actual observed effects rather than measured values). MM intensity values for an earthquake at any one place can vary depending on its magnitude, the distance from its epicenter, and the type of geologic material. The MM values for intensity range from I (earthquake not felt) to XII (damage nearly total), and intensities ranging from IV to X could cause moderate to significant structural damage. The MM scale for earthquake intensity (MM Intensity Scale) is presented in Table 4.7-3, along with the related PGA values.[6]

[6] Peak ground accelerations, are commonly represented as a fraction of the acceleration of gravity (g), which is 980 centimeters per second squared. 1.0 g of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds.

TABLE 4.7-3
MODIFIED MERCALLI INTENSITY SCALE

Intensity Value	Intensity Description	Average Peak Ground Acceleration[a]
I	Not felt except by a very few persons under especially favorable circumstances.	< 0.0017 g
II	Felt only by a few persons at rest, especially on upper floors on buildings. Delicately suspended objects may swing.	0.0017-0.014 g
III	Felt noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly, vibration similar to a passing truck. Duration estimated.	0.0017-0.014 g
IV	During the day felt indoors by many, outdoors by few. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.	0.014–0.039g
V	Felt by nearly everyone, many awakened. Some dishes and windows broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles may be noticed. Pendulum clocks may stop.	0.035 – 0.092 g
VI	Felt by all, many frightened and run outdoors. Some heavy furniture moved; and fallen plaster or damaged chimneys. Damage slight.	0.092 – 0.18 g
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.	0.18 – 0.34 g
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.	0.34 – 0.65 g
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.	0.65 – 1.24 g
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from riverbanks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.	> 1.24 g
XI	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.	> 1.24 g
XII	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown upward into the air.	> 1.24 g

[a] Value is expressed as a fraction of the acceleration due to gravity (g). Gravity (g) is 9.8 meters per second squared. 1.0 g of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds.

SOURCE: ABAG, 2003

As discussed above, a major earthquake is likely to affect the Refinery within the next 30 years, and would produce strong ground-shaking effects throughout the region. Earthquakes on active or potentially active faults, depending on their magnitude and distance from the Refinery, could produce a range of ground-shaking intensities. Historically, earthquakes have caused strong ground shaking and damage in the San Francisco Bay Area; the most recent being the M 6.9 Loma Prieta earthquake in October 1989. The epicenter was approximately 50 miles southwest of the Refinery, but this earthquake is estimated to have caused light (MMI V) to moderate (MMI VI) shaking intensities at the Refinery (ABAG, 2010). The largest earthquake in Bay Area history was the San Francisco Earthquake of 1906, with an estimated M 7.9. This earthquake produced moderate (MMI VI) to very strong (MMI VIII) shaking intensities at the Refinery (ABAG, 2010).

The highest ground motions at the Refinery would be generated from an M 7.0 earthquake on the Concord-Green Valley fault. Given the relatively close distance to the fault (1.7 miles), the potential ground shaking is expected to be very strong to violent within the vicinity of the Refinery (ABAG, 2010). Additionally, moderate to very strong ground shaking (MMI VI to MMI VIII) would be generated at the Refinery from major earthquake along the Hayward fault or the Mt. Diablo Thrust. Moderate to violent (MM VI to MM IX) ground shaking would be expected during a major earthquake on one of the other regional faults.

One useful tool that seismologists use to describe ground-shaking hazard is a probabilistic seismic hazard assessment (PSHA). The PSHA for the State of California takes into consideration the range of possible earthquake sources (including such worse-case scenarios as described above) and estimates their characteristic magnitudes in order to generate a probability map for ground-shaking. The PSHA maps depict values of PGA that have a 10 percent probability of being exceeded in 50 years. This probability level allows engineers to design buildings for ground motions that have a 90 percent chance of not occurring in the next 50 years, making buildings and structures safer than if they were simply designed for the most likely events (Peterson et al., 1996). The PSHA indicates that at the Refinery, there is a 10 percent chance of exceeding a PGA value of 0.541 acceleration due to gravity (g) over the next 50 years (CGS, 2010). As indicated in Table 4.7-3, these PGAs could result in damage even in specially designed structures, causing partial collapse of some buildings.

Liquefaction and Lateral Spreading

Liquefaction is a phenomenon in which saturated cohesionless soils are subject to a temporary loss of shear strength because of pore pressure buildup under the cyclic shear stresses associated with earthquakes. A liquefaction susceptibility map prepared by the USGS, in cooperation with the California Geological Survey (CGS), indicates marsh deposits in the southeast corner of the tank farm area having moderate liquefaction susceptibility. This area is part of a narrow strip of land with moderate susceptibility that extends southwest from the ponds across the Refinery (ABAG, 2011; ENGEO, 2010). A small area of the Refinery immediately south of the ponds, which are adjacent to Interstate 680 (I-680), is designated as having very high liquefaction susceptibility (ABAG, 2011). The majority of soils in the Refinery are alluvium over bedrock with a low potential for liquefaction. Consequently, the remaining portions of the Refinery mapped as having very low susceptibility (USGS, 2006).

The regional hazard mapping is a generalized liquefaction susceptibility primarily based on the geologic age and general properties of the geologic units. The available test borings in the marsh deposits indicate that they consist mainly of stiff clays and silts, with minor interbedded layers of medium dense sand. The fine-grained marsh deposit soils would not be susceptible to liquefaction. The minor interbedded lenses of sand are potentially liquefiable. The fill deposits overlying the marsh soils are composed of compacted excavated rock and fine-grained soil and would not be susceptible to liquefaction (ENGEO, 2010).

Lateral spreading is a failure within weak soils, typically due to liquefaction, which causes the soil mass to move toward an open channel, or down a gentle slope. Based on the overall conditions at the tank farm site and limited occurrence of liquefiable soils, the risk of lateral spreading is anticipated to be low (ENGEO, 2010).

Other Secondary Earthquake Hazards

Secondary earthquake hazards at the Refinery include earthquake-induced land sliding, settlement, and liquefaction (discussed above). Strong ground motions that occur during earthquakes are capable of inducing landslides and related forms of ground failure. The rate of rock and soil movements can vary from a slow creep over many years to sudden mass movements. Settlement is the gradual downward movement of an engineered structure (such as a building) due to the compaction of unconsolidated material below the foundation. Settlement accelerated by earthquakes can result in vertical or horizontal separations of structures or portions of one structure; cracked foundations, roads, sidewalks, and walls; and (in severe situations) building collapse and bending or breaking of underground utility lines. The compacted fills and fine-grained marsh soils present at the Refinery would not be susceptible to settlement. Thin pockets of sand dispersed within the marsh soils could potentially experience settlement.

4.7.2.6 Regulatory Setting

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy.[7] In accordance with this Act, the state geologist established regulatory zones, called “earthquake fault zones,” around the surface traces of active faults and published maps showing these zones. Within these zones, buildings for human occupancy cannot be constructed across the surface trace of active faults. There is the potential for ground surface rupture along any of the branches. The Project would not be subject to this act because none of the project components would be constructed within an Alquist-Priolo Earthquake Fault Zone.

[7] In accordance with Title 14 of the California Code of Regulations, Section 3601(e), the act applies only to buildings that would be inhabited for more than 2,000 person-hours per year.

Clean Water Act – National Pollutant Discharge Elimination System (NPDES)

Shell is required to prepare a project specific Construction Stormwater Management Plan (CSMP) as part of its existing Stormwater Pollution Prevention Plan (SWPPP) under NPDES Permit CA 0005789 Order R2-2006-070. This CSMP would be prepared and incorporated into the Refinery's SWPPP. As required by the NPDES permit, the SWPPP would be updated as needed and submitted to the Regional Water Quality Control Board (RWQCB) for approval.

Seismic Hazard Mapping Act

The Seismic Hazard Mapping Act was passed in 1990 following the Loma Prieta earthquake to reduce threats to public health and safety and to minimize property damage caused by earthquakes. The Act directs the California Department of Conservation to identify and map areas prone to the earthquake hazards of liquefaction, earthquake-induced landslides, and amplified ground shaking. The Act requires site-specific geotechnical investigations to identify potential seismic hazards and formulate mitigation measures prior to permitting most developments designed for human occupancy within the Zones of Required Investigation. The Department of Conservation has not prepared a seismic hazard map for the Refinery.

California Building Code

The California Building Code (CBC) has been codified in the California Code of Regulations (CCR) as Title 24, Part 2, which is a portion of the California Building Standards Code. The most current version of the CBC is dated 2010. Under State law, all building standards must be centralized in Title 24 or they are not enforceable. The California Building Standards Commission is, by law, responsible for coordinating all building standards under Title 24. The purpose of the California Building Code is to provide minimum standards to safeguard the general public's health, safety, property, and welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all buildings and structures within its jurisdiction. The CBC is based on the 1997 Uniform Building Code (UBC), which is a model building code, published by the International Conference of Building Officials, and which has been widely adopted in the United States. The Refinery is located within Zone 4, which is one of the four seismic zones designated in the United States by the UBC. Zone 4 is expected to experience the greatest effects from earthquake ground shaking and therefore has the most stringent requirements for seismic design. The CBC also adds necessary California amendments that include significant building design criteria tailored for California earthquake conditions.

Contra Costa County General Plan

The Conservation and Safety Element of the Contra Costa County General Plan (2008) outlines the goals, policies, and programs in regards to geologic hazards. The following geologic and seismic hazard policies and implementation measures may be directly applicable to the Project:

> *Policy 10-4*: In areas prone to severe levels of damage from ground shaking (i.e., Zone IV on map 10-4 of the General Plan), where the risks to life and investments are sufficiently

high, geologic-seismic and soils studies shall be required as a precondition for authorizing public or private construction.

Policy 10-5: Staff review of application for development permits and other entitlements, and review of applications to other agencies that are referred to the County, shall include appropriate recommendations for seismic strengthening and detailing to meet the latest adopted seismic design criteria.

Policy 10-9: In areas susceptible to high damage from ground shaking (i.e., Zone IV on map 10-4 of the General Plan), geologic-seismic and soils studies shall be required prior to authorization of major land developments and significant structures (public or private).

Policy 10-10: Policies regarding liquefaction shall apply to other ground failures which might result from ground shaking, but which are not subject to such well-defined field and laboratory analysis.

Policy 10-20: Any structures permitted in areas of high liquefaction danger shall be sited, designed and constructed to minimize the dangers from damage due to earthquake-induced liquefaction.

Policy 10-21: Approvals to allow for the construction of public and private development projects in areas of high liquefaction potential shall be contingent upon geologic and engineering studies which define and delineate potentially hazardous geologic and/or soils conditions, recommend means of mitigating these adverse conditions, and on proper implementation of the mitigation measures.

Policy 10-27: Soil and geological reports shall be subject to the review and approval of the County Planning Geologist.

Implementation Measure 10-d: Through the environmental review process, require geologic, seismic, and/or soils studies as necessary to evaluate proposed development in areas subject to ground shaking, fault displacement, or liquefaction.

Contra Costa Environmental Health Division

Contra Costa Environmental Health Division requires a well permit to construct or destroy an environmental or geotechnical well or soil boring. This includes, but is not limited to, cone penetrometers, inclinometers, piezometers, extraction wells, recovery wells, monitoring wells, temporary wells, hydropunch soil borings, and soil borings drilled for geotechnical purposes (whether or not groundwater is encountered).Each well or boring would require a separate permit. Contra Costa County requires that any well work be performed by a licensed well contractor. Upon the setting of the well, Contra Costa Environmental Health would inspect the installation. After Contra Costa Environmental Health has approved the installation of a well, a Well Completion Report (DWR form 188) signed by the responsible geologist or well driller must be submitted. A boring log is required for borings, hydropunch sampling and cone penetrometer testing. Upon satisfactory inspection of work and approval of the reports, final approval of the wells/borings will be granted.

4.7.2.7 Project Baseline

Baseline conditions generally reflect the environmental setting. The Project area experienced light (MMI V) to moderate (MMI VI) shaking intensities during the Loma Prieta earthquake. The existing tank farm site is located on a slightly elevated area within the Refinery. The majority of Refinery site is characterized as having very low susceptibility to liquefaction. However a small portion of the Refinery has soils with high liquefaction susceptibility. The southeastern portion of the existing tank farm site is characterized as having moderate liquefaction susceptibility. There are no known landslide deposits at the Refinery. Additionally, the existing facilities have been subject to onsite soil conditions at the Project site where soils are slightly erodible; have expansive characteristics; and are moderately to highly corrosive.

4.7.3 Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts related to geology and soils if it would:

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

   1. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault. Refer to Division of Mines and Geology Special Publication 42;
   2. Strong seismic ground shaking;
   3. Seismic-related ground failure, including liquefaction;
   4. Landslides;

b) Result in substantial soil erosion or the loss of topsoil;

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on-or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property; or

e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste disposal systems where sewers are not available for the disposal of wastewater.

4.7.4 Discussion of No Geology and Soils Impacts

Review and comparison of the setting circumstances and Project characteristics with each of the five significance criteria stated above, clearly show that no impacts to geology and soils would result for criteria a) 1. and e). The following discusses the reasoning to support this conclusion:

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

1. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault. Refer to Division of Mines and Geology Special Publication 42.

The faults most susceptible to earthquake rupture are active faults, which are faults that have experienced surface displacement within the last 11,000 years. No active faults cross the Refinery; and the nearest active fault (i.e., the Concord-Green Valley fault) is at a distance of approximately 1.7 miles. Although seismic activity is not limited to active faults, ground rupture is typically associated with active faults. Since there are no known active faults crossing the Project site and it is not within a designated Alquist-Priolo Special Study Zone, the potential for fault rupture to affect the Project is considered low and no impacts would occur.

e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.

The Project would not include the development of septic tanks or alternative wastewater disposal systems. Treatment and discharge of wastewater would continue to occur through the Refinery's existing wastewater collection, treatment, and disposal system. There would be no impact.

4.7.5 Discussion of Impacts and Mitigation Measures

a) Would the Project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

2. Strong seismic ground shaking;

3. Seismic-related ground failure, including liquefaction;

4. Landslides?

Impact 4.7-1: Project facilities could be damaged by seismically induced ground shaking. (*Less than Significant with Mitigation*)

The Project site is located in a region that is likely to experience at least one major earthquake (i.e., M6.7 or higher) within the next 30 years. An earthquake of moderate to high magnitude generated within the San Francisco Bay Area could cause considerable ground shaking at the Project site. The site may experience different levels of ground shaking as a result of varying soil types and depth to bedrock. As discussed above in the setting, ground shaking could exceed PGA values of 0.541 g in the next 50 years. This range of values correspond to Modified Mercalli Shaking Intensity VIII (strong to very strong), which could cause considerable damage to older, poorly built structures, and slight damage to structures built according to modern building codes. Substantial cracks could appear in the ground, and the shaking could cause other secondary damaging effects, such as the failure of underground utilities. This level of ground shaking may possibly induce soil liquefaction and other secondary ground shaking effects, which are discussed

under Impact 4.7-2, below. Because the Project would potentially expose structures to damage from strong ground shaking and the operations in the Refinery could expose people to harm, this impact is considered potentially significant.

Several laws and policies impose stringent seismic safety requirements on the design and construction of new structures. In accordance with the CBC, project equipment would be designed, at minimum, to withstand the ground acceleration that has a 10 percent probability of being exceeded in 50 years.[8] With foundation and structural design in accordance with the current CBC standards, seismic shaking would not be expected to result in significant structural damage to the Project facilities. In addition, the County General Plan policies regarding mitigation of seismic and geologic hazards are applicable to the Project and would require Shell to reduce injuries and health risks resulting from the effects of earthquake ground shaking on structures, facilities, and utilities as well as conduct seismic hazards studies prior to development of any significant structures.

As described above in Section 4.7.2, *Setting*, the entire Refinery is likely to encounter risks from seismic ground shaking, which would not be significantly increased as a result of implementation of the Project. However, following current building codes, using accepted geotechnical evaluation techniques as well as standard, accepted engineering remedies can substantially reduce the potential for injury and damage, thereby exposing fewer people and less property to the effects of a major damaging earthquake. Appropriate grading and design, in accordance with the CBC requirements and local planning and building department requirements, would also be used to reduce the secondary effects of ground shaking on structures and infrastructure. Any fill materials would be appropriately compacted and engineered as directed by a California certified engineering geologist or geotechnical engineer. In the course of the final facility design, the Project engineering geologist or geotechnical engineer may provide additional foundation design recommendations based on the ground conditions at the Project site. These recommendations would become part of the Project specifications. Conformance to the current building code recommendations does not constitute a guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake. Consequently, a design-level, geotechnical investigation would be required to adequately characterize the potential for substantial adverse effects to people or structures as a result of strong seismic ground shaking. Implementation of Mitigation Measure 4.7-1 would further ensure that strong seismic ground shaking would have a less-than-significant impact on the Project.

Mitigation Measure 4.7-1: Shell shall comply with and implement all of the following measures designed to reduce potential substantial adverse effects resulting from strong seismic ground shaking:

(A) A California licensed geotechnical engineer or engineering geologist shall perform a comprehensive geotechnical investigation of all Project facilities based on adequate subsurface exploration, laboratory testing of selected samples, and engineering/geologic analysis of the data gathered. The information shall be compiled and presented as a geotechnical report that provides an evaluation of

[8] CGS probability-based ground accelerations for the region encompassing the Refinery are estimated to reach or exceed 0.541 g (CGS, 2010).

potential seismic and geologic hazards, and provides 2010 CBC seismic design parameters, along with providing specific standards and criteria for site grading, drainage, berm, and foundation design.

(B) The Project geotechnical engineer or engineering geologist shall prepare an Original Geologic Map of the Project site and adjacent areas based on subsurface exploration, field geologic mapping and interpretation of historic aerial photographs. The map shall show the details of site geologic conditions, including lithologic units (i.e., bedrock units/stratigraphy), geologic structure, and the distribution of surficial deposits (e.g., colluvium, landslides, and artificial fill).

(C) The information shall be compiled and presented as a geotechnical report that provides an evaluation of potential seismic hazards, including secondary seismic ground failures such as liquefaction and collapse, lateral spread and earthquake induced settlement, and other geologic hazards, such as landslides, expansive and corrosive soils, and provides 2010 CBC seismic design parameters, along with specific standards and criteria for site grading, drainage, and foundation design.

(D) Where landslides are confirmed within or immediately adjacent to planned improvements, specific geotechnical design measures shall be used to achieve long-term stability. These shall include, but will not necessarily be limited to, corrective grading of landslides or colluvial wedges that present the potential to effect improvements. Additionally, standard practices such as minimizing the amount of grading required in areas that are deemed to be stable in their existing condition; installing adequate drainage; avoiding grading activities and excavations during and immediately following periods of heavy rainfall; geotechnical monitoring of slopes for stability during construction; minimizing the gradient of engineered slope; following natural topography; and, salvaging topsoil for use during final grading to facilitate revegetation, shall be implemented during construction.

(E) For construction requiring excavations, such as foundations, appropriate support and protection measures shall be implemented to maintain the stability of excavations and to protect construction worker safety. Where excavations are adjacent to existing structures, utilities, or other features that may be adversely affected by potential ground movements, bracing, underpinning, or other methods of support for the affected facilities shall be implemented.

(F) Recommendations in the approved geotechnical report shall be incorporated into the design and construction specifications and shall be implemented during build-out of the Project.

(G) The Project geotechnical engineer shall provide observation and testing services during grading and foundation-related work, and shall submit a grading completion report to the County prior to requesting the final inspection. This report shall provide full documentation of the geotechnical monitoring services provided during construction, including the results of American Society for Testing and Materials (ASTM) testing. The Final Grading Report shall also certify compliance of the as-built Project with the recommendations in the approved geotechnical report.

Significance after Mitigation: Less than Significant.

Impact 4.7-2: The Project could be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site lateral spreading, subsidence, liquefaction, or collapse. (*Less than Significant with Mitigation*)

Portions of the Refinery may be subject to secondary ground shaking effects that occur primarily as a result of saturated soils with poor strength characteristics. These effects include liquefaction and secondary ground failures associated with liquefaction, including lateral spreading and earthquake-induced settlement. As indicated above in the discussion of the environmental setting, there is very low potential for earthquake-induced settlement given the compacted fills and fine-grained marsh soils present at the Refinery.

The soils most susceptible to liquefaction are clean, loose, uniformly graded, saturated, sands and silts. The majority of soils at the Refinery are alluvium over bedrock with a low potential for liquefaction. A small area immediately south of the ponds, which are adjacent to I-680 is designated as having very high liquefaction susceptibility (ABAG, 2011). Additionally a narrow strip extending southwest from the ponds across the Refinery is mapped as having moderate liquefaction susceptibility. While the southeastern portion of the tank farm site is located in an area designated as having very high liquefaction susceptibility, no structures are proposed in the areas designated as having very high liquefaction susceptibility (ABAG, 2011; ENGEO, 2010). Additionally, test borings at the project indicate that the liquefiable marsh deposits are overlain by fill deposits composed of compacted excavated rock and fine-grained soil, which would not be susceptible to liquefaction. However, there is slight potential for one or more tanks to be damaged from seismically-induced liquefaction resulting in a potentially significant impact.

As mentioned in the discussion of Impact 4.7-1 above, a design-level geotechnical investigation would be performed for the Project. The investigation would include an analysis of the underlying soil properties including the potential for instability, subsidence, liquefaction, or collapse. The analyses would be conducted in accordance with current engineering standards which can effectively mitigate unstable soils. The investigation would determine final design parameters for the earthwork, foundations, and pipelines. The investigations would be reviewed and approved by a California registered geotechnical engineer. As a result, the significant impact would be minimized to less than significant.

Mitigation: Implement Mitigation Measure 4.7-1.

Significance after Mitigation: Less than Significant.

Impact 4.7-3: Project implementation would expose people or structures to potential substantial adverse effects as a result of landslides. (*Less than Significant with Mitigation*)

Landslides have been identified and mapped by the United States Geological Survey (USGS) as part of Bay Area-wide studies of debris flows and landslides (USGS, 1997b). As indicated above in the discussion of the Project's setting, there are small, localized areas with slopes that exceed

26 percent in the western portion of the Refinery and in the areas adjacent to Vine Hill, providing evidence that this area may be susceptible to earthflows during heavy winter rains (USGS, 1997b) as well as earthquake-induced landslides. However, the areas of proposed construction show no history of landslides and are relatively flat with the exception of a shallow slope on the east site of the tank farm.

Activities proposed at the laydown areas, such as grading and equipment storage, would not significantly increase disturbance in the area or create unstable conditions or landslide risk. Given the mostly flat topography of the tank farm area, grading and excavations that would be associated with the Project would not create unstable conditions or landslide risks in most areas. However, a recent geotechnical assessment conducted for the Project (ENGEO, 2010) indicates that there is a potential for slope deformation to occur in the eastern portion of the tank farm site during a seismic event and recommends that further geotechnical investigations be conducted to more accurately characterize onsite conditions and to provide design level recommendations to reduce landslide-related risks. Potential risks associated with landslides could result in a significant impact. Implementation of recommendations included in the design-level geotechnical investigation as stated in Mitigation Measure 4.7-1 would reduce potential impacts resulting from landslides to a less-than-significant level.

Mitigation: Implement Mitigation Measure 4.7-1.

Significance after Mitigation: Less than Significant.

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b) Result in substantial soil erosion or the loss of topsoil.

Impact 4.7-4: Project implementation could result in erosion or loss of top soil. *(Less than Significant)*

The preliminary stages of construction, especially site grading, excavation, and raising the berms would leave loose soil exposed to the erosive forces of rainfall and high winds. Erosion and loss of topsoil could be problematic in areas underlain by soils with a high runoff and erosion potential. Intense rain or wind events in such areas could result in substantial soil erosion and increased surface water runoff. This could cause entrainment of sediment in runoff and sedimentation into adjacent waterways affecting water quality (see Section 4.10, *Hydrology and Water Quality*). Erosion of top soil is not a concern for the Project given that ground disturbing activities would occur in an area that is highly disturbed and classified as Urban Land (NRCS, 2010). However, soil erosion during construction could still pose a threat to water quality.

As discussed Chapter 3, *Project Description*, and in more detail in Section 4.10, *Hydrology and Water Quality*, Shell would be required to prepare a project specific Construction Stormwater Management Plan (CSMP) as part of its existing SWPPP under NPDES Permit CA 0005789 Order R2-2006-070. This CSMP would be prepared and incorporated into the Refinery's SWPPP. As required by the NPDES permit, the SWPPP would be updated as needed and submitted to the

RWQCB for approval. The SWPPP (and associated CSMP) would be prepared and implemented prior to commencing construction, and effectiveness would be ensured through the sampling, monitoring, reporting, and record keeping requirements. Therefore, impacts related to substantial or accelerated soil erosion during and following construction of the Project would be less than significant.

Mitigation: None required.

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c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on-or off-site landslide, lateral spreading, subsidence, liquefaction or collapse

Impact 4.7-5: The Project could result in on-or off-site landslide, lateral spreading, subsidence, liquefaction or collapse. (*Less than Significant with Mitigation*)

Potential impacts relating to lateral spreading, liquefaction, and/or collapse as a result of implementing the Project are addressed under Impact 4.7-2, above, and have been found to be less than significant with mitigation. Potential impacts relating to increased earthquake-induced landslide hazards or static landslide hazards on- or off-site as a result of implementation of the Project are addressed under Impact 4.7-3 above, and have been found to be less than significant with mitigation. As discussed in Impact 4.7-2, the Project is located in an area characterized by shallow alluvium overlying bedrock with some marsh deposits. Subsidence occurs in alluvial soils, such as those located at the Refinery, as a result of the extraction of large volumes of groundwater or oil. While dewatering could occur during construction, the Project would not include any long-term groundwater use; as such, the Project would have a less-than-significant impact from subsidence conditions at the Refinery.

Mitigation: Implement Mitigation Measure 4.7-1.

Significance after Mitigation: Less than Significant.

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d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property

Impact 4.7-6: Project implementation could occur on expansive soils, creating risks to life and property. (*Less than Significant*)

Portions of the Project site contain soils with moderate to high expansion potential. Expansive soils may cause structural damage over a long period of time, usually as the result of inadequate soil and foundation engineering or placement of structures directly on expansive soils. The Refinery may also contain soils that possess corrosive properties. If improperly designed or installed, foundations constructed in areas with expansive or corrosive soils could be damaged over a long period of time.

However, the soil conditions present in the Refinery are not particularly unique in comparison to other areas nor do they represent a significant impediment to the Project.

The Project would be required to adhere to all applicable standards of the California Building Standards Code (CCR Title 24) and would employ standard engineering and building practices common to construction projects throughout California. Structural foundations and utilities would be designed to accommodate expected soil movements or would be placed within imported sand or gravel or other backfill material. Depending on the nature of the facilities and the characteristics of the soils at each specific work site, the standards and recommendations could require a variety of mitigation approaches, including specialized foundation design; over-excavation and placement of clean, non-expansive engineered fill prior to construction; and/or other measures to reduce concerns related to expansive and corrosive soils, consistent with the prevailing engineering standard of care. Because soil conditions are not unique or particularly hazardous, and methods to address expansive and corrosive soils are common engineering practices, this impact is considered less than significant.

Mitigation: None required.

4.8 Greenhouse Gas Emissions

4.8.1 Introduction

This section analyzes the Project's relationship to greenhouse gas (GHG) emissions. Discussed are the physical and regulatory setting; the baseline for determining environmental impacts; the criteria used for determining the significance of environmental impacts; potential impacts associated with construction, operation, and maintenance of the Project; and mitigation measures to reduce or avoid environmental impacts determined to be potentially significant.

4.8.2 Setting

4.8.2.1 Background on Greenhouse Gases and Climate Change

Gases that trap heat in the atmosphere are called GHGs. What GHGs have in common is that they allow sunlight to enter the atmosphere, but trap a portion of the outward-bound infrared radiation, which warms the air. The process is similar to the effect greenhouses have in raising the internal temperature, hence the name GHGs. Both natural processes and human activities emit GHGs. The accumulation of GHGs in the atmosphere regulates the Earth's temperature; however, emissions from human activities such as fossil fuel-based electricity production and the use of motor vehicles have elevated the concentration of GHGs in the atmosphere. This accumulation of GHGs has contributed to an increase in the temperature of the Earth's atmosphere and has contributed to global climate change. Global climate change is a change in the average weather on earth that can be measured by wind patterns, storms, precipitation, and temperature. Although there is disagreement as to the rate of global climate change and the extent of the impacts attributable to human activities, most in the scientific community agree that there is a direct link between increased emissions of GHGs and long term global temperature increases.

The principal GHGs are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs). CO_2 is the most common reference gas for climate change. To account for the warming potential of GHGs, GHG emissions are often quantified and reported as CO_2 equivalents (CO_2e). For example, SF_6 is a GHG commonly used in the utility industry as an insulating gas in circuit breakers and other electronic equipment. SF_6, while comprising a small fraction of the total GHGs emitted annually world-wide, is a much more potent GHG with 23,900 times the global warming potential as CO_2. Large emission sources are reported in million metric tons of CO_2e.[1]

Some of the potential effects in California of global warming may include loss in snow pack, sea level rise, more extreme heat days per year, more high ozone days, more large forest fires, and more drought years (CARB, 2009). Globally, climate change has the potential to impact numerous environmental resources through potential, though uncertain, impacts related to future air temperatures and precipitation patterns. The projected effects of global warming on weather and climate are likely to vary regionally, but are expected to include the following direct effects (IPCC, 2001):

[1] A metric ton is 1,000 kilograms; it is equal to approximately 1.1 U.S. tons and approximately 2,204.6 pounds.

- Higher maximum temperatures and more hot days over nearly all land areas;
- Higher minimum temperatures, fewer cold days and frost days over nearly all land areas;
- Reduced diurnal temperature range over most land areas;
- Increase of heat index over land areas; and
- More intense precipitation events.

Also, there are many secondary effects that are projected to result from global warming, including global rise in sea level, impacts to agriculture, changes in disease vectors, and changes in habitat and biodiversity. While the possible outcomes and the feedback mechanisms involved are not fully understood and much research remains to be done, the potential for substantial environmental, social, and economic consequences over the long term may be great.

The California Air Resources Board (CARB) estimated that, in 2008, California produced 478 million gross metric tons of CO_2e emissions (CARB, 2010). CARB found that transportation was the source of 37 percent of the State's GHG emissions; followed by electricity generation at 24 percent, and industrial sources at 19 percent.

4.8.2.2 Regulatory Setting

Federal

The federal Clean Air Act (CAA) requires the U.S. Environmental Protection Agency (USEPA) to define national standards to protect U.S. public health and welfare. The federal CAA does not specifically regulate GHG emissions; however, the U.S. Supreme Court has determined that GHGs are pollutants that can be regulated under the federal CAA. There are currently no federal regulations that set ambient air quality standards for GHGs. However, due to a recent set of settlements the USEPA and other parties are working on promulgating GHG regulations for specific industries (fossil fueled power plants and refineries). These regulations will affect the new source review process under the CAA. The schedule for implementation of the first set of regulations is for the USEPA to implement proposed regulations by July 26, 2011 and final regulation by May 26, 2012 for fossil fueled power plants; while the schedule for refineries is for proposed regulations by December 15, 2011 and final regulations by November 15, 2012 (USEPA, 2011).

State of California

Executive Order S-3-05

In 2005, in recognition of California's vulnerability to the effects of climate change, Governor Schwarzenegger established Executive Order S-3-05, which set forth a series of target dates by which statewide emissions of GHGs would be progressively reduced, as follows:

- By 2010, reduce GHG emissions to 2000 levels;
- By 2020, reduce GHG emissions to 1990 levels; and
- By 2050, reduce GHG emissions to 80 percent below 1990 levels.

Assembly Bill 32 – California Global Warming Solutions Act

California Assembly Bill 32 (AB 32), the Global Warming Solutions Act of 2006, was enacted as legislation in 2006 and requires CARB to establish a statewide GHG emissions cap for 2020 based on 1990 emission levels. AB 32 required CARB to adopt regulations by January 1, 2008 that identify and require selected sectors or categories of emitters of GHGs to report and verify their statewide GHG emissions, and CARB is authorized to enforce compliance with the program. Under AB 32, CARB was also required to adopt, by January 1, 2008, a statewide GHG emissions limit equivalent to the statewide GHG emissions levels in 1990, which must be achieved by 2020. CARB established this limit, in December 2007, at 427 million metric tons of CO_2e. This is approximately 30 percent below forecasted "business-as-usual" emissions of 596 million metric tons of CO_2e, and about 10 percent below average annual GHG emissions during the period of 2002 through 2004 (CARB, 2009).

By January 1, 2011, CARB was required to adopt rules and regulations (which shall become operative January 1, 2012), to achieve the maximum technologically feasible and cost-effective GHG emission reductions. AB 32 permits the use of market-based compliance mechanisms to achieve those reductions. AB 32 also requires CARB to monitor compliance with and enforce any rule, regulation, order, emission limitation, emissions reduction measure, or market-based compliance mechanism that it adopts.

In June 2007, CARB directed staff to pursue 37 early actions for reducing GHG emissions under AB 32. The broad spectrum of strategies to be developed, including a Low Carbon Fuel Standard, regulations for refrigerants with high global warming potentials, guidance and protocols for local governments to facilitate GHG reductions, and green ports, reflects that the serious threat of climate change requires action as soon as possible.

In addition to approving the 37 GHG reduction strategies, CARB directed staff to further evaluate early action recommendations made at the June 2007 meeting, and to report back to CARB within six months. The general sentiment of CARB suggested a desire to try to pursue greater GHG emissions reductions in California in the near-term. Since the June 2007 CARB hearing, CARB staff has evaluated all 48 recommendations submitted by stakeholders and several internally-generated staff ideas and published the *Expanded List of Early Action Measures To Reduce Greenhouse Gas Emissions In California Recommended For Board Consideration* in September 2007 (CARB, 2007). CARB adopted nine Early Action Measures for implementation, including Ship Electrification at Ports, Reduction of High Global-Warming-Potential Gases in Consumer Products, Heavy-Duty Vehicle Greenhouse Gas Emission Reduction (Aerodynamic Efficiency), Reduction of Perfluorocarbons from Semiconductor Manufacturing, Improved Landfill Gas Capture, Reduction of Hydroflourocarbon-134a from Do-It-Yourself Motor Vehicle Servicing, Sulfur Hexafluoride Reductions from the Non-Electric Sector, a Tire Inflation Program, and a Low Carbon Fuel Standard.

Climate Change Scoping Plan

In December 2008, CARB approved the AB 32 Scoping Plan outlining the State's strategy to achieve the 2020 GHG emissions limit (CARB, 2009). This Scoping Plan, developed by CARB in coordination with the Climate Action Team (CAT), proposes a comprehensive set of actions designed to reduce overall GHG emissions in California, improve the environment, reduce dependence

on oil, diversify California's energy sources, save energy, create new jobs, and enhance public health. The measures in the Scoping Plan approved by the Board are scheduled to be in place by 2012.

The Scoping Plan expands the list of the nine Early Action Measures into a list of 39 Recommended Actions contained in Appendices C and E of the Scoping Plan. These measures are presented in Table 4.8-1.

CEQA Guidelines Revisions

In 2007, the State Legislature passed SB97, which required amendment of the State CEQA Guidelines to incorporate analysis of, and mitigation for, GHG emissions from projects subject to CEQA. The California Natural Resources Agency adopted these amendments on December 30, 2009, and they took effect March 18, 2010, after review by the Office of Administrative Law and filing with the Secretary of State for inclusion in the California Code of Regulations.

The Guidelines revisions include a new section (Sec. 15064.4) that specifically addresses the potential significance of GHG emissions. Section 15064.4 calls for a "good-faith effort" to "describe, calculate or estimate" GHG emissions; Section 15064.4 further states that the analysis of the significance of any GHG impacts should include consideration of the extent to which the project would increase or reduce GHG emissions; exceed a locally applicable threshold of significance; and comply with "regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions." The new Guidelines also state that a project may be found to have a less-than-significant impact on GHG emissions if it complies with an adopted plan that includes specific measures to sufficiently reduce GHG emissions (Sec. 15064(h)(3)). Importantly, however, the Guidelines do not require or recommend a specific analytical methodology or provide quantitative criteria for determining the significance of GHG emissions.

Bay Area Air Quality Management District 2010 CAP

On September 15, 2010, the Bay Area Air Quality Management District (BAAQMD) Board of Directors adopted the final *Bay Area 2010 Clean Air Plan* (2010 CAP). The 2010 CAP control strategies include revised, updated, and new measures in the three traditional control measure categories, including stationary sources measures, mobile source measures, and transportation control measures. In addition, the Bay Area 2010 CAP indentifies two new categories of control measures, including land use and local impact measures and energy and climate measures (BAAQMD, 2010a).

Contra Costa County General Plan

The Contra Costa County General Plan Conservation Element contains an air quality resources discussion (Section 8.14) that identifies general goals and policies designed to address air pollution. The goals and policies tend to focus on improvements to the transportation system, reducing long distance commuting, encouraging and supporting non-auto transportation, and reducing future land use conflicts related to air pollution (Contra Costa County, 2010). Although Section 8.14 appears to be geared toward criteria pollutants, such as ozone and particulate matter, implementation of

TABLE 4.8-1
RECOMMENDED ACTIONS OF CLIMATE CHANGE SCOPING PLAN

ID #	Sector	Strategy Name
T-1	Transportation	Pavley I and II – Light-Duty Vehicle GHG Standards
T-2	Transportation	Low Carbon Fuel Standard (Discrete Earl Action)
T-3	Transportation	Regional Transportation-Related GHG Targets
T-4	Transportation	Vehicle Efficiency Measures
T-5	Transportation	Ship Electrification at Ports (Discrete Early Action)
T-6	Transportation	Goods-movement Efficiency Measures
T-7	Transportation	Heavy Duty Vehicle Greenhouse Has Emission Reduction Measure – Aerodynamic Efficiency (Discrete Early Action)
T-8	Transportation	Medium and Heavy-Duty Vehicle Hybridization
T-9	Transportation	High Speed Rail
E-1	Electricity and Natural Gas	Increased Utility Energy efficiency programs ; More stringent Building and Appliance Standards
E-2	Electricity and Natural Gas	Increase Combined Heat and Power Use by 30,000 GWh
E-3	Electricity and Natural Gas	Renewables Portfolio Standard
E-4	Electricity and Natural Gas	Million Solar Roofs
CR-1	Electricity and Natural Gas	Energy Efficiency
CR-2	Electricity and Natural Gas	Solar Water Heating
GB-1	Green Buildings	Green Buildings
W-1	Water	Water Use Efficiency
W-2	Water	Water Recycling
W-3	Water	Water System Energy Efficiency
W-4	Water	Reuse Urban Runoff
W-5	Water	Increase Renewable Energy Production
W-6	Water	Public Goods Charge (Water)
I-1	Industry	Energy Efficiency and Co-benefits Audits for Large Industrial Sources
I-2	Industry	Oil and Gas Extraction GHG Emission Reduction
I-3	Industry	GHG Leak Reduction from Oil and Gas Transmission
I-4	Industry	Refinery Flare Recovery Process Improvements
I-5	Industry	Removal of Methane Exemption from Existing Refinery Regulations
RW-1	Recycling and Waste Management	Landfill Methane Control (Discrete Early Action)
RW-2	Recycling and Waste Management	Additional Reductions in Landfill Methane – Capture Improvements
RW-3	Recycling and Waste Management	High Recycling/Zero Waste
F-1	Forestry	Sustainable Forest Target
H-1	High Global Warming Potential Gases	Motor Vehicle Air Conditioning Systems (Discrete Early Action)
H-2	High Global Warming Potential Gases	SF_6 Limits in Non-Utility and Non-Semiconductor Applications (Discrete Early Action)
H-3	High Global Warming Potential Gases	Reduction in Perfluorocarbons in Semiconductor Manufacturing (Discrete Early Action)
H-4	High Global Warming Potential Gases	Limit High GWP Use in Consumer Products (Discrete Early Action, Adopted June 2008)
H-5	High Global Warming Potential Gases	High GWP Reductions from Mobile Sources
H-6	High Global Warming Potential Gases	High GWP Reductions from Stationary Sources
H-7	High Global Warming Potential Gases	Mitigation Fee on High GWP Gases
A-1	Agriculture	Methane Capture at Large Dairies

SOURCE: CARB, 2009.

the stated goals and policies also benefit efforts to reduce GHG emissions. The Project would not conflict with the goals or policies identified in the Contra Costa County General Plan Conservation Element.

Contra Costa County Climate Change Working Group

In May 2005, the Board of Supervisors convened department heads in a Climate Change Working Group (CCWG) to identify existing County activities and policies that could potentially reduce GHG emissions. The CCWG is comprised of the Agricultural Commissioner, the Deputy Director of Building Inspection, and the Directors of Conservation and Development, General Services, Health Services, and Public Works. In November 2005, the CCWG presented a climate protection report to the Board of Supervisors, which included a list of existing and potential GHG reduction measures. To quantify Contra Costa County's current GHG emissions and to evaluate the impact of these GHG reduction measures, the Board of Supervisors approved a resolution in February 2007 to join Local Governments for Sustainability (formerly known as the International Council for Local Environmental Initiatives (ICLEI)) and to conduct a GHG emissions inventory of Contra Costa County's countywide and municipal emissions. Upon completion of the inventory and associated report, the Board of Supervisors approved a resolution in October 2007, to complete a climate action plan for the County's municipal facilities and operations, funded by a grant from the BAAQMD (Contra Costa County, 2008). In December 2008, the Contra Costa County Municipal Climate Action Plan was adopted; however, the plan is geared toward the County's municipal operations and is not directly applicable to the Project.

4.8.2.3 Project Baseline

Under CEQA, the project baseline is normally defined as the physical conditions of the environment as it exists at the time of publication of the Notice of Preparation of the project EIR. The Notice of Preparation for the Project was issued in February 2010. For a refinery, emissions often must be averaged over a multi-year period, such as a three-year average, to capture a representative period of refinery operations. This is because refineries undergo lengthy periodic shutdowns for scheduled maintenance that can under-represent emissions for the year when the maintenance shutdown occurs. In addition, market forces can also cause refineries to vary their capacity (up or down). These factors cause refinery emissions to fluctuate up and down between years and so a longer baseline period is needed to account for these cycles.

In consideration of these factors affecting refinery operations, Shell used data from 2007 to 2009 to arrive at a baseline that best represents typical operations and emissions that are associated with the Refinery. In 2009 and part of 2008, the Refinery experienced artificially low operations due to an unusual number of turnarounds (maintenance projects) and the extreme downturn in the economy. Therefore, an average of emissions over the three-year period was used to be more representative of typical operations. In addition, the use of a three-year baseline is consistent with BAAQMD permit application methodology.

Estimated baseline GHG emissions for the Project are presented in Table 4.8-2. For details of data, calculations, and assumptions used to determine baseline emissions associated with the Project, refer to the *Shell Crude Tank Replacement Project, Air Quality/Greenhouse Gas Emissions/Public Health Assessment* (ERM, 2011), which can be obtained from the County for review. In the following subsections, baseline emissions are compared to proposed operating emissions for each Project component.

TABLE 4.8-2
ANNUAL PROJECT BASELINE GHG EMISSIONS

Source	CO_2e (metric tons per year)
Marine Terminal Operations -- Crude Oil Shipping	10,817
Indirect Emissions - Storage Tank Electric Mixers	299
Total	**11,116**

SOURCE: ERM, 2011.

4.8.3 Significance Criteria

Based on CEQA Guidelines Sections 15064.4 and 15064.7(c), as well as Appendix G, a project would cause adverse impacts associated with GHG emissions if it would:

a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment; or

b) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

Approach to Analysis

Emission estimates for the Project presented in this section were prepared by Environmental Resource Management (ERM) and independently reviewed by the County's consultant, Environmental Science Associates (ESA). For details of data, calculations, and assumptions used to determine Project-related emissions for crude oil storage tanks and marine terminal operations, refer to the *Shell Crude Tank Replacement Project, Air Quality/Greenhouse Gas Emissions/Public Health Assessment* (ERM, 2011), which can be obtained from the County for review.

The BAAQMD's *CEQA Air Quality Guidelines* identify quantitative operations-related thresholds of significance that can be applied to the significance criteria listed above (BAAQMD, 2010b). The guidance specifies a significance threshold of 10,000 metric tons per year of CO_2e for projects involving stationary sources and 1,100 metric tons per year of CO_2e for other types of projects. The BAAQMD recommends that the stationary source threshold be used for land use projects that would accommodate processes and equipment that would emit GHG emissions and would require a BAAQMD permit. The Project would emit GHG emissions and require a BAAQMD permit for new Project-related equipment and activities. Therefore, Project annual operational GHG

emissions would be considered to result in a significant impact on the environment if the net emissions would be more than 10,000 metric tons CO_2e per year.

The BAAQMD Guidelines do not identify an approach to assessing the significance of construction-related GHG emissions. However, for a conservative analysis the estimated maximum annual construction emissions of the Project are compared to the BAAQMD's most conservative significance threshold, which is 1,100 metric tons CO_2e per year for projects that are not stationary sources.

There is no qualified climate action plan for Contra Costa County that would be applicable to the Project. However, the Project's potential to conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHG is assessed by examining any potential conflicts with the GHG reduction measures related to implementation of AB 32, including the potential for the Project to conflict with the 39 Recommended Actions identified by CARB in its Climate Change Scoping Plan, and any potential conflicts related to implementation of measures identified in the 2010 CAP.

4.8.4 Discussion of No Impacts

As discussed in Section 4.8.5, analysis of the baseline and Project conditions relative to the significance criteria show that the Project would have impacts with respect to both of the above significance criteria.

4.8.5 Discussion of Impacts and Mitigation Measures

a) Would the Project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

Impact 4.8-1: Construction of the Project would result in emissions of greenhouse gases that could contribute to global climate change. (*Less than Significant*)

Construction activities at the Project site would be associated with demolition of existing tanks, construction of replacement tanks, tank refurbishing, and site grading. Construction of the Project would occur over a period of approximately 36 months. It is estimated that several pieces of off road construction equipment, including dozers, cranes, forklifts, graders, tractors, water trucks, compactors, etc., would be required between one and eight hours per day, depending on the specific equipment type and construction activity, to construct the Project.

In addition to the off-road equipment, on-road truck trips would be required to deliver materials and equipment to the construction sites as well as to transport workers to and from the construction sites. It is estimated that an average of approximately 100 round trips per day, including truck trips and commuting worker trips, would be required during the construction period. For the purpose of estimating annual construction emissions, construction activities have been identified for the following two worst-case construction scenarios:

- Scenario 1: Simultaneously demolishing one tank, constructing one tank, retrofitting the roof on two tanks, and constructing an energy efficiency project; or

- Scenario 2: Simultaneously grading the site and constructing two tanks.

The BAAQMD CEQA Guidelines do not have thresholds of significance for GHG emissions during construction. However, the guidance does specify a threshold of 10,000 metric tons per year of CO_2e for projects involving stationary sources and 1,100 metric tons per year of CO_2e for other types of projects. Annual estimates of Project construction GHG emissions listed in Table 4.8-3 are below both of these thresholds. Considering the estimated GHG construction emissions are short-term emissions and are below the thresholds for long-term activities, the impact associated with GHG emissions generated during construction are considered to be less than significant. In addition, elements of the basic mitigation measures (e.g., reduce idling and maintain equipment) for the criteria pollutants would also minimize GHG emissions.

TABLE 4.8-3
PROJECT CONSTRUCTION GHG EMISSIONS

Construction Scenario	GHG Emissions (metric tons/year)
Scenario 1: Simultaneously demolishing one tank, constructing one tank, retrofitting two tanks, and energy efficiency project	603
Scenario 2: Simultaneously site grading and constructing two tanks	969

NOTES: Annual emissions conservatively assume GHG is emitted at the peak daily rate for 22 days per month or 264 days per year. This table lists the emissions of CO_2 and not total CO_2e. However, the other GHG emissions from equipment exhaust that would contribute to the total CO_2e would be primarily CH_4 and N_2O, which are emitted in quantities much less than CO_2 and would result in a negligible component of total CO_2e.

SOURCE: ERM, 2011.

Mitigation: None required.

Impact 4.8-2: Project operations would result in emissions of greenhouse gases that could contribute to global climate change. (*Less than Significant*)

Crude Oil Shipping Emissions

Implementation of the Project would result in an increase in emissions associated with the crude oil storage tanks as well as from the increased vessel shipping activity. Under the Project, crude oil shipments would be expected to increase at the marine terminal from 30 crude oil vessels per year (the average during the three-year baseline period) to a projected 87 crude oil vessels per year. Crude oil shipping traffic and hoteling at the marine terminal generates emissions of GHGs. Emissions were calculated for the three-year baseline period and for conditions with the Project. Table 4.8-4 summarizes the net increase in crude oil shipping-related GHG emissions that would result under the Project. The total CO_2e emissions were derived by adding CH_4 emissions, multiplied by 21, and N_2O emissions, multiplied by 310, to account for the Global Warming Potential (GWP) of these compounds.

TABLE 4.8-4
PROJECT CRUDE OIL SHIPPING GHG NET EMISSIONS

GHG	Baseline	Metric Tons per Year With Project	Net Increase
CO_2	10,707	27,723	17,016
CH_4[a]	0.8	0.5	-0.3
N_2O	0.3	0.4	0.1
Total CO_2e	**10,817**	**27,858**	**17,041**

[a] Estimated CH_4 emissions are lower under the Project compared to baseline conditions because under baseline conditions it is assumed that boilers are fired on residual fuel oil and under the Project it is assumed that boilers would be fired by diesel, which has a much lower CH_4 emission rate compared to residual fuel oil.

SOURCE: ERM, 2011.

Tank-Related Emissions

Energy in the form of electricity and/or steam is used to provide power for transfer pumps and for heating elements associated with moving and storing crude oil at the Refinery. The Project would result in indirect GHG emission increases associated with the increased electricity demand and steam demand of the proposed tanks.

Electricity is used to power in-tank mixers located at the base of the crude oil storage tanks. The electric in-tank mixers are used to maintain a homogenous mixture prior to pumping the crude oil to the mix tank for blending. The new crude oil storage tanks would be constructed with new electric in-tank mixers with larger horsepower ratings. Table 4.8-5 presents a summary of baseline and Project electricity usage and the resulting GHG emission increases that would be associated with in-tank tank mixers.

TABLE 4.8-5
ELECTRICITY USE AND NET INDIRECT GHG EMISSIONS FOR IN-TANK ELECTRIC MIXERS

Period	Number of Mixers	Total Electrical Demand Capacity Factor (0.6) (MW-hr)	CO_2e (metric tons per year)
Baseline	7	1,253	299
With Project	12	3,270	779
Net Increase	5	2,017	480

SOURCE: ERM, 2011.

In addition to the new in-tank mixers, three electric transfer pumps would be installed that would replace existing smaller pumps. The amount of energy required for pumping depends on the amount of crude oil transferred by the pumps. However, since the overall amount of crude oil transferred within the Refinery and subsequently to the mix tank is unchanged, there would be no net increase in electricity required from crude oil pump transfers. As the amount of crude oil received via the wharf increases, and the associated pumping of crude oil from the marine

terminal to the mix tank increases, there would be a corresponding drop in the volume of crude oil pumped to the mix tank from the tanks that store San Joaquin Valley crude oil from the pipeline. Therefore, there would be no net change in electrical demand, or associated indirect emissions, due to the installation of the three new transfer pumps.

To provide additional heating, new heat exchangers would be installed to support the proposed new tanks. An additional set of two heat circulation pumps would be installed to circulate crude oil between the storage tank and the heat exchanger. There would also be seven new pumps installed to process wastewater and for tank dewatering. Table 4.8-6 presents a summary of Project electricity usage and resulting GHG emission increases that would be associated with the net increase in pump usage.

TABLE 4.8-6
ELECTRICITY USE AND NET INDIRECT GHG EMISSIONS FOR ELECTRIC PUMPS

Number of Pumps	Total Electrical Demand Usage Factor (0.6) (MW-hr)	CO_2e (metric tons per year)
9	1,483	353

SOURCE: ERM, 2011.

Steam is used to heat the contents of the storage tanks to maintain a temperature that facilitates pumping into the mix tank for blending with other crude oils prior to discharge to the Crude Distillation Unit. The existing crude oil storage tanks proposed for replacement are equipped with steam heating coils and are not insulated. The proposed new crude oil storage tanks would have steam-heating coils and would be insulated. To provide additional heating, new heat exchangers would be installed to support the new crude oil storage tanks. Although there would be a projected increase in crude oil storage volume requiring heating, because the new tanks would be insulated, no increase in steam demand from current baseline would be expected. Therefore, there would be no expected indirect emissions associated with Project steam use.

Proposed Emission Reduction Measure

Shell has proposed an energy efficiency measure as part of the Project (see Project Description Section 3.4.5.3, *F-40 Air Preheater Energy Efficiency Improvement*). The proposed measure would reduce fuel consumption and associated GHG emissions through the use of a new air preheater (APH) at the Crude Unit Furnace F-40. This measure would be implemented to offset a portion of the CO_2e emissions from anticipated increased shipping activity.

Net Project Emissions

The total net annual Project-related operational GHG emissions are presented in Table 4.8-7. The table includes emissions relative to baseline conditions and conditions with the Project, and the proposed energy efficiency measure (i.e., the F-40 APH). The Project increases are shown with the applicable BAAQMD CEQA significance threshold. Implementation of the Project would result in a less than significant increase of CO_2e.

TABLE 4.8-7
TOTAL NET ANNUAL PROJECT GHG EMISSIONS

Emission Scenario	CO_2e (metric tons per year)
With Project Emissions	
Crude Oil Storage Tanks – Indirect Emissions	1,132
Wharf Operations – Crude Oil Shipping	27,858
Total Emissions	28,990
Total Baseline Emissions (see Table 4.8-2)	11,116
Project Increase Above Baseline	**17,874**
F-40 APH	-8,833
Project Increase above Baseline	**9,041**
Threshold of Significance	**10,000**

SOURCE: ERM, 2011.

Additional Emission Reductions

While the net reduction of GHG emissions shown in Table 4.8-7 result in CTRP GHG emissions below the threshold of significance, Shell has proposed several additional GHG reduction measures and has committed to a self-imposed goal of no net increase of GHG emissions for the CTRP. These additional GHG reduction measures are as follows:

CRU Energy Efficiency Project

The CRU Energy Efficiency Project involves the installation of a new heat exchanger at the CRU, and was originally proposed as part of the CTRP. However, it can only be undertaken during a CRU turnaround, which occurs in designated intervals for safety, environmental, and operational reasons. Therefore, the CRU Energy Efficiency Project was removed from the CTRP so that it could be installed during the 2011 CRU turnaround, which occurred April 8 - May 9, 2011. If the CRU Energy Efficiency Project did not occur during the 2011 turnaround, it could not have been implemented until the next turnaround for the CRU, which would be in three to six years. Consequently, the 2011 turnaround provided an opportunity for an early reduction of GHG emissions associated with the CRU.

The improvement associated with the CRU Energy Efficiency Project is achieved through heat recovery and a resulting reduction in furnace firing, which in turn results in a commensurate reduction in GHG emissions, expressed as CO_2e. The reductions in emissions at the CRU are being realized by the CRU F-49 furnace. This furnace produces incremental steam which is added to the overall steam make of the Refinery. Reducing the F-49 firing rate also reduces the steam it produces; therefore, this CRU steam must be produced by another steam producing unit in the Refinery. Hence, the emission reductions for this project must be reduced by the emissions generated by the additional steam production. As shown in Table 4.8-8, for every 2.2 MMBtu/hour reduction in F-49 firing, there is a corresponding increase of 1 MMBtu/hour firing required for

making up the lost steam at one of the steam producing units (i.e., 39.6 MMBtu/hour reduction compared to 17.8 MMBtu/hour increase). For the purposes of these emission calculations, Boiler 4 (F-70) is used as a surrogate for the Refinery's overall steam producing units to demonstrate the increase in firing required to make up for the reduction in steam produced in F-49.[2]

DHT Energy Efficiency Project

Similar to the CRU project, the DHT Energy Efficiency Project was originally part of the CTRP. However, due to delays in the anticipated timing of the issuance of the Land Use Permit for the CTRP, the DHT project has been removed from the CTRP and will be implemented independently in mid 2011. This project will reduce fuel consumption and associated GHG emissions through the activation of an existing idle heat exchanger. The reduction in CO_2e emissions have been estimated by quantifying baseline and projected CO_2e emissions assuming the DHT F-13909 will typically operate as a startup/shutdown furnace rather than continuously as it currently operates. As shown in Table 4.8-8, the DHT project would result in up to 7,066 metric tons of annual CO_2e emission reductions.

TABLE 4.8-8
ENERGY EFFICIENCY FIRING RATES AND ADDITIONAL CO_2E EMISSION REDUCTIONS

Heater	Baseline Firing Rate (MMBtu/hour)	Post-Project Firing Rate (MMBtu/hour)	Net Firing Rate Change (MMBtu/hour)	CO_2e Emissions Change (metric tons/year)
F-49 CRU	114.8	75.3	-39.6	-18,386
F-70 (steam)	113.9	131.6	17.8	8,261
DHT F-13909	21.9	6.77	-15.2	-7,066
Total Potential Reductions	---	---	---	-17,191

SOURCE: ERM, 2011.

The DHT process utilizes hydrotreating catalyst to remove sulfur and nitrogen from its hydrocarbon stream. This process is exothermic and provides heat to sustain DHT operations. Historic operations indicate that as the catalyst degrades over time, the amount of heat the reaction provides decreases. This may require startup of F-13909 near the end of the catalyst run to provide this heat until the catalyst is replaced. Typical DHT catalyst run lengths are 2-4 years.

It should be noted that the total emission reductions identified in Tables 4.8-7 and 4.8-8 for the proposed F-40 APH, the DHT project, and the CRU project represent maximum achievable reductions and the actual emission reductions may be less due to operational considerations associated with the emission reduction measures including, lack of availability of units during turnarounds, outages during catalyst replacement (DHT) etc. Therefore, as a means of ensuring that the CO_2e emission reductions that would be associated with the proposed F-40 APH measure

[2] The steam producing units are more efficient at generating steam than the CRU and as a result, more steam is produced at the steam producing units per MMBtu/hr of firing than at the CRU.

and the CRU and DHT energy efficiency projects would result in a no net increase of GHG emissions associated with the CTRP, as proposed by Shell, the following mitigation measure shall be implemented.

> **Mitigation Measure 4.8-2: F-40 Air Preheater, Distillates Hydrotreater, and Catalytic Reformer Unit Firing Emission Reductions.** Prior to commencement of any Project operations, Shell shall demonstrate to the County that it has accepted a new BAAQMD permit condition that shall restrict the firing of the Distillates Hydrotreater F-13909 and the Catalytic Reformer Unit furnaces F-49, such that the combined DHT, CRU, and F-40 APH CO_2e emissions reductions would be at least 17,874 metric tons per year over a 3-year rolling average.

Significance after Mitigation: Less than Significant.

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b) Would the Project conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Impact 4.8-3: The Project could conflict with an applicable plan. (*Less than Significant*)

The Project could conflict with certain GHG reduction goals set forth in AB 32, including the 39 Recommended Actions identified by CARB in its Climate Change Scoping Plan. Table 4.8-1 presents the 39 Recommended Action measures identified by CARB in its Climate Change Scoping Plan. Measure CR-1, *Energy Efficiency*, calls for more efficient use of natural gas. The intent of this measure would be achieved under the Project due to implementation of energy savings associated with the proposed F-40 Air Preheater, the DHT, and CRU energy efficiency projects. None of the other Scoping Plan measures appear to be directly applicable to the Project. Scoping Plan Measure T-5, *Ship Electrification at Ports*, would reduce emissions from diesel auxiliary engines on ships while berthing at a California Port, which the regulation defines as the Ports of Los Angeles, Long Beach, Oakland, San Diego, San Francisco, and Hueneme. Therefore, this measure is not applicable to the Project.

One 2010 CAP Stationary Source Measure (SSM) referred to as SSM 15, *Greenhouse Gases in Permitting – Energy Efficiency* would be directly applicable to the Project. The intent of this 2010 CAP SSM would be incorporated into the Project through implementation of the proposed energy recovery measures by ensuring reduced fuel consumption. Therefore, the Project would support the primary goals of the 2010 CAP, and would not disrupt or hinder implementation of any of the GHG-related 2010 CAP control measures. Therefore, any potential impacts associated with conflicts to implementation of the 2010 CAP would be less than significant.

Implementation of the proposed energy efficiency projects would ensure that the Project would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHG.

Mitigation: None required.

4.9 Hazards and Hazardous Materials

4.9.1 Introduction

This section analyzes the Project's relationship to hazards and hazardous materials. Discussed are the physical and regulatory setting, the baseline for determining environmental impacts, the significance criteria used for determining environmental impacts, and potential impacts associated with construction, operation, and maintenance of the Project.

4.9.2 Setting

4.9.2.1 Regional and Local Setting

Shell's Martinez Refinery (Refinery) is located approximately 25 miles northeast of San Francisco (see Section 3, *Project Description*, Figure 3-1) adjacent to the community of Martinez. Approximately 20 percent of the Refinery is located within the corporate limits of the City of Martinez. The remainder of the Refinery is in an unincorporated area of the County. All of the CTRP components would be constructed within the County.

Section 3.3.2, *Location*, provides general information about the regional and local setting. This Section provides setting information specific to hazards and hazardous materials in the Project area. The Project site's current primary land uses is industrial. Specifically, the current land use is bulk petroleum storage within the existing oil Refinery. There are no schools or airports within the Project vicinity. The nearest school is New Vistas Christian School, a private school for grades 5-12. The school is located approximately 3,080 feet (0.58 miles) southeast of the Project site. The nearest airport is Buchanan Field, in the City of Concord. The nearest portion of the airport is approximately 2.7 miles southeast of the Project site.

Based on land use in the Project area, existing hazardous materials use could include those hazardous materials common to oil refining, such as petroleum hydrocarbons, sulfur and sulfur compounds, hydrogen, methane and LPG. Hazards associated with the Project primarily are associated with the handling of crude oil at the Shell Marine Terminal (MT), the generation of hazardous materials and wastes from construction activities, and the potential for spills and fires at the storage tanks.

Hazardous materials used or previously used in the design, construction, and operation of facilities under the existing land use may include asbestos and lead based paint. In addition, subsurface soil or groundwater contamination related to hydrocarbon storage and hazardous material use may be present in the Project area and is discussed in the following paragraphs.

Crude Oil Receipt and Storage

Crude oil is currently received by pipeline and from vessels calling at the MT. Crude oil storage capacity is proposed to be increased via three storage tank replacements, one storage tank refurbishing, and by the addition of one new storage tank. Receipt of San Joaquin Valley crude by pipeline has been declining due to reduced availability. The proposed crude storage tank capacity

increase will facilitate an operational shift with lower crude oil pipeline receipts and increased crude oil MT receipts. The hazards of crude oil transport and receipt are different, dependent upon the mode of transport. Crude oil transport and receipt via pipeline can contribute to subsurface contamination through long term small, undetected leaks and can release crude oil to the environment if the pipeline fails for any reason. Crude oil transport via marine vessel can release crude oil to surface water due to in-transit incidents or due to MT incidents. Bulk storage of crude oil presents a fire hazard. Crude oil properties vary. The crude oil received at the Refinery is primarily heavy crude oil with flammability characteristics of a National Fire Protection Association (NFPA) Class 3 material.[1]

Subsurface Contamination

Bulk oil storage tanks may contribute to subsurface contamination through long term slow leaks. Cathodic protection systems, double tank bottoms, and periodic tank internal inspections are some of the methods used to prevent or detect leaks. Subsurface hydrocarbon leaks can impact soil and ground water quality.

Naturally Occurring Asbestos

Asbestos is a naturally occurring fibrous group of minerals. Chrysotile, which is found in the serpentine group,[2] is the most common asbestos mineral in California. Small amounts of chrysotile asbestos, a fibrous form of serpentine minerals, are common in serpentinite. When disturbed, the asbestos fibers can become airborne and present a public health risk when inhaled. The California Geological Survey has mapped California for the occurrence of ultramafic rocks, which have the highest potential for serpentine.

Wildland Fire

The California Department of Forestry and Fire Protection (CAL FIRE) Fire Hazard Severity Zoning map ranks land under State responsibility as to wildland fire hazard.

Airports and Air Hazards

Airport Influence Areas are used in land use planning to identify areas commonly overflown by aircraft as they approach and depart an airport, or as they fly within established airport traffic patterns. The Project is located approximately 2.7 miles from Buchanan Field airport perimeter, an airport in the City of Concord.

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1 NFPA Class III flammable liquids are those with flashpoints at or above 140F but below 200F. Examples are creosote oils, phenol, and naphthalene. Liquids in this category are generally termed combustible rather than flammable.

2 Serpentine is a naturally occurring group of minerals that can be formed when ultramafic rocks are metamorphosed during uplift to the earth's surface. Serpentinite is a rock consisting of one or more serpentine minerals. This rock type is commonly associated with ultramafic rock along earthquake faults.

4.9.2.2 Regulatory Setting

Federal and State

Hazardous Materials Management

The Federal Emergency Planning & Community Right-To-Know Act (EPCRA) 312 requires businesses have available Material Safety Data Sheets (MSDS) and must submit hazardous chemical inventory forms to the State Emergency Response Commission (SERC), Local Emergency Preparedness Committee (LEPC), and local fire department annually on March 1st. Meeting this federal requirement is achieved through compliance with the California Hazardous Materials Business Plan program (CA Health and Safety Code sec 25504 (a-c)). The Hazardous Materials Business Plans describe hazardous materials inventory, storage container types and locations, emergency response and evacuation procedures, and employee hazardous materials training program. Enforcement of hazardous waste management rules is assigned to the Certified Unified Program Agency (CUPA), Contra Costa County Health Services.

Hazardous Waste Management

The Federal Resource Conservation and Recovery Act of 1976 (RCRA) established a “cradle-to-grave” regulatory program governing the generation, transportation, treatment, storage, and disposal of hazardous waste. Under RCRA, individual states may implement their own hazardous waste programs in lieu of RCRA as long as the state program is at least as stringent as federal RCRA requirements. In California, the Department of Toxic Substances Control (DTSC) regulates the generation, transportation, treatment, storage, and disposal of hazardous waste. The hazardous waste regulations establish criteria for identifying, packaging, and labeling hazardous wastes; dictate the management of hazardous waste; establish permit requirements for hazardous waste treatment, storage, disposal, and transportation; and identify hazardous wastes that cannot be disposed of in landfills. These regulations also require hazardous waste generators to prepare a Hazardous Waste Contingency Plan that describe hazardous waste storage and secondary containment facilities, emergency response and evacuation procedures, and employee hazardous waste training program. While DTSC generally retains authority, day to day enforcement of hazardous waste management rules is delegated to the CUPA, Contra Costa County Health Services.

Hazardous Materials Transportation

The United States Coast Guard (USCG) enforces Federal hazardous materials transportation laws aimed at prevention of oil spills from ships and marine facilities. These include the Federal Water Pollution Control Act, which delegates enforcement authority and responsibility to the USCG in cases where oil and hazardous substances are discharged into United States waters in harmful quantities. The Act to Prevent Pollution from Ships (33 USC 1901 et seq.) limits the operational discharges of oil from ships and requires reception facilities to receive waste that cannot be discharged at sea. The Marine Protection, Research and Sanctuaries Act of 1972 (33 USC 1401 et seq.) requires Coast Guard surveillance of ocean dumping activities. The Oil Pollution Act of 1990 (33 USC 2701 et seq.) requires increased USCG involvement with vessel traffic service systems, vessel and facility monitoring, oil spill prevention and cleanup, in addition to amending the Federal Water Pollution Control Act.

The U.S. Department of Transportation Pipeline and Hazardous Materials Administration (PHMSA) regulates hazardous materials transportation by pipeline. The Liquid Pipeline Integrity Management program (49 CFR Parts 195.450 and .452) specifies how pipeline operators must identify, assess, evaluate, repair, and validate the integrity of hazardous liquid pipelines that could, in the event of a leak or failure, affect High Consequence Areas (HCAs). HCAs include population areas, areas containing drinking water and ecological resources that are unusually sensitive to environmental damage, and commercially navigable waterways. PHMSA regulations are applicable to transmission pipelines, and are not applicable to U.S. Environmental Protection Agency (USEPA) regulated pipelines within a facility such as an oil refinery.

Accidental Release Prevention

USEPA Accidental Release Prevention/Risk Management Plan (RMP) Rule, the California Accidental Release Prevention (CalARP) Program; and the California Occupational Safety and Health Program (Cal/OSHA) Process Safety Management (PSM) standard require that facilities assess the potential for accidental releases of acutely hazardous substances, and programs must be established to minimize the frequency and extent of accidental releases. The regulations are geared to protect both workers and the general public.

Crude oil is not a regulated substance under the federal USEPA Accidental Release Prevention/ RMP Rule. Crude oil can contain hydrogen sulfide (H_2S), which can be captured by the RMP rule. However, the threshold determination for hydrogen sulfide in 40 CFR 68.115(b) is one percent by weight. Crude oil containing less than one percent hydrogen sulfide is not captured under the RMP rule.

Cal/OSHA PSM Standard. Crude oil is not classified as an acutely hazardous material in the California Code of Regulations, Title 8, Section 5189 (PSM).

Oil Spill Prevention

Part 112 of Title 40 of the Code of Federal Regulations (CFR) implements provisions of the Oil Pollution Act of 1990 to prevent discharge of oil through secondary containment, leak detection, overfill prevention, maintenance and inspection programs, operator training, and emergency response procedures. Facility-specific spill prevention measures must be presented in a Spill Prevention Control and Countermeasure (SPCC) Plan. The SPCC Plan encompasses storage tanks, pipelines, and load/unload areas within a facility. Each SPCC Plan must be certified by a Professional Engineer. The SPCC Plan must be reviewed by facility management at least every five years, and revised as needed to reflect facility changes. The USEPA retains enforcement responsibility for the SPCC Rule. The SPCC plan also outlines the monitoring and reporting requirements and actions that must be performed in the event of a spill.

The California Aboveground Petroleum Storage Act (APSA) regulates aboveground storage of petroleum and petroleum products (California Health & Safety Code Chapter 6.67 Section 25270). The Contra Costa County Health Services Department is the CUPA responsible for implementation, enforcement, and administration of the APSA. In addition to the requirements of the Federal SPCC

rule, the APSA oil storage capacity and a storage tank fee be submitted to the CUPA. The CUPA is required to conduct tank facility inspections at least every 3 years.

Office of Spill Prevention and Response (OSPR; California Department of Fish and Game). The California Fish and Game Code provides at Sections 5650 et seq. general law regarding water pollution prohibitions and both criminal and civil penalties on discharges of petroleum and other deleterious materials entering California waters. State Fish and Game wardens enforce these sections. Further, California Water Code Section 13272 requires any person responsible for any oil or petroleum product discharge into California waters notify the Office of Emergency Services (1-800-852-7550). Failure to comply is a misdemeanor. All OSPR regulations are found in Title 14, California Code of Regulations. Regulations promulgated by the California State Lands Commission (CSLC) are found in Title 2 and 24, California Code of Regulations

Airports and Air Hazards

Projects within the Buchannan Field Airport Influence Area are subject to Airport Land Use Commission Review. The Buchanan Field Airport Influence Area is defined as the area within 14,000 feet of the ends of the primary surfaces for runways (Contra Costa County, 2000).

Fire Protection-Wildfire

The California Public Resources Code (PRC) includes fire safety regulations that apply to State responsibility areas during the time of year designated as having hazardous fire conditions.

Fire Protection-Flammable Liquids Storage

The CTRP is required to comply with the California Fire Code and National Fire Protection Association (NFPA) codes that address requirements for flammable and combustible liquid storage including AST installation, water mains, foam fire protection systems, and water supply reliability requirements. The Contra Costa County Fire Protection District has local jurisdiction over proper implementation of fire code requirements, and identified specific applicable portions of these codes in a scoping comment.

Worker Safety

Occupational safety standards exist in federal and State laws to minimize worker safety risks from both physical and chemical hazards in the work place. The California Division of Occupational Safety and Health (Cal-OSHA) and the federal Occupational Safety and Health Administration are the agencies responsible for assuring worker safety in the workplace.

Cal-OSHA assumes primary responsibility for developing and enforcing standards for safe workplaces and work practices within the State. Storage tank dikes and bulk storage tanks are examples of confined spaces. Worker entry into confined spaces must be performed in accordance with OSHA confined space procedures, including training for participants, planning, provisions for access/egress, monitoring, and supervision. Storage tank demolition, repair, and installation require hot work (cutting torches, welding, grinding, etc.). Hot work within the Refinery environment must be performed under the facility hot work program that is designed in

accordance with OSHA requirements and industry guidelines. At sites known to have hazardous materials present (hydrocarbons, lead based paint, asbestos, contaminated soil, etc.), a site safety plan must be prepared to protect workers. The site safety plan establishes policies and procedures to protect workers and the public from exposure to known and potential hazards at the site.

Emergency Response

California has developed an emergency response plan to coordinate emergency services provided by federal, State, and local government and private agencies. Responding to hazardous materials incidents is one part of this plan, as is responding to intentional acts of destruction. Another part involves development of a downstream evacuation plan for areas within the potential inundation area. For Contra Costa County, the plan is administered by the California Office of Emergency Services, which coordinates the responses of other agencies, including the California Environmental Protection Agency, CHP, California Department of Fish and Game, Regional Water Quality Control Board, and local fire departments.

The Coast Guard is the lead Federal agency for response to oil spills on navigable waters. The Oil Pollution Act of 1990 (33 USC 2701 et seq.) requires increased USCG involvement with vessel traffic service systems, vessel and facility monitoring, oil spill prevention and cleanup, in addition to amending the Federal Water Pollution Control Act. The Coast Guard operates the National Response Center. The Federal Government requires that the National Response Center (1-800-424-8802) be notified by the responsible party for oil or hazardous substance discharges/releases. California state law requires that the Office of Emergency Services (OES) be notified (1-800-852-7550). Within California, the State agency with primary responsibility for enforcing federal and State regulations and for responding to oil spills to navigable waters are the California State Lands Commission, Office of Spill Response (OSPR).

Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS)

The Marine Facilities Division (MFD) of the CSLC developed MOTEMS, a set of engineering standards for the design and maintenance of marine oil terminals. MOTEMS became the regulatory standard in February 2006. These standards address new terminals or new components, as well as existing facilities. The standards include criteria for above and under water inspection, structural (and seismic) rehabilitation, and design of new fire, piping, mechanical and electrical systems.

Security

The Department of Homeland Security, United States Coast Guard, has authority to oversee the development and implementation of security measures at marine oil terminals and on oil tankers (Facility Security Rule, 33 CFR Part 105). Vessels and facilities must conduct security assessments, and must submit a Vessel Security Plan (VSP) or Facility Security Plan (FSP) to the Coast Guard for approval.

California Department of Toxic Substances Control

The DTSC is responsible for regulating management of hazardous waste and correction of releases of hazardous constituents to the environment. In a scoping comment, DTSC suggests that

the Project presents an opportunity to investigate soil and groundwater immediately below the footprint of removed tanks, and an opportunity to remove soil and groundwater if hydrocarbon impacts are detected.

Contra Costa County General Plan

The Safety Element (Section 10) of the Contra Costa County General Plan contains relevant goals and policies regarding hazardous materials and fire protection. The hazardous materials goal is to provide public protection from hazards associated with the use, transport, treatment and disposal of hazardous substances and is supported by policies that require appropriate storage and containment of hazardous substances. Fire protection goals are intended to provide public protection services in a disaster. Implementation Measures supporting General Plan fire protection goals and policies require that projects that encroach into high fire hazard areas be reviewed by the appropriate Fire Bureau to determine if special fire prevention measures are advisable. Additional fire protection policies are described in the Public Facilities/Services Element of the General Plan and encourage wildland fire prevention activities such as control burning, fuel removal, establishment of fire roads, fuel breaks and water supply in wildland areas. This section also prohibits siting hazardous waste facilities within the watershed (Contra Costa County, 2010).

The Contra Costa County Health Services (CCCHS) is the CUPA, the agency certified by the California Secretary of Environmental Protection to implement the Unified Hazardous Waste and Hazardous Materials Management Regulatory Program specified in Health and Safety Code Chapter 6.11. As such, CCCHS oversees the regulatory programs for Hazardous Materials Business Plans, aboveground storage tanks, underground storage tanks, hazardous waste generators, and California Accidental Release Prevention (CalARP), including facility inspections and permitting.

Contra Costa County has adopted the *Contra Costa County Hazardous Materials Area Plan*, which outlines the procedures that County regulatory and response agencies will use to coordinate management, monitoring, containment, and removal of hazardous materials in the event of an accidental release (Contra Costa County, 2009).

The Contra Costa County *Airport Land Use Compatibility Plan* Countywide Policy 4.3.5 requires FAA review and approval of any structure over 200 feet in height. In addition, the proposal must be submitted to the Contra Costa County Airport Land Use Commission for its review and comment.

Contra Costa County Code

Contra Costa County Industrial Safety Ordinance

The Contra Costa County Industrial Safety Ordinance (ISO) regulations require that facilities assess the potential for accidental releases of acutely hazardous substances, and programs must be established to minimize the frequency and extent of accidental releases. The regulations are geared to protect both workers and the general public.

Contra Costa County Fire Prevention District

The local Fire District administers approvals under the California Health & Safety Code and the 2007 California Fire Code (CFC), (with reference to the Uniform Fire Code) for any development or project that involves flammable liquid storage. Shell must submit final plans and specifications for the storage tanks for review and approval by the Fire District per CFC 3404.2 prior to construction. Acceptance testing must be performed on fire protection systems per NFPA-24 (fire water) and NFPA-11 (foam systems) prior to operation of the tanks per CFC 508.1.

Contra Costa Health Services Hazardous Materials Incident Notification Policy

This Policy promotes prompt and accurate reporting in the event of a release of hazardous materials that may impact the environment or community and enables the County to undertake measures to mitigate any such impact including dispatching emergency response teams, assessing the extent of the risk of a release, determining whether to activate the Community Warning System and responding to public and media inquiries.

Industry Standards

American Petroleum Institute (API) and Other Industry Standards

In addition to regulatory requirements, refinery equipment and structures are designed in accordance with industry standards and best engineering practices (e.g., NFPA and API). API 650 is the current standard for the design of welded tanks for oil storage and API 653 sets standards for inspection, repair, alteration, and reconstruction of storage tanks. These standards include measures to prevent accidental releases, and to incorporate safety and back-up measures or features to reduce risk in the event of an emergency, and set inspection frequencies. API Standard 2015 sets the industry standards for safe entry and cleaning of petroleum storage tanks, and API recommended practice 2016 is a supplemental document with guideline and procedures for safe entry and cleaning of petroleum storage tanks.

4.9.3 Project Baseline

This section summarizes existing Project-specific conditions, based upon the Project location and information contained in Shell's CTRP Hazards Assessment.

A review of the California Department of Conservation, Division of Mines and Geology map shows that the Project area is not near mapped locations of ultramafic rocks (CDC, 2000). The historic locations of known asbestos mines in Contra Costa County map shows the nearest former mine sites to the southeast in the Mount Diablo area and to the west/southwest in the East Bay Hills (USGS-MRDS). The referenced maps are consistent. Therefore, the potential for encountering naturally occurring asbestos during construction is considered very low.

The Project area is not ranked on the Fire Hazard Severity Zoning map, because it lies within areas mapped as "Local Responsibility Area – Incorporated" and "Local Responsibility Area – Unincorporated" (CAL FIRE, 2007). The Project area is within a developed industrial land use area. Due to the Project's location outside areas of State responsibility for fire hazard zoning, the

public safety requirements to minimize the risk of wildland fire would not apply within the Project area.

The Buchanan Field Airport Influence Area is defined as the area within 14,000 feet of the ends of the primary surfaces for runways (Contra Costa County, 2000). The Project site is located over 15,000 feet from the end of the nearest runway. Due to the Project's location outside airport influence areas, the public safety requirements to minimize the risk of related to airport proximity would not apply within the Project area.

The existing tanks to be replaced or refurbished may contain tank bottom waste, which could either be classified as an excludable recyclable material (ERM), or be classified as a listed hazardous waste per RCRA (RCRA-40 CFR 262.11). Tank bottom waste would be sampled and analyzed to allow this determination. Based on the determination, tank bottom waste would be handled, stored, transported, and disposed of per applicable RCRA regulations.

Crude oil is not a regulated substance under the USEPA Accidental Release Prevention/Risk Management Plan (RMP) Rule. Crude oil can contain hydrogen sulfide (H_2S), which can be captured by the RMP rule. However, the threshold determination for hydrogen sulfide in 40CFR 68.15 (b)(I) is one percent by weight. Crude oil containing less than one percent is not captured under the RMP rule. The crude oil is projected to contain less than 0.05 percent, which is significantly less than one percent hydrogen sulfide, so USEPA RMP would not apply.

While not captured under the USEPA RMP rule, Shell operates under the Contra Costa County ISO. As required under the Contra Costa County ISO, Shell maintains a Safety Plan that addresses Accidental Release Prevention Program elements required in the California Accidental Release Prevention (CalARP) program, development of a human factors program, root-cause analysis and incident investigation, management of change, Process Hazard Analysis (PHA), and accident history. Shell would perform a PHA on the new crude tanks to comply with the ISO.

The proposed tank changes would be incorporated into the Shell Martinez Refinery SPCC Plan, including changes required to meet the SPCC requirements for secondary containment volumes. An amendment to the SPCC Plan would be completed within six months of the facility change. Any SPCC program updates resulting from the SPCC Plan amendment would be implemented within six months following the amendment preparation.

Shell maintains a Martinez Refinery Spill Response Plan to address response to MT crude oil spills and maintains procedures in the Environmental Procedure Manual and Emergency Manual section on Wharf Emergencies that cover notifications in the event of a spill. Shell performs MT inspections in compliance with MOTEMS requirements. Wharf operations manuals, spill response plans, and inspection programs, are consistent with CSLC regulatory and lease renewal permit requirements.

4.9.4 Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts related to hazards and hazardous materials if it would:

a) Create a significant hazard to the public or the environment through the routine transport, use or disposal of hazardous materials;

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;

c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances or waste within one-quarter mile of an existing or proposed school;

d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment;

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would result in a safety hazard for people residing or working in the project area;

f) For a project within the vicinity of a private airstrip, would result in a safety hazard for people residing or working in the project area;

g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or

h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

4.9.5 Discussion of No Hazards and Hazardous Materials Impacts

Review and comparison of the setting circumstances and Project characteristics with each of the eight significance criteria stated above, clearly show that no impacts associated with hazards or hazardous materials would result for criterion c, e, f, and h. The following discusses the reasoning supporting this conclusion:

c) The Project would not emit hazardous emissions or handle hazardous or acutely hazardous materials, substances or waste within one-quarter mile of an existing or proposed school.

There are no existing or proposed schools within one-quarter mile of the Project area. Therefore, the Project would have no impact with regard to criterion c).

e) The Project would not be located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport.

There is no airport land use plan that includes the Project area. There are no public airports or public use airports within two miles of the Project area. Therefore, the Project would have no impact with regard to criterion e).

f) The Project would not be located in the vicinity of a private airstrip.

There is no private airstrip in the vicinity of the Project area. Therefore, the Project would have no impact with regard to criterion f).

h) The Project would not expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

There are no areas in the vicinity of the Project area that are rated by the California Department of Forestry and Fire Protection as wildland fire hazard zones. Therefore, the Project would have no impact with regard to criterion h).

4.9.6 Discussion of Impacts and Mitigation Measures

a) Create a significant hazard to the public or the environment through the routine transport, use or disposal of hazardous materials.

Impact 4.9-1: The Project would shift the routine transport of crude oil receipts from mostly pipeline to mostly tanker vessels, which would increase the potential for a hazardous crude oil release. *(Significant and Unavoidable)*

Pipeline transport of hazardous liquids is statistically the safest mode of transport (DOT, 2011). The CTRP would increase the probability of a significant hazard to the public or the environment through the increased routine transportation of crude oil by tanker vessel and via over-the-water transfers at the MT. To evaluate the potential impacts from an accidental release of crude oil from Project related tanker operations, a crude oil spill analysis for the Project was conducted by Coast Harbor Engineering (see Appendix C). To determine the area of potential effect from different size spills, the modeling considered the area and probability of a fairly low threshold for the minimum potential quantity of crude oil to form a 'silvery sheen'[3] on the water surface and shorelines around the Bay (collectively includes San Francisco Bay, San Pablo Bay, Carquinez Strait, and Suisun Bay). The eight modeled scenarios were for periods of five days for four different accidental spill sizes during summer and winter flow conditions in the Bay (see Appendix C).

[3] Silvery sheen is used as the threshold level of concern and is measured by the probability of this threshold being exceeded at shoreline zones. Each shoreline zone is 8,200 feet of shoreline and is graphically portrayed on a Bay Area map by the percentage of exceedance. A silvery sheen is modeled to be produced on the water when approximately 50 gallons of oil are spread over one square nautical mile (see Appendix C).

The first six scenarios were used to evaluate possible accidental crude oil spills at the MT and the last two were used to consider an 'in-transit' spill/release event at the Carquinez Bridge. Shell maintains a wide variety of spill containment materials directly on the MT and staff are trained in how to contain a spill if one were to happen (Shell, 2011).

The first two scenarios evaluate a possible accidental release of the reasonable worst case spill at the MT of 1,680 barrels (bbl) of crude oil into the Carquinez Strait. These scenarios show high probabilities (i.e., 50 to 100 percent) of exceedance (i.e., areas where the crude oil colors on the water would be darker (thicker) than a silvery sheen) all along the Carquinez Strait and Suisun Bay. In San Pablo Bay, the sheen would begin to disperse and the probability of exceeding a silvery sheen would drop to a range of 20 to 50 percent in the winter and 10 to 40 percent in the summer. In both seasonal cases there would be higher levels where the Bay narrows at the Richmond Bridge and Tiburon Point.

The third and fourth scenarios evaluate a smaller possible accidental release of 168 bbl of crude oil into the Carquinez Strait from the MT. Even with the smaller release, most of the Carquinez Strait would exceed the threshold of a silvery sheen nearly 100 percent of the time. Exceedance levels stay high on the south side of Suisun Bay while they diminish to 40 to 70 percent in the more distant northern shorelines of Suisun Bay. Most of San Pablo Bay would not be affected by this smaller spill size, although the higher flows during winter would result in higher probabilities of exceedance between 20 to 40 percent along the Marin shore at the Richmond Bridge and Tiburon Point.

The fifth and sixth scenarios evaluate the smallest and most probable accidental release of 50 bbl of crude oil into the Carquinez Strait at the MT. Modeled results for summer and winter are similar. Exceedance level probabilities would range between 60 to 80 percent throughout the Carquinez Strait and along the southern shores of Suisun Bay. Further up Suisun Bay and along the intermediate shores, the probability of an exceedance would be in the 30 to 60 percent range. The far northern shores of Suisun Bay show limited exceedance probability levels of 0 to 10 percent.

The final two scenarios evaluate a much larger possible accidental release of 20,000 bbl of crude oil at the Carquinez Bridge (downstream of the MT). Once again, the Carquinez Strait would bear the brunt of the spill, with 100 percent probability of exceedance of the threshold up and down the Carquinez Strait. Upstream disbursement patterns are very similar to the first two scenarios, where in the upper reaches of Suisun Bay probability of exceedance levels drop to 20 to 50 percent. It is downstream on the shores of San Pablo Bay where the full magnitude of this larger spill would be realized. In the winter, most of San Pablo Bay would experience 30 to 70 percent probability of exceedance levels and this would continue on either side of the shoreline out the Golden Gate. In the summer case, Marin and Sonoma County shorelines would be exposed to less crude oil, with an exceedance level of 10 to 30 percent.

The modeling study shows that for all but the third and fourth scenarios (50 bbl), any accidental spill of crude oil would affect wide portions of the shoreline of San Pablo Bay, Suisan Bay, and the Carquinez Strait regions. The effect of any uncontained crude oil spill would be significant.

The CSLC recently certified MT EIR[4] concluded that without rapid containment by immediate booming and cleanup, the effects of even a small spill of 50 bbl can leave residual impacts, and they can be significant. It also acknowledged that with containment and clean up, the effects can be reduced but that it is impossible to predict with any certainty the potential consequences of spills; therefore, impacts can be considered to be adverse and significant, depending on the effectiveness of the first response containment and cleanup. The CSLC MT EIR imposes mitigation measures (OS-3a through OS-3c, OS-6b, OS-7a, and OS-7b) that require Shell to implement a number of spill prevention and response measures contained in the Operational Safety/Risk of Accidents Section of the certified EIR.

The EIR for the CSLC Shell MT Lease considered future tanker vessel traffic within the Bay and the Carquinez Strait, including all vessel traffic related to the Shell MT, not just the vessel traffic increase (about one crude oil tanker per week) related to the CTRP. In doing so, the CSLC MT EIR includes the proposed vessel traffic of the CTRP. The CSLC Shell MT EIR determined that the potential for petroleum spills from all vessel traffic at the MT required the following mitigation measures to be implemented (CSLC, 2011):

OS-3a Remote Release Systems: Install and maintain mooring quick release devices that shall be able to be activated within 60 seconds.

- These devices shall be capable of being engaged by electric/push button release mechanism and by integrated remotely-operated release system.
- Shell shall document procedures and training for systems use and communications between Terminal and vessel operator(s).
- Routine inspection, testing and maintenance of all equipment and systems in accordance with manufacturers' recommendations and necessity are required to ensure safety and reliability, to the satisfaction of CSLC staff.
- Shell may install alternate technology that provides an equivalent level of protection, as reviewed by CSLC staff and approved by the Commission at a publicly noticed meeting.

OS-3b Tension Monitoring Systems (TMSs): Install and maintain TMSs to effectively monitor all mooring line and environmental loads, and avoid excessive tension or slack line conditions that could result in damage to the terminal structure and/or equipment and/or vessel mooring line failures that could result in spills.

- Line tensions and environmental data shall be integrated into systems that record and relay all critical data to the Control Room, terminal operator(s) and vessel operator(s).
- This system shall include, but not be limited to, quick release hooks only (with load cells), site-specific current meter(s), site-specific anemometer(s), and visual and audible alarms that can support effective preset limits and shall be able to record and store monitoring data.

[4] The EIR was certified on June 23, 2011.

- Shell shall document procedures and training for systems use and communications between Terminal and vessel operator(s).
- Routine inspection, testing and maintenance of all equipment and systems in accordance with manufacturers' recommendations and necessity are required to ensure safety and reliability, to the satisfaction of CSLC staff.
- Shell may install alternate technology that provides an equivalent level of protection, as reviewed by CSLC staff and approved by the Commission at a publicly noticed meeting.

OS-3c Allision Avoidance Systems: Install and maintain Allision Avoidance Systems (AASs) at the Shell Terminal to prevent damage to the wharf and/or vessel during docking and berthing operations.

- The AASs shall be used and alarmed to monitor vessel drift (both surge and sway) during all mooring operations, and shall be equipped with an AIS receiver to capture passing vessel parameters.
- This shall be integrated with the Tension Monitoring Systems such that all data collected are available in the Control Room and to Terminal operator(s) at all times and vessel operator(s) during berthing operations. The AASs shall also be able to record and store monitoring data.
- Prior to implementing this measure, Shell shall consult with the San Francisco Bay Bar Pilots, the USCG, and the CSLC staff and provide information that would allow CSLC staff to determine, on the basis of such consultations and information regarding the nature, extent and adequacy of the existing berthing system, the most appropriate application and timing of an AASs at the Shell Terminal.
- Shell shall document procedures and training for systems use and communications between Terminal and vessel operator(s).
- Routine inspection, testing and maintenance of all equipment and systems in accordance with manufacturers' recommendations and necessity are required to ensure safety and reliability, to the satisfaction of CSLC staff.

OS-6b: Shell shall develop a Fire Plan consistent with Section 3108F2.2 of 24 CCR, Part 2, California Building Code, Chapter 31F. Shell shall also develop a set of procedures and conduct training and drills for dealing with tank vessel fires and explosions for tankers berthed at the terminal. The procedures shall include the steps to follow in the event of a tank vessel fire and describe how Shell and the vessel will coordinate activities. The procedures shall also identify other capabilities that can be procured if necessary in the event of a major incident. The Fire Plan and procedures shall be submitted to the CSLC within 90 days of lease renewal. The CSLC shall have final approval of the plan.

OS-7a: Shell shall participate in U.S. Coast Guard Ports and Waterways Safety Assessment workshops for the San Francisco Bay area to support overall safety improvements to the existing Vessel Traffic Service in the Bay Area, if such workshops are conducted by the USCG during the life of the lease.

OS-7b: Shell shall respond to any spill from a vessel traveling in the Bay to or from the wharf, moored at its wharf, related in any way to the wharf, or carrying cargo owned by

Shell, as if it were its own, without assuming liability, until such time as the vessel's response organization can take over management of the response actions in a coordinated manner.

The CSLC Shell MT EIR concluded that even with implementation of the above spill prevention and response measures, the impact would remain a significant and unavoidable impact (CSLC, 2011). The CSLC measures address all of the vessel traffic at the Shell MT, which would include the increased vessel traffic related to the CTRP, and they directly relate to both the prevention and response to crude oil spills. The follow measure would ensure that the County is informed of the implementation of the CSLC mitigation measures and any changes to the measures that may occur.

Mitigation Measure 4.9-1: Implementation of CSLC Oil Spill Mitigation Measures Notification. Shell shall notify the Contra Costa County Department of Conservation & Development, Community Development Division in writing of implementation of the CSLC measures and any changes to the requirements contained within of CSLC mitigation measures OS-3a through OS-3c, OS-6b, OS-7a, and OS-7b within 30 days of the change.

Significance after Mitigation: A review of accidental spills associated with the MT indicate that there have been four spill events between 1984 and 2009 of volumes between 1 and 25 bbl, and no significant environmental impact was documented (Shell, 2011). Given this history and because the Project would add only one additional ship weekly, the likelihood of a spill occurring in a large volume would be very low and regular operational protocols, including the use of secondary containment, would minimize the potential effects of a hazardous release on the environment. Although the risk would be low, the impact would be *significant and unavoidable* even with implementation of the County and CSLC mitigation measures.

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b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.

Impact 4.9-2: The Project would increase the quantity of routinely stored hazardous materials. *(Less than Significant)*

The Project would increase inventory of crude oil within the same footprint of space. The potential risk of tank fires is increased by the increased inventory and the increased number of tanks. This could create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment. The CTRP is subject to review, permitting, and approval by the Contra Costa Fire Prevention District. The CCFPD requires compliance with the California Fire Code and NFPA 30, the applicable industry standard. The California Fire Code and NFPA 30 include requirements for minimum spacing between storage tanks, fire water supply, fixed fire fighting equipment such as tank mounted foam injection nozzles, and portable, supplemental fire fighting capabilities and equipment.

The potential risk of tank overfills and other oil spills is increased by the increased number of tanks. This could create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment. The CTRP is subject to review, permitting, and approval by the CUPA. The CUPA enforces the California Aboveground Petroleum Storage Act (APSA). APSA encompasses the requirements of the Federal SPCC rule. Compliance with the SPCC Rule includes providing overfill prevention measures for each tank, requires secondary containment dikes around the CTRP storage tanks, and requires other spill prevention and spill response planning measures.

Mitigation: None required.

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d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment.

Impact 4.9-3: The Project is located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment. *(Less than Significant)*

The CTRP is subject to review, permitting, and approval by the Contra Costa County Health Services, the CUPA. Contaminated soils, if encountered, would be handled in accordance with existing facility protocols that are consistent with regulatory requirements. Soil and groundwater below the footprint of removed tanks would be sampled and analyzed for the presence of hydrocarbons. Analytical results from subsurface investigations would be shared with the CUPA. Removal actions, if warranted based on analytical results would be planned and implemented in cooperation with the CUPA and DTSC.

Mitigation: None required.

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g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.

Impact 4.9-4: The Project may impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan and, as a result, could create a significant hazard to the public or the environment. *(Less than Significant)*

The CTRP would tend to interfere with roads, access, and egress within the Refinery during construction. However, the Refinery maintains a Hazardous Materials Business Plan with the CUPA. Current emergency access/egress routes would be maintained, posted for use by internal employees and contractors, and provided to the CUPA and emergency response agencies.

Mitigation: None required.

4.10 Hydrology and Water Quality

4.10.1 Introduction

This section analyzes the Project's relationship to hydrology and water quality. Discussed are the physical and regulatory setting, the baseline for determining environmental impacts, the significance criteria used for determining environmental impacts, and potential impacts associated with construction, operation, and maintenance of the Project.

4.10.2 Setting

This section describes the existing hydrological and water quality conditions in the vicinity of the Refinery and any specific information relevant to the tank farm site and lay-down areas around the site where Project activities would occur.

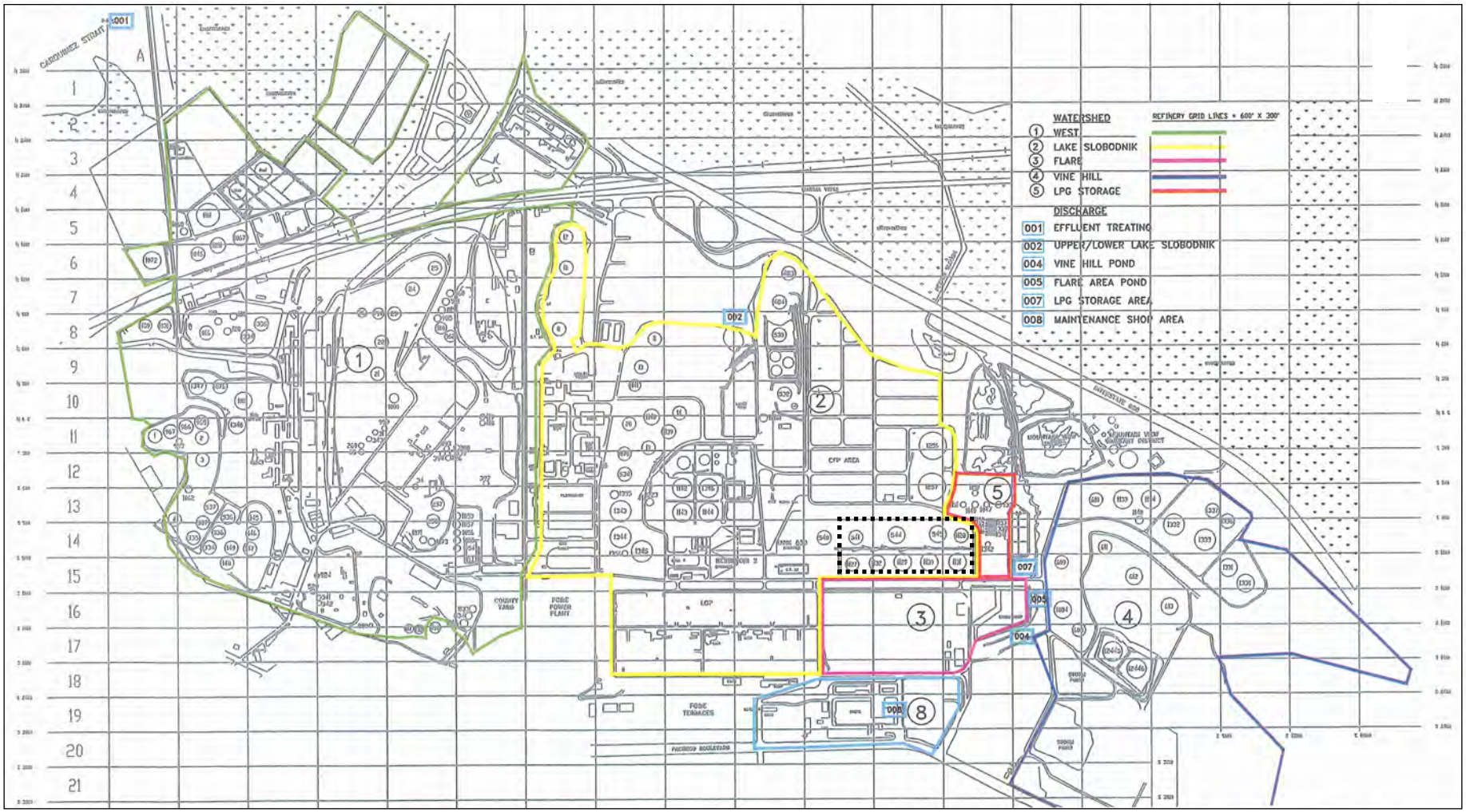
4.10.2.1 Hydrology

The Project area lies in the Suisun Basin within the San Francisco Bay Area Hydrologic Basin. San Francisco Bay marks a natural topographic separation between the northern and southern coastal mountain ranges. The San Francisco Bay estuarine system conveys the waters of the Sacramento and San Joaquin Rivers into the Pacific Ocean. These rivers enter San Francisco Bay through the delta at the eastern end of Suisun Bay (RWQCB, 2007).

The northern portion of the Refinery is located at the Carquinez Strait shoreline and south of Suisun Bay. The topography in the area consists of gently sloping lowlands and hilly terrain ranging in elevation from sea level to 400 feet above mean sea level (amsl). The floor of the valley slopes gently to the northwest (DWR, 2004). The Refinery property is situated on a north-trending spur ridge, flanked by lowlands on the east and west, and the confluence of the Sacramento River with Carquinez Strait to the north. The majority of the Refinery, including the approximately 1,200-foot by 600-foot tank farm site, has been developed and has undergone extensive grading (ERM, 2010a).

Most of the Project activities would be located at the tank farm in the southeast portion of the Refinery. This portion of the Project area is located in the Peyton Slough Watershed that has over 55 percent of impervious surfaces (CCWF, 2010). The topography at the proposed tank farm site is relatively flat, with elevations ranging from approximately 25 feet to 35 feet amsl. A sloped area adjacent to the eastern side of the tank farm slopes to 10 feet amsl into a marshy lower area (ERM, 2010a). The majority of the Refinery drains into Peyton Slough, which then drains into the Carquinez Strait. Some portions of the Refinery drain directly into the Carquinez Strait (RWQCB, 2006b), which flows west into San Francisco Bay (see Figure 4.10-1).

The 20-acre tank farm site is bounded by an elevated containment levee. Each tank is equipped with external floating roof. Each roof captures rainwater, which is routed to the effluent treatment plant on the northwestern end of Refinery or to a stormwater pond known as Lake Slobodnik located



Project Site Boundary

0 1600
Feet

SOURCE: Shell, 2010

Shell Crude Tank Replacement Project . 209699

Figure 4.10-1
Site Drainage

northwest of the tank farm (see Watershed 2 and discharge point E002 in Figure 4.10-1). The effluent treatment plant is designed to treat up to 10 million gallons per day (mgd) of flows. Both the effluent treatment plant and Lake Slobodnik discharges are regulated outfalls under the National Pollutant Discharge Elimination System permit (discussed below). Additionally stormwater sumps are located in each tank's internal levee. Runoff from the individual tank levees are also routed to the effluent treatment plant except during higher rainfall in which the flow is bypassed from the effluent treatment plant to Lake Slobodnik (Shell, 2010).

As shown on Figure 4.10-1, the Refinery has four storm water impoundment basins on the east side of Shell Avenue. Each of these basins is discharged to Peyton Slough. None discharge directly to the Carquinez Strait. The discharge points on Figure 4.10-1 are shown as 002, 004, 005, and 007. The impoundment basin related to the Project is 002, also known as Lake Slobodnik. The watershed for Lake Slobodnik is shown as #2 in Figure 4.10-1 and outlined in yellow. All process unit storm sewers and tank levees are routed to the low point sump, which then can be directed either to the effluent treatment plant or Lake Slobodnik. Lake Slobodnik was designed and built to contain runoff from a statistical 100-year, 7-day storm. The three other storm water impoundments are also designed and built to contain a 100-year, 7-day storm. These impoundments also serve as a treatment step to remove suspended solids, which are known to carry most of the important pollutant loads from various types of drainage areas (.e.g., industrial, urban, rural).

Shell operates the existing marine terminal (MT), which consists of a T-shaped concrete wharf on the southern shore of the Carquinez Strait connected to the shore by an elevated wooden approach roadway. The Shell MT serves inbound and outbound shipments and handles different types of crude oil, refined products, and feedstocks. Petroleum products handled at the MT consist of light products and heavy products (see Chapter 3 for further details).

4.10.2.2 Water Quality

The majority of the Refinery stormwater drains into Peyton Slough that flows into the Carquinez Strait, which in turn flows into the San Francisco Bay. San Francisco Bay has been greatly altered from its natural conditions by human activities. The quality of the Bay water varies seasonally. For most of the year, water quality is strongly influenced by tidal exchanges with the Pacific Ocean. From December through April, water quality is affected by freshwater inflow from the Sacramento-San Joaquin Delta and other local small tributaries that drain urbanized portions of Contra Costa County and the entire Bay Area. The water quality of the creeks within urbanized areas has been degraded by the presence of high levels of suspended solids, together with traces of contaminants associated with motor vehicles, such as oil and grease, gasoline, and other hydrocarbons (Contra Costa County, 2010). Based on the available monitoring data for stormwater discharged from the Project area, the stormwater quality is in compliance with the regulatory permit standards (Shell, 2011a).

4.10.2.3 Groundwater

The Project area lies within the Clayton Groundwater Basin, which is located in northern Contra Costa County. The basin is bounded by Suisun Bay on the north, Mt. Diablo Creek on the east, the Concord Fault on the west, which separates this basin from the Ygnacio Valley groundwater basin, and the foothills of Mount Diablo on the south (DWR, 2004). The Clayton groundwater basin currently provides municipal and domestic water supply and provides water supplies for industrial processes and agriculture (RWQCB, 2007).

Groundwater conditions in the vicinity of the site are expected to vary depending on factors such as weather conditions, time of year, and irrigation practices (ERM, 2010b). Groundwater levels in the basin have shown a slight gradual decline over the period of record. The depth to groundwater is generally greatest in summer months and shallowest in winter months (DWR, 2004). Groundwater levels in the basin generally range from 40 to 605 feet below ground surface (bgs) in domestic wells and from 80 to 540 feet bgs in municipal wells (DWR, 2004). At the Refinery, groundwater was reported at varying depths. Groundwater underlying the tank farm site was reported to be as shallow as one foot bgs within the lowland areas. There was no subsurface water encountered in several borings in the upland area of the Refinery (ERM, 2010b).

4.10.2.4 Flooding

Storm Flooding

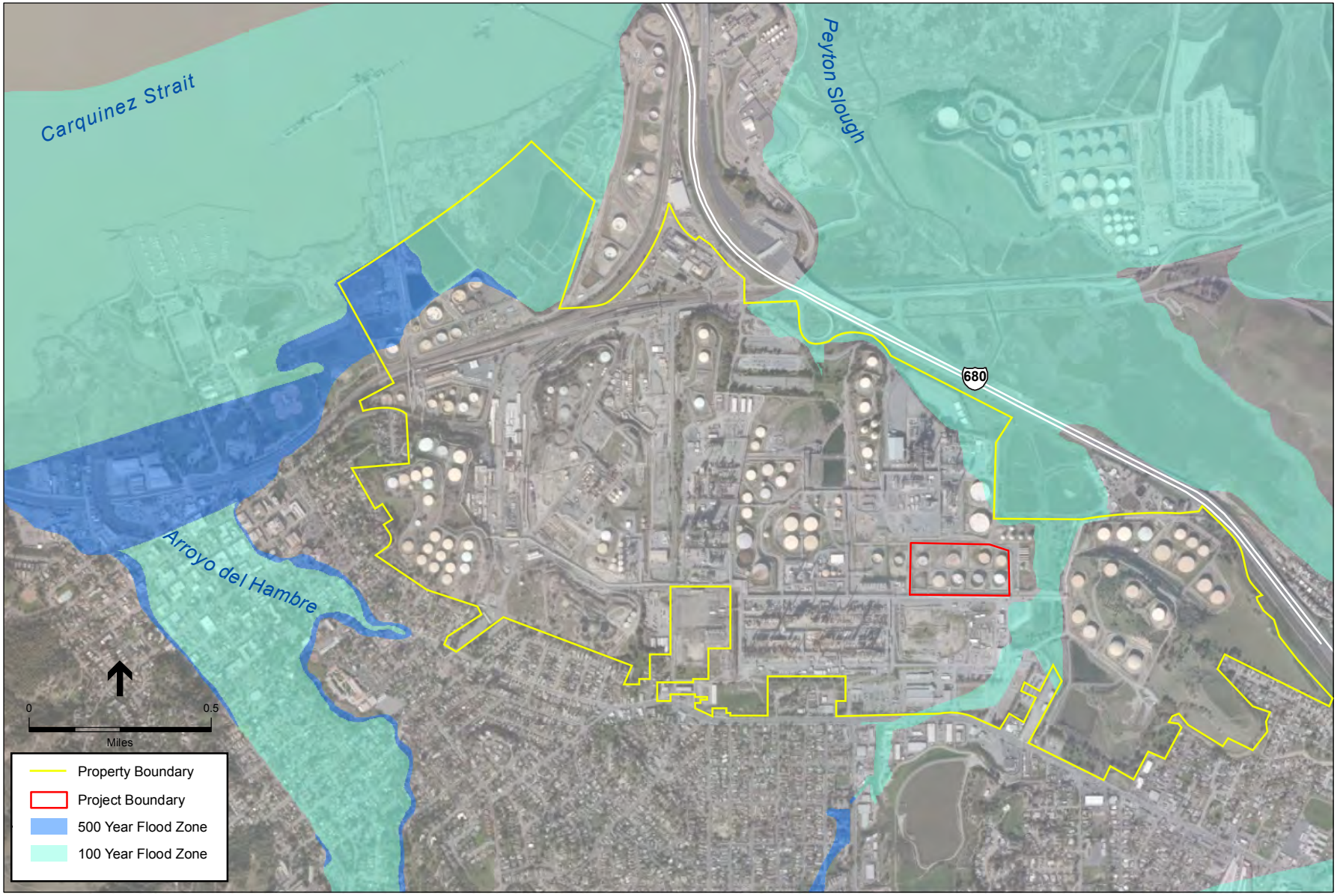
In the Project area, the low-lying areas adjacent to Suisun Bay are susceptible to flooding (Contra Costa County, 2010). The Federal Emergency Management Agency (FEMA) has designated most of the Project area as Zone X, which is an area determined to be outside the 0.2 percent annual chance floodplain. A portion of the Refinery just northeast and east of the tank farm site is designated as a Zone AE, which is an area subject to a one percent annual chance of flooding (100-year) with a base flood elevation[1] of nine feet amsl (FEMA, 2009) (see Figure 4.10-2).

Tsunamis

Tsunamis are sea waves usually caused by displacement of the ocean floor. Typically generated by seismic or volcanic activity or by underwater landslides, a tsunami consists of a series of high-energy waves that radiate outward from the area in which the generating event occurred. Tsunamis affecting the Bay region would most likely originate west of the Bay, within the Pacific Rim. Areas that are highly susceptible to tsunami inundation tend to be located in low-lying coastal areas such as tidal flats, marshlands, and former bay margins that have been artificially filled. Such vulnerable areas include the City of Martinez (ERM, 2010b).

Based on an estimated tsunami run-up of 20 feet at the Golden Gate, it is estimated that east of Point Pinole (located in San Pablo Bay approximately 14 miles west of the Project area), the wave height would be one-tenth of that at the Golden Gate. Attenuation within the Bay would

[1] Water surface elevation at 1 percent annual chance flood.



SOURCE: FEMA, 2009

Shell Crude Tank Replacement Project . 209669

Figure 4.10-2

Flood Zones in the Project Vicinity

diminish a 20-foot wave to a height of approximately 10 feet at Richmond, and would continue to diminish as it progressed further into the Bay. The likelihood of a damaging tsunami reaching the Project area is low due to the site elevation and distance from the Bay (ERM, 2010b).

Seiches

Seiches are a series of standing waves (sloshing action) of an enclosed body or partially enclosed body of water caused by seismic shaking. Seiche action can affect harbors, bays, lakes, rivers, and canals. Similar to tsunamis, seiches can be generated by a number of sources, including distant earthquakes, local earthquakes, large landslides into bodies of water, and submarine landslides in bodies of water. Due to the distance inland from deep bodies of water, the risk of seiches at the Project site is likely low or moderate (ERM, 2010b).

Sea Level Rise

Scientific research to date indicates that observed climate change around the globe will likely result in sea level rise. Sea level rise is defined as the measured, continual increase in steady astronomical tide elevations. The monthly mean sea levels during the period of 1906 to 2006 at the San Francisco (Fort Point) National Oceanic and Atmospheric Association (NOAA) tide station show a linear trend in sea level rise of approximately 2 millimeters per year (mm/yr). During this period, unusually high spikes are noted due to El Niño episodes. However, evidence of accelerated sea level rise due to effects of global climate change is not yet evident in the measured tide record for San Francisco. Given the nature of change from the current operations at the Project, the relatively small changes in sea level would not be expected to affect Project operations. Therefore, the potential impacts of sea level rise on the MT are not discussed further in this document.

4.10.2.5 Regulatory Setting

Federal and State

Clean Water Act

Under the Clean Water Act of 1977, the U.S. Environmental Protection Agency (USEPA) seeks to restore and maintain the chemical, physical, and biological integrity of the nation’s waters. The Clean Water Act authorizes the USEPA to implement water quality regulations. The National Pollutant Discharge Elimination System (NPDES) permit program under Section 402(p) of the Clean Water Act controls water pollution by regulating sources that discharge pollutants into the waters of the United States. California has an approved state NPDES program. The USEPA has delegated authority for issuing NPDES permits in California to the State Water Resources Control Board (SWRCB), which has nine regional water quality control boards (RWQCBs). The San Francisco Bay RWQCB regulates water quality in the Project area.

Section 303(d) of the Clean Water Act requires that each state identify water bodies or segments of water bodies that are “impaired” (i.e., do not meet one or more of the water quality standards established by the state). These waters are identified in the Section 303(d) list as waters that are

polluted and need further attention to support their beneficial uses. Once the water body or segment is listed, the state is required to establish a Total Maximum Daily Load (TMDL) for the pollutant. The TMDL is the maximum amount of a pollutant that a water body can receive and still meet the water quality standards. Typically, a TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources.

The water body closest to the Project area that is listed as impaired on the 303(d) list is Carquinez Strait. Carquinez Strait is listed as impaired for chlordane, DDT[2], dieldrin, dioxin compounds, mercury, exotic species, furan compounds, PCBs[2], and selenium (SWRCB, 2007).

Oil Pollution Act

The Oil Pollution Act of 1990 established a single uniform federal system of liability and compensation for damages caused by oil spills in U.S. navigable waters. The Act requires removal of spilled oil and establishes a national system of planning for, and responding to, oil spill incidents. The Project would involve continuation of the existing operations at the MT with slightly increased vessel traffic, therefore would be subject to oil prevention, control, and response requirements under this Act administered mostly by California State Lands Commission (CSLC) (see discussion below).

Porter-Cologne Water Quality Act

The Porter-Cologne Water Quality Control Act allows the SWRCB to adopt statewide water quality control plans or basin plans. The purpose of the plans is to establish water quality objectives for specific water bodies. The RWQCB has prepared the *Water Quality Control Plan* (*Basin Plan*) *for the San Francisco Bay Basin* (RWQCB, 2007), which establishes water quality objectives and implementation programs to meet the stated objectives and to protect the beneficial uses of the San Francisco Bay waters (see the San Francisco Bay Basin Plan discussion below). The act also authorizes the NPDES program under the Clean Water Act, which establishes effluent limitations and water quality requirements for discharges to waters of the State (see General Construction Permit discussion below).

San Francisco Bay Basin Plan. The San Francisco Bay RWQCB prepared the Basin Plan (RWQCB, 2007), which contains descriptions of the legal, technical, and programmatic basis for water quality regulation in the region. The Basin Plan describes beneficial uses of major surface waters and their tributaries. Table 4.10-1 lists the beneficial uses for the water bodies in the Project area.

Construction General Permit. Construction activities on one acre or more are subject to the requirements of the NPDES *General Permit for Discharges of Stormwater Runoff Associated with Construction Activity (Order 2009-0009)*, which is promulgated, by the SWRCB for the purpose of reducing impacts to surface waters that may occur due to construction activities, and is jointly administered by the SWRCB and the RWQCBs. The General Permit requires preparation

[2] DDT is Dichlorodiphenyltrichloroethane; PCB is polychlorinated biphenyls.

TABLE 4.10-1
BENEFICIAL USES FOR WATER BODIES IN THE PROJECT AREA

Water Body	Designated Beneficial Uses
Carquinez Strait	Industrial Service Supply; Ocean, Commercial, and Sport fishing; Estuarine Habitat, Fish Migration, Preservation of Rare and Endangered Species, Fish Spawning, Wildlife, Water Contact and Noncontact Recreation, Navigation
Suisun Bay	All of the above, and Industrial Process Water Supplies
San Francisco Delta	All of the above; Agricultural, Municipal and Domestic Water Supply, and Groundwater Recharge

SOURCE: RWQCB, 2007

and implementation of a stormwater pollution prevention plan (SWPPP) that incorporates best management practices to control erosion and sedimentation and protect receiving water quality. The Project would involve grading and construction activities over greater than one acre of land; and would be exempt from the construction SWPPP requirements set forth in the Order No. 2009-0009-DWQ because the Project would be termed as a "construction activity covered by an individual NPDES permit for storm water discharges" per Section I.C.29 - Activities Not Covered Under the General Permit (p. 7). In compliance with Provision C.7 of the NPDES Permit CA 0005789 (discussed below) Order R2-2006-070, Shell has prepared a SWPPP for construction activities at the Refinery property. Consistent with this SWPPP, Shell would prepare a Construction Stormwater Management Plan (CSMP) for the Project. This CSMP would be prepared and incorporated into the Refinery's SWPPP. As required by the NPDES permit, the SWPPP would be reviewed and updated (if needed) annually and submitted to the RWQCB for approval (Shell, 2011b).

Contra Costa County provides guidance for preparing a SWPPP and refer to the California Stormwater Quality Association's Stormwater Handbook (2010) for guidance regarding construction site stormwater control BMPs to employ during construction. The Project CSMP would be consistent with the Refinery SWPPP and would be reviewed by Contra Costa County to ensure that it achieves compliance with the County's Grading Ordinance (§716) and Stormwater Management and Discharge Control (§1014; discussed below).

Dewatering Requirements

Excavation and trenching activities in areas with shallow groundwater such as the tank farm site could require dewatering (the removal of groundwater by pumping), which would be discharged to the effluent treatment plant and subject to the Refinery's NPDES permit. The treatment and discharge of extracted groundwater would be covered by the permit.

California Oil Spill Prevention and Response Act

Following the 1989 Exxon Valdez crude oil spill and the 1990 American Trader crude oil spill off Huntington Beach, parallel to the federal Oil Pollution Act, the state Lempert-Keene-Seastrand Oil Spill Prevention and Response Act was passed to help prevent future spills and increase

response capabilities. The Act covers all aspects of marine oil spill prevention and response in California. As both a prevention and response organization, the Office of Spill Prevention and Response (OSPR) at the California Department of Fish and Game (CDFG) has the public trustee and custodial responsibilities for protecting, managing, and restoring the State's fish, wildlife, and plants. Under the Act, the CSLC investigates spills within the jurisdictional boundaries of California and assesses the cause of the spill to determine the effectiveness of its regulations and spill prevention programs (CDFG, 2008). Therefore, under the Act the CSLC has the primary authority and jurisdiction with respect to marine terminals, including the Shell MT. The operations at the MT are subject to requirements such as inspections and monitoring of the terminal, precautions and communications during transfer operations, and spill containment and mitigation monitoring requirements.

Local

Contra Costa County General Plan

The Project area, including the tank farm site, lies in Contra Costa County. The following goals and policies in the *Contra Costa County General Plan* (Contra Costa County, 2010) would be relevant to the Project:

> **General Water Resources**
>
> *Policy 8-75*: Preserve and enhance the quality of surface and groundwater resources.
>
> *Policy 8-91*: Grading, filling, and construction activity near watercourses shall be conducted in such a manner as to minimize impacts from increased runoff, erosion, sedimentation, biochemical degradation, or thermal pollution.
>
> **Water Resources Implementation Measures**
>
> *Policy 8-cy*: Through the environmental review process, the likely effects of construction and other proposed activities on nearby natural watercourses and related open space shall be determined. Measures shall be identified that will mitigate these effects and encourage the preservation of natural waterways and related open space.

Contra Costa County Code

Contra Costa County has adopted ordinances that have been subsequently incorporated into its municipal codes for the protection of water quality during construction. These include:

- Title 7 of the Code, Division 716 specifying grading and erosion control requirements;
- Title 10 of the Code, Division 1010 specifying watercourse protection requirements; and
- Title 10 of the Code, Division 1014 specifying stormwater requirements.

Section 1014 of the Contra Costa County Code (Stormwater Management and Discharge Control) seeks to eliminate, to the maximum extent practicable, the discharge of pollutants into local watercourses and municipal storm drain systems. Section 1014 requires that applicants for projects creating and/or redeveloping at least 10,000 square feet of impervious surface prepare a Stormwater Control Plan (SWCP) that provides for the treatment of stormwater runoff generated by the project.

Projects creating and/or redeveloping impervious surface in excess of one acre are required to not only treat stormwater runoff through preparation of a SWCP, but also to provide hydrograph modification management (resulting in post-project stormwater runoff flow rates and durations effectively matching the estimated pre-project levels) as per the County Stormwater C.3 Guidebook. Stormwater from the Project site ultimately drains into the Carquinez Strait mostly through enclosed pipes or engineered hardened channels after it receives treatment at an onsite treatment facility regulated by the NPDES permit (Order No. R2-2006-0070, NPDES No. CA0005789; discussed below). Stormwater from the Project area is treated either at the Refinery's effluent treatment plant or through sedimentation basins (Lake Slobodnik system) that function to remove suspended sediment prior to the discharge to Peyton Slough. Therefore, Shell would be subject to the NPDES permit requirements and would not be required to prepare a SWCP.

The County Health and Safety Code Chapter 6.95 requires, among other things, that any business which handles a specified quantity of a hazardous material establish a business plan for emergency response to a release or threatened release of a hazardous material. The business plan includes an inventory of hazardous materials handled by the business and includes a process to report to the administering agency and the State Office of Emergency Services occurrences of specified releases or threatened releases of hazardous materials. The purpose of this division is to impose regulations in addition to Health and Safety Code Chapter 6.95, for the protection of the public and emergency rescue personnel in the County and to facilitate implementation of said chapter, as authorized by Health and Safety Code section 25500 (Ordinances. 88-74 section 2, 87-5 section 2).

Contra Costa County (and the Contra Costa Countywide Clean Water Program)

The Contra Costa Countywide Clean Water Program (CCCWP), a collaboration between Contra Costa County, the 19 incorporated cities within the County, and the Contra Costa County Flood Control and Water Conservation District, was established as the local entity responsible for coordinating compliance with Municipal Separate Storm Sewer System (MS4) NPDES permits for jurisdictions throughout Contra Costa County.

Since the Project would be located within the unincorporated area of Contra Costa County, the CCCWP is being implemented in compliance with the MS4 NPDES Permit issued by the San Francisco Bay RWQCB ("Municipal Regional Permit") (RWQCB, 2009). Under the permit, the County requires construction sites to have site specific and seasonally- and phase-appropriate and effective best management practices in the following five categories: erosion control; run-on and runoff control; sediment control, active treatment systems (as necessary); good site management; and non-stormwater management (RWQCB, 2006a). The permit contains a comprehensive plan to reduce the discharge of pollutants to the "maximum extent practicable" and mandates that participating municipalities implement an approved stormwater management plan. The plan incorporates BMPs that include construction controls (such as a model grading ordinance), permanent stormwater management (treatment and flow control) facilities to manage runoff from new development and redevelopment projects, legal and regulatory approaches (such as stormwater ordinances), public education and industrial outreach (to encourage the reduction of pollutants at various sources), inspection activities, wet-weather monitoring, and special studies.

Since the Project area is regulated by the Refinery's NPDES permit with specific requirements for development and implementation of a SWPPP, the Project would not be subject to the County SWCP requirements.

NPDES Permit

The NPDES Permit (Order No. R2-2006-0070, NPDES No. CA0005789) issued by the San Francisco Bay RWQCB per Section 402 of the Clean Water Act regulates the point source discharges and stormwater discharges from the Refinery (RWQCB, 2006b). The point source discharge is associated with the onsite wastewater treatment system that receives the wastewater generated at the Refinery, and the stormwater collected from the west side of the Refinery and discharged into Carquinez Strait. The nonpoint source discharges collected from the east side of the Refinery are associated with stormwater that flows into the wastewater system or is discharged through a large stormwater contaminant/sedimentation basin and then into Peyton Slough. The NPDES permit establishes receiving water and effluent limitations for the discharges and requirements for monitoring that must be performed to confirm compliance with NPDES limits. The permit also requires Shell to update and submit the SWPPP annually and prepare an annual stormwater report for San Francisco Bay RWQCB review.

4.10.2.6 Project Baseline

The Project site is an existing Refinery with tank farms and refining equipment. Waterways in the Project area, and other features relevant to hydrologic resources for the Project area, are discussed above as part of the environmental setting. As relevant to water quality, potential contaminants, including crude oil, refined petroleum products, and other materials used for the maintenance and upkeep of the existing facilities, are also utilized on site, and stored in large quantities.

4.10.3 Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts to hydrology and water quality if it would:

a) Violate any water quality standards or waste discharge requirements;

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

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

d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface run-off in a manner which would result in flooding on-or off-site;

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

f) Otherwise substantially degrade water quality;

g) Place housing within a 100-year flood hazard area as mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map;

h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows;

i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam; or

j) Result in or cause inundation by seiche, tsunami, or mudflow.

4.10.4 Discussion of No Hydrology and Water Quality Impacts

Review and comparison of the setting circumstances and Project characteristics with each of the significance criteria stated above indicate no impacts associated with hydrology and water quality would result for criteria b, g, h, i, and j. The following discussion supports the reasoning for this conclusion.

b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge?

The Project would not include groundwater extraction or other activities that would affect groundwater supplies. In addition, all Project elements would be constructed within previously developed areas and would not substantially change the existing conditions in terms of groundwater recharge. Therefore the Project would have no impact on groundwater recharge and supplies.

g, h) The Project would not place housing within a 100-year flood hazard area.

The Project would not result in construction of any housing on-site, nor would it displace any people or housing thereby necessitating the construction of replacement housing elsewhere. Therefore, no housing would be located within a mapped flood hazard area and no impact would occur with respect to this criterion.

i) The Project would not expose people to a significant risk of loss, injury, or death due to flooding, including flooding as a result of levee or dam failure.

Martinez Reservoir is located less than 1,000 feet south of the Refinery boundary (ABAG, 1995). Portions of the Project area are located in the inundation zone of Martinez Reservoir in the unlikely event of its failure. However, the Project would be located on a graded and developed area in the Refinery property and Project activities would involve reconfiguration or replacement of existing tanks and construction of a new tank in areas already developed with crude oil storage tanks. The Project would not change the level of risk associated with flooding or expose people to

a significant risk or loss, injury, or death to flooding from dam failure. Therefore, the Project is anticipated to have no impact.

j) Would the Project be subject to inundation by seiche, tsunami, or mudflow?

As described above in Section 4.10.2, *Setting*, the Project would not be located in an area that would likely be affected by seiche or tsunami. The Project would not denude the Project area of vegetation or cause other impacts that would result in increased potential for mudflow on-site. The Project construction and operation activities would occur on developed lands within the Refinery and would not contribute to or cause the scale of mass movement required to produce a mudflow. Therefore, there would be no impact.

4.10.5 Discussion of Impacts and Mitigation Measures

a) Would the Project violate any water quality standards or waste discharge requirements?

f) Would the Project otherwise substantially degrade water quality?

Impact 4.10-1: Project construction activities could cause soil erosion and sedimentation resulting in degradation of the receiving water quality. *(Less than Significant)*

Project construction activities would involve grading and excavation associated with tank construction at the crude oil tank farm site. The existing tank berms/levees would be modified to accommodate the new tanks and excavation would be required for the foundations of the new tanks. Additional grading could be necessary in the laydown areas to accommodate larger equipment and construction materials. Such soil disturbing activities could cause erosion and the eroded soil may come in contact with stormwater and result in sedimentation. However, any stormwater collected in the Project area would either be routed to the effluent treatment plant or to a set of stormwater pond/sedimentation basins prior to discharge to Carquinez Strait or Peyton Slough, respectively. This could adversely affect the marshy area east of the tank farm and also may affect Peyton Slough, and eventually the Carquinez Strait. In addition, temporary storage of chemicals such as oil, grease, and fuel and the use of construction equipment such as bulldozers and cranes could result in accidental spills or inadvertent releases that could degrade water quality of the receiving waters. However, as described in Section 4.10.2.2 and Chapter 3, *Project Description*, Shell would be required to prepare a project specific CSMP that would be incorporated into the SWPPP for the Refinery. Shell would incorporate spill avoidance and control practices during construction to minimize any water quality impacts.

Contaminants such as oily sludge and crude-coated steel may be generated onsite during construction. Contaminated soils may be present in the tank area and exposure to stormwater flow during construction or operations could result in degradation of water quality. However, prior to construction, soils would be sampled and tested in order to develop an initial plan for handling any excavated soil. Soil determined to be hazardous would be sent to offsite hazardous waste

disposal facilities (ERM, 2010b). In addition, the project could be subject to the Contra Costa County Department of Toxic Substances Control requirements protective of human and environmental health. Please refer to Section 4.9, Hazards and Hazardous Materials, for impacts related to exposure to contaminants.

Implementation of the SWPPP and compliance with NPDES permit limits for stormwater discharges would minimize water quality impacts. The impact would therefore be less than significant.

Mitigation: None required.

Impact 4.10-2: Project construction would involve dewatering that could cause degradation of water quality. ***(Less than Significant)***

Given the likelihood of shallow subsurface water in lowland areas, especially at the tank farm site (see Section 4.10.2.3), any potential excavation during Project construction could intercept the shallow groundwater table and may require groundwater dewatering. The extracted groundwater would be discharged to the Refinery's effluent treatment plant and after treatment, would be discharged under the Refinery's NPDES permit to the Carquinez Strait. The discharge therefore would be in compliance with the regulatory requirements and not cause a significant impact.

Mitigation: None required.

Impact 4.10-3: Project-related increase in operations at the MT could affect water quality in the Bay. ***(Significant and Unavoidable)***

In addition to continuing the existing operations, the Project would result in an increase in the total daily volume of crude oil shipments received at the MT (from the current daily average of 27 thousand barrels (bbl) to up to 120 thousand bbl). There would approximately be one additional ship per week to maintain production levels at the Refinery. If not managed properly, an increase of 107 thousand barrels of oil on a daily basis could increase the risk of spill or accidental release of oil in the Bay during the trip or during transfer operations.

As described in Chapter 3, Project Description, there are two breasting dolphins (sturdy pilings for protecting the wharf from moored vessels) and two mooring dolphins connected by walkways on each side of the wharf to attach the vessel's mooring lines. Oil-containment booms are located on each end of the wharf. Hydrocarbon pipelines connect the MT to the Refinery storage tanks on the upland parcel. All pipelines connecting the MT to the Refinery tank farm are above ground, regularly inspected, and painted for corrosion protection. In addition, as required by Contra Costa County Ordinance 2005-34, Shell is required to have a business plan for emergency response to any release or threatened release of a hazardous material. The plan typically includes an inventory

of hazardous materials handled by the business, and outlines training procedures for employees, emergency response procedures, and preventative measures to minimize the potential for accidental release.

With respect to potential spills from marine vessels associated with the Project, an analysis of the potential spills that could occur as a result of Project implementation was conducted and is provided in Appendix C. The analysis derived probabilities of spill volumes within the shoreline zones resulting from a spill of a certain material and volume at the MT and also at an in-transit location at the Carquinez Bridge. The analysis assumed eight scenarios consisting of different spill locations (i.e., Shell MT and Carquinez Bridge), times of year that the spill would occur (i.e., summer and winter), and spill volumes (1,680 bbl, 168 bbl, 50 bbl, and 20,000 bbl). Spill transport was evaluated at multiple times during a five-day simulation period, and the maximum probabilities of spill volumes exceeding a critical threshold value (level of concern) in each shoreline zone were determined. It was assumed that spill materials do not mix, and are all present on the surface as a sheen. The level of concern in each shoreline zone was defined as the volume of material present in each shoreline zone, and was determined based on the shoreline zone area (8,200 feet by 1,650 feet) and the thickness of the crude oil sheen.

Based on the modeled sheen thickness, a volume of 0.6 barrel per shoreline zone was determined to be the level of concern upon which probabilities of impact were calculated. The reasonable worst case spill scenarios at the Shell MT (1,680 bbl) and at the Carquinez Bridge (20,000 bbl) indicated the greatest probabilities of exceeding the levels of concern at the shorelines west of the MT past the Carquinez Bridge and east to Chipps Island and Mallard Island. Probabilities of exceedance were slightly greater for winter months than summer and exceeded to areas to the Golden Gate and south of Alameda. As is discussed in Sections 4.4, *Biological Resources* and 4.9, *Hazards and Hazardous Materials*, crude oil or fuel oil spills from marine vessels would result in significant and unavoidable impacts on the environment through the temporary degradation of the water quality in the Bay. As is also discussed in those sections, the recently certified CSLC EIR for the Shell MT lease renewal also identified significant and unavoidable impacts from potential oil spills. An oil spill from a marine vessel associated with Project operations would constitute a significant and unavoidable impact to water quality in the Bay.

Mitigation: Implement Mitigation Measures 4.4-2 and 4.9-1.

Significance after Mitigation: A review of accidental spills associated with the MT indicate that there have been four spill events between 1984 and 2009 of volumes between 1 and 25 bbl, and no significant environmental impact was documented (Shell, 2011c). Given this history and because the Project would add only one additional ship weekly, the likelihood of a spill occurring in a large volume would be very low and regular operational protocols, including the use of secondary containment, would minimize the potential effects of a release on water quality in the Bay. Although the risk would be low, the impact would be *significant and unavoidable* even with implementation of the County and CSLC mitigation measures.

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

d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface run-off in a manner which would result in flooding on-or off-site.

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

Impact 4.10-4: The Project could result in change in the drainage patterns that would increase stormwater flows that could increase erosion and affect water quality. Increased storm flows could also cause flooding downstream. *(Less than Significant)*

Post-construction, the Project would involve operation of the new tanks and continued operation of the marine terminal to receive crude oil from vessels. As described in Chapter 3, *Project Description*, the existing crude oil storage tanks and mix tank would be decommissioned and removed, and the new storage tanks and mix tank would be built in the same tank farm area. The new enclosed piping from the new tanks to the oil/water separation facilities would be installed aboveground. These Project elements would add approximately 52,487 square feet of tank surface area, which would increase the stormwater flows by 0.2 percent. The stormwater from the tank farm area, including the stormwater collected on the external floating roofs, would be routed to the effluent treatment plant, which has a capacity of 10 million gallons per day (mgd) to treat and discharge storm flows, or to Lake Slobodnik (discharge point E002). The Project activities would occur in an existing graded and developed tank farm site and stormwater flows and quality would be monitored and reported as per the NPDES permit.

The new crude oil storage tanks would be constructed per American Petroleum Institute 650 Welded Tanks for Oil Storage construction standards with crude oil-compatible materials in order to minimize the potential for cracking, corrosion, and other integrity issues. In addition to the leak detection system, secondary containment systems would be installed for the tanks, in the same containment area as the current tanks. The berms of the containment area would be modified to accommodate the increased storage capacity. Secondary containment would be capable of containing 110 percent of the volume of the largest crude oil storage tank, as required by Spill Prevention Control and Countermeasures (SPCC) regulations (ERM, 2010b; see Section 4.9, *Hazards and Hazardous Materials*, for details). Stormwater that falls within the tank containment berms would be managed in accordance with Refinery stormwater practices and SPCC plan regulations. Uncontaminated stormwater would be routed to the Refinery stormwater system that is governed by the Refinery's NPDES permit. The surface area that collects stormwater at the location of the crude oil storage and blending tanks would remain the same, and a higher percentage of the area would be covered by the storage and blending tanks; therefore, the Project would have little or no adverse effect on stormwater discharges or quality. Further, any minor increase in stormwater that would occur (~0.2 percent) would be treated and discharged within the 10 mgd capacity of the effluent treatment plant or to Lake Slobodnik (discharge point

E002) and can be accommodated by the retention capacity of Lake Slobodnik as well as the ETP (see Section 4.10.2.1, *Hydrology*, above). The impact would therefore be less than significant.

Mitigation: None required.

Impact 4.10-5: The Project would involve continuation of current operations and would cause negligible change in water quality. *(Less than Significant)*

Operation of the Project would not result in an increase in throughput to the Crude Oil Distillation Unit. The Project would not result in any modification to hydrocarbon processing units nor would its implementation cause an increase in crude oil processing capacity at the Refinery. The Project would not cause any appreciable increase in process wastewater volume. The type of wastewater generated by the Project would be similar in nature to the wastewater currently generated at the Refinery. Any process wastewater generated by the Project would be treated at the Refinery's effluent treatment plant and discharged through the existing outfall into Carquinez Strait, in compliance with the RWQCB's NPDES permit (CA 0005789). The impact would be less than significant.

Mitigation: None required.

4.11 Land Use and Planning

4.11.1 Introduction

This section analyzes the Project's relationship to land use and planning. Discussed are the physical and regulatory setting, the baseline for determining environmental impacts, the significance criteria used for determining environmental impacts, and potential impacts associated with construction, operation, and maintenance of the Project.

4.11.2 Setting

4.11.2.1 Regional and Local Setting

Shell's Martinez Refinery (Refinery) is located approximately 25 miles northeast of San Francisco (see, Section 3, *Project Description*, Figure 3-1) adjacent to the community of Martinez. Approximately 20 percent of the Refinery is located within the corporate limits of the City of Martinez. The remainder of the Refinery is in an unincorporated area of the County. All of the CTRP components would be constructed within the County. The general area of the CTRP and Refinery supports a wide range of land uses, ranging from heavy industry to open space. The land uses that surround the Refinery are described as follows:

- North: The Refinery is bordered to the north Heavy Industry (HI) land use and the Carquinez Strait water way.
- East: To the east the Refinery is highway 680, there are some public lands (PS) just to the east of the CTRP site a wetland area across highway 680 designated as open space (OS).
- South: Along the southern edge of the Refinery are lands designated as commercial (CO), multiple family residential light (ML) and single family residential heavy (SH).

  West: These lands are similar in mix to the land use along the southern area of the Refinery however, directly west of the Refinery is the central downtown area of Martinez.

4.11.2.2 Regulatory Setting

Section 15125(d) of the CEQA Guidelines states that "the EIR shall discuss any inconsistencies between the Project and applicable general plans and regional plans" as a part of the discussion of the existing setting of the project. However, the Guidelines further state that inconsistency with an adopted plan does not necessarily indicate a significant impact by the project.

This section considers adopted County and regional plans and the policies that are applicable to the Project, and determines whether the Project conforms with those plans and policies. Plans that were reviewed include the County's General Plan and Zoning Ordinance. Other local, regional or State plans and policies that relate to topical areas other than land use (such as air quality, water quality and biological resources) are discussed generally here and in more detail in the respective topical sections of this EIR.

Contra Costa County General Plan

The Contra Costa County General Plan designates the Project site as HI (Heavy Industry) as is the entire Refinery similarly designated. The HI designation allows activities requiring large areas of land with convenient truck and rail access. These uses are typically not compatible with residential uses in close proximity and the operations conducted may be characterized by noise or other conditions requiring spatial separation. Uses may include metalworking, chemical or petroleum product processing and refining, heavy equipment operation and similar activities. The CTRP will be constructed and operated on existing Refinery property which has been and is currently used for identical purposes as the CTRP and will require no change to any land use designation and would be expected to conform to the Contra Costa County General Plan (Contra Costa County, 2010).

Growth Management, 65/35 Standard, and Urban Limit Line

In 1990, the voters of Contra Costa County passed Measure C-1990, which established the 65/35 Land Preservation Standard. The purpose of the Standard is to limit urban development to no more than 35 percent of the land in the County. Conversely, Measure C-1990 requires that no less than 65 percent of the land in the County be preserved for parks, open space, agriculture, wetlands, and other non-urban uses. The 65/35 Land Preservation Standard is a policy that applies to the County planning process and is implemented through the establishment of the Urban Limit Line (ULL), which is aimed at limiting annexation, extension of urban services and urban-type development in areas beyond the ULL. In 2000, the County conducted a land use inventory to assess its development status relative to the 65/35 standard. That analysis measured the developed or urban area of the County at 30 percent and the undeveloped or non-urban portion at 70 percent (Contra Costa County, 2010). The ULL is incorporated into the 2005-2020 Contra Costa County General Plan. The CTRP is located within the ULL of Contra Costa County (Contra Costa County, 2010).

Contra Costa County Zoning Ordinance

The County Zoning Ordinance is contained in Title 8 of the County Ordinance Code. The vast majority of the Refinery is zoned Heavy Industrial. The Heavy Industrial zoning designation permits heavy industrial manufacturing uses of all kinds, including, but not limited to, the manufacturing or processing of petroleum, lumber, steel, chemicals, explosives, fertilizers, gas, rubber, paper, cement, sugar, and all other industrial or manufacturing products. A wide range of other uses may be permitted in the Heavy Industrial zoning district upon approval of a land use permit. Heavy Industrial uses can create land use conflicts as operations may be noisy, generate odor or dust, or otherwise warrant spatial separation from residential and other sensitive land uses (Contra Costa County, 2005).

4.11.2.3 Project Baseline

Baseline conditions reflect the ongoing operation of the Refinery as it existed at the time of the issuance of the NOP (February 2010), as an oil refinery, including on going operations and maintenance activities.

4.11.3 Significance Criteria

Based on CEQA Guidelines Appendix G, a project would have significant adverse impacts to land use and planning if it would:

a) Physically divide an established community;

b) Conflict with any applicable land use plan, policy, or the regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect; or

c) Conflict with any applicable habitat conservation plan or natural community conservation plan.

4.11.4 Discussion of No Land Use and Planning Impacts

Review and comparison of the setting circumstances and Project characteristics with all of the significance criteria stated above, clearly show that no impacts associated with land use and planning would result. The following discusses the reasoning that supports this conclusion:

a) The Project would not physically divide an established community.

The CTRP site is located in a heavily industrialized area of North Central Contra Costa County and there are no established communities on the Refinery or in the CTRP area. Therefore, the Project would have no impact regarding the division of an established community.

b) Conflict with any applicable land use plan, policy, or the regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect.

The CTRP would be constructed and operated on lands already established and used for identical purposes as the Project. Consequently, it would conform to the Contra Costa County General Plan, Urban Limit Line and Contra Costa County Zoning Ordinance code, assuming that the County approves the land use permit for Shell. Therefore, the Project would have no impact to or on local land use plans and policies.

c) Potential of the Project to conflict with an adopted habitat conservation plan or natural community conservation plan.

The CTRP is not located within an area identified in a habitat conservation plan or natural community conservation plan. In addition, there are no known habitat conservation plans or natural community conservation plans proposed for adoption that would include Refinery property. The Project would have no impact on a habitat conservation plan or a natural community conservation plan. A discussion of special-status species that the Project could potentially impact can be found in Section 4.3, *Biological Resources*.

4.11.5 Discussion of Impacts and Mitigation Measures

There are no impacts associated with land use and planning.

4.12 Mineral Resources

4.12.1 Introduction

This section analyzes the Project's relationship to mineral resources. Discussed are the physical and regulatory setting, the baseline for determining environmental impacts, the significance criteria used for determining environmental impacts, and potential impacts associated with construction, operation, and maintenance of the Project.

4.12.2 Setting

4.12.2.1 Regional and Local Setting

This section provides setting information specific to mineral resources in the region and in the Project area. Noteworthy mineral resource areas are located in Contra Costa County near the communities of Port Costa, Concord, Clayton, and Byron. The Project would be located in the industrialized area that straddles unincorporated Contra Costa County and the City of Martinez, in the northern portion of the county. The closest significant mineral resource areas are shale deposits in the Port Costa area and crushed Diabase rock on the north side of Mt. Diablo in the Concord area. These resources are designated approximately four miles northwest and approximately 11 miles southeast of the Project area, respectively (Contra Costa County, 2010).

Contra Costa County is one of the leading counties in the State in terms of natural gas production. The County also has a small volume of oil production. The most productive gas and oil fields are concentrated in the eastern portion of the County, north of Brentwood and east of Antioch, several miles from the Project area. No significant gas or oil concentrations are known to exist in the immediate vicinity of the Project (Contra Costa County, 2010).

Mineral Resource Classification

In accordance with the Surface Mining and Reclamation Act (SMARA) of 1975, the State of California has established a mineral land classification system to help identify and protect mineral resources in areas that are subject to urban expansion or other irreversible land uses that would preclude mineral extraction. Specific types of mineral resources protected under this act are discussed below in Section 4.12.2.2, *Regulatory Setting*. This system provides guidance for identifying mineral resource zones (MRZs) based on the following four general categories:

> MRZ-1: Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence
>
> MRZ-2: Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood exists for their presence
>
> MRZ-3: Areas containing mineral deposits, the significance of which cannot be evaluated
>
> MRZ-4: Areas where available information is inadequate for assignment to any other zone

The area within the Shell Martinez Refinery property boundary is designated as having no known mineral resources (MRZ-1). However, there is not sufficient geologic information available to determine the mineral resource potential for portions of Project area (MRZ-4). The mineral resources with indeterminate significance (MRZ-3) are located one mile east of the Project area between Highway 680 and Pacheco Creek. The closest significant mineral resource identified near the Project area (MRZ-2) are four miles northwest and 11 miles southeast of the Project area (CDMG, 1982).

4.12.2.2 Regulatory Setting

State of California

Surface Mining and Reclamation Act of 1975

Pursuant to the Surface Mining and Reclamation Act of 1975 (SMARA), the California Geological Survey (CGS) has evaluated areas in California for mineral resource potential and has classified the land accordingly. One of the objectives of SMARA is to identify areas of the State that contain significant mineral resources so these lands can be set aside for uses that are compatible with possible future mining. Natural resources that are identified include air, minerals, water, sand and gravel, timber, energy, and other resources used for construction. Under SMARA, protected mineral resources include construction materials, industrial and chemical mineral materials, metallic and rare minerals, and non-fluid mineral fuels. Non-fuel mineral resources include metals such as gold, silver, iron, and copper; industrial minerals such as boron compounds, rare-earth elements, clays, limestone, gypsum, salt, and dimension stone; and construction aggregate, which includes sand, gravel, and crushed stone. CGS has mapped many areas of the state using the California mineral land classification system to identify areas with known mineral resources. Mapped resources in the vicinity of the Project or in the Project area are discussed in Section 4.12.2.1, Regional and Local setting, above.

Contra Costa County General Plan

The Conservation Element of the Contra Costa County General Plan (2010) identifies mineral resource areas within the County and contains mineral resource-related goals, policies and implementation measures that are applicable to all development projects in the unincorporated areas of the County. Examples are Mineral Resource Goals 8-M and 8-N, Policy 8-58, and Implementation Measure 8-bu, which ensure the following: viability of mineral extraction operations that are important to the County’s economy; protection of identified valuable mineral resource areas from incompatible land uses; and planning of future development in the vicinity of valuable mineral resource areas in a way that would minimize incompatibility among uses (Contra Costa County, 2010).

The Conservation Element also contains oil and gas production-related goals, policies and implementation measures that are applicable throughout the unincorporated areas of the County. Examples are Oil and Gas Resources Goals 8-R and 8-S, Policy 8-69, and Implementation Measure 8-cj, which ensure the following: beneficial utilization of oil and gas resources,

minimization of impacts on surrounding uses and the environment, agricultural viability of rural areas, and resolution of conflicts between proposed oil and gas wells and residential uses (Contra Costa County, 2010).

4.12.2.3 Project Baseline

Baseline conditions reflect the ongoing operation of the Project as an oil refinery, including operations and maintenance activities. As stated above, no oil and gas extraction operations are occurring in the project area. No mineral resource areas are known to exist within the Project area; the nearest known mineral resource area with indeterminate significance (MRZ-3) is located approximately one mile east of the Project area.

4.12.3 Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts to mineral resources if it would:

a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state; or

b) Result in the loss or availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.

4.12.4 Discussion of No Mineral Resources Impacts

A review and comparison of the setting circumstances and Project characteristics with the significance criteria stated above indicates that no mineral resource impacts would result under the following criteria:

a) The project would result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state.

The Project could result in significant impacts to mineral resources of value to the region or State if resources that are currently available become unavailable as a result of Project implementation. The area within the Shell Martinez Refinery property does not contain identified mineral resources. However, portions of the property have been designated under SMARA as MRZ-4 in the absence of available information to assign another classification (see Section 4.12.2.1 for details). Therefore, there is a very minimal potential for the Project area to be underlain by mineral resource that could be of value to the region or State. Implementation of the Project would not expand the refinery or in any way decrease the level of accessibility to mineral resources potentially underlying the site. As discussed previously, the Project would be located at a distance of over four miles from any indentified significant mineral resource areas (MRZ-2). Additionally, the Project would not be located within significant known mineral, oil, or gas resource extraction areas. Thus, the Project would not result in the loss of availability of known mineral resources, make extraction of mineral resources more difficult, or make them inaccessible. Therefore, implementation of the Project would have no impact on mineral resources of regional or State value.

b) The project would result in the loss of availability of a locally important mineral resource recovery site.

As described under Section 4.12.2.1 and in the Contra Costa County General Plan, the local mineral resources closest to the Project area are located four miles northwest of the project site in Port Costa and 11 miles southeast in the Concord area. The Project would not be located within any locally important significant mineral, oil, or gas resource areas. Furthermore, implementation of the Project would not increase the area of the Shell Martinez Refinery. Therefore, the Project would not result in the loss of availability of known mineral resources, make extraction of mineral resources more difficult, or make them inaccessible. Therefore, implementation of the Project would have no impact on mineral resources of local importance.

4.12.5 Discussion of Impacts and Mitigation Measures

There would be no impacts to mineral resources.

4.13 Noise

4.13.1 Introduction

This section analyzes the Project's relationship to noise. Discussed are the regulatory setting, the baseline for determining environmental impacts, the significance criteria used for determining environmental impacts, and potential construction and operational impacts of Project-related noise on existing sensitive receptors. Mitigation measures are identified to reduce potentially significant impacts. Background information on environmental acoustics, including definitions of terms commonly used in noise analysis, is also provided.

4.13.2 Setting

4.13.2.1 Noise Background

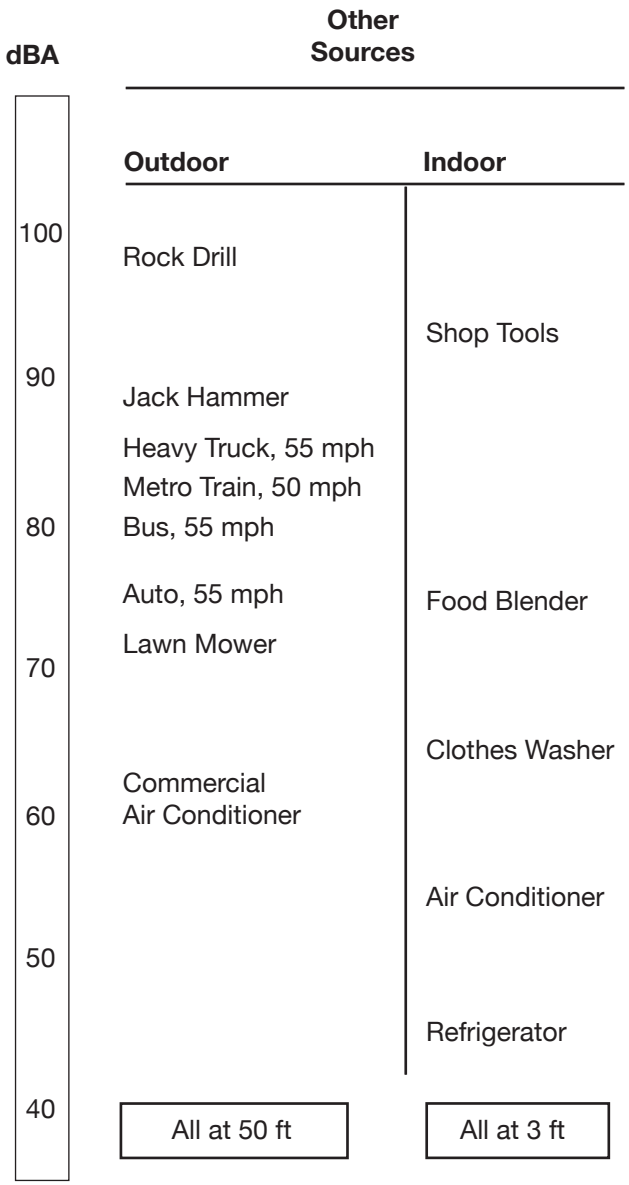
Sound is mechanical energy transmitted by pressure waves through a medium such as air. Noise can be defined as unwanted sound. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level. Sound pressure level is measured in decibels (dB), with zero dB corresponding roughly to the threshold of human hearing and 120 to 140 dB corresponding to the threshold of pain.

Sound pressure fluctuations can be measured in units of hertz (Hz), which correspond to the frequency of a particular sound. Typically, sound does not consist of a single frequency, but rather a broad band of frequencies varying in levels of magnitude (sound power). When all the audible frequencies of a sound are measured, a sound spectrum is plotted consisting of a range of frequency spanning 20 to 20,000 Hz. The sound pressure level, therefore, constitutes the additive force exerted by a sound corresponding to the sound frequency/sound power level spectrum.

The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. As a consequence, when assessing potential noise impacts, sound is measured using an electronic filter that de-emphasizes the frequencies below 1,000 Hz and above 5,000 Hz in a manner corresponding to the human ear's decreased sensitivity to low and extremely high frequencies instead of the frequency mid-range. This method of frequency weighting is referred to as A-weighting and is expressed in units of A-weighted decibels (dBA). Some typical A-weighted sound levels are presented in Figure 4.13-1.

Noise Exposure and Community Noise

An individual's noise exposure is a measure of the noise experienced by the individual over a period of time. A noise level is a measure of noise at a given instant in time. However, noise levels rarely persist consistently over a long period of time. In fact, community noise varies continuously with time with respect to the contributing sound sources of the community noise



SOURCE: Federal Transit Administration, 2006

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Figure 4.13-1

Typical A - Weighted Sound Levels

environment. Community noise is primarily the product of many distant noise sources, which constitute a relatively stable background noise exposure, with the individual contributors unidentifiable. Background noise levels change throughout a typical day, but do so gradually, corresponding with the addition and subtraction of distant noise sources and atmospheric conditions. The addition of short duration single event noise sources (e.g., aircraft flyovers, motor vehicles, sirens) makes community noise constantly variable throughout a day.

These successive additions of sound to the community noise environment vary the community noise level from instant to instant requiring the measurement of noise exposure over a period of time to legitimately characterize a community noise environment and evaluate cumulative noise impacts. This time-varying characteristic of environmental noise is described using statistical noise descriptors. The most frequently used noise descriptors are summarized below:

L_{eq}: The equivalent sound level is used to describe noise over a specified period of time, in terms of a single numerical value. The L_{eq} is the constant sound level which would contain the same acoustic energy as the varying sound level, during the same time period (i.e., the average noise exposure level for the given time period).

L_{max}: The instantaneous maximum noise level measured during the measurement period of interest.

DNL: The day-night noise level (DNL; also referred to as L_{dn}) or the energy average of the A-weighted sound levels occurring during a 24-hour period and which accounts for the greater sensitivity of most people to nighttime noise by weighting noise levels at night ("penalizing" nighttime noises). Noise between 10:00 p.m. and 7:00 a.m. is weighted (penalized) by adding 10 dBA to take into account the greater annoyance of nighttime noises.

CNEL: Similar to the DNL, the Community Noise Equivalent Level (CNEL) adds a 5-dBA "penalty" for the evening hours between 7:00 p.m. and 10:00 p.m. in addition to a 10-dBA penalty between the hours of 10:00 p.m. and 7:00 a.m.

Effects of Noise on People

The effects of noise on people can be placed into three categories:

- *Interference with activities such as speech, sleep, and learning* – The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors, the thresholds are about 15 dBA higher. Interior residential standards for multi-family dwellings are set by the State of California at 45 DNL. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses.

- *Subjective effects of annoyance, nuisance, and dissatisfaction* – Based on attitude surveys used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas, the main causes for annoyance are interference with speech, radio and television, house vibrations, and interference with sleep and rest. The DNL as a measure has been found to provide a valid correlation of noise level and the percentage of people annoyed. Three aspects of community noise are most important in

determining subjective response – the level of sound, the frequency composition or spectrum of the sound and the variation of sound level with time.

- *Physiological effects such as hearing loss or sudden startling* – While physical damage to the ear from an intense noise impulse is rare, a degradation of auditory acuity can occur even within a community noise environment. Hearing loss occurs mainly due to chronic exposure to excessive noise, but may be due to a single event such as an explosion. Natural hearing loss associated with aging may also be accelerated from chronic exposure to loud noise.

Environmental noise typically produces effects in the first two categories. Workers at industrial plants often experience noise in the last category. There is no completely satisfactory way to measure the subjective effects of noise, or the corresponding reactions of annoyance and dissatisfaction. A wide variation exists in the individual thresholds of annoyance and different tolerances to noise tend to develop based on an individuals past experiences with noise.

Thus, an important way of predicting a human reaction to a new noise environment is the way the new noise compares to the existing noise levels to which one has adapted: the so called “ambient noise” level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise would be judged by those hearing it. With regard to increases in A-weighted noise level, the following relationships occur:

- Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived;
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference when the change in noise is perceived but does not cause a human response;
- A change in level of at least 5 dBA is required before any noticeable change in human response would be expected; and
- A 10-dBA change is subjectively heard as approximately a doubling in loudness and can cause an adverse response.

These relationships occur in part because of the logarithmic nature of sound and the decibel system. A ruler is a *linear* scale: it has marks on it corresponding to equal quantities of distance. One way of expressing this is to say that the ratio of successive intervals is equal to one. A *logarithmic* scale is different in that the ratio of successive intervals is not equal to one. Each interval on a logarithmic scale is some common factor larger than the previous interval. A typical ratio is 10, so that the marks on the scale read: 1, 10, 100, 1,000, 10,000, etc., doubling the variable plotted on the x-axis. The human ear perceives sound in a non-linear fashion; hence the decibel scale was developed. Because the decibel scale is based on logarithms, two noise sources do not combine in a simple additive fashion, rather they combine logarithmically. For example, if two identical noise sources produce noise levels of 50 dBA, the combined sound level would be 53 dBA, not 100 dBA.

Noise Attenuation

Sound level naturally decreases as with distance from the source. This basic attenuation rate is referred to as the *geometric spreading loss*. The basic rate of geometric spreading loss depends on whether a given noise source can be characterized as a point source or a line source. Point sources of noise, including stationary mobile sources such as idling vehicles or onsite construction equipment, attenuate (lessen) at a rate of 6.0 dBA per doubling of distance from the source. In many cases, additional noise attenuation occurs due to ground absorption, reflective wave canceling, and physical barriers and/or topography that block the line of sight between the source and receiver. These factors are collectively referred to as *excess ground attenuation*.

Trees and vegetation, buildings, and barriers reduce the noise level that would otherwise occur at a given receptor distance. However, for a vegetative strip to have a noticeable effect on noise levels, it must be dense and wide. For example, a stand of trees must be at least 100 feet wide and dense enough to completely obstruct a visual path to the source to attenuate noise by five dB (Caltrans, 1998). A row of structures can shield more distant receivers depending upon the size and spacing of the intervening structures and site geometry. Generally, for an average residential area where the first row of houses cover at least 40 percent of the total area, the reduction provided by the first row of houses is approximately 3.0 dB and 1.5 dB for each additional row (Caltrans, 1998).

Vibration

Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings. The root mean square (RMS) amplitude is most frequently used to describe the affect of vibration on the human body. The RMS amplitude is the average of the squared amplitude of the signal. Decibel notation (VdB) is commonly used to measure RMS. The decibel notation acts to compress the range of numbers required to describe vibration (FTA, 2006). Typically, ground-borne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration.

4.13.2.2 Environmental Setting

Existing Ambient Noise Environment Near the Project Site

The dominant existing sources of both noise and vibration within the vicinity of the Refinery include the operations at the Refinery and traffic on the major roadways and nearby rail lines. The operation of equipment and vehicles within the Refinery generates varying levels of noise throughout the day. In addition, major roadways in the vicinity of the Refinery, including Pacheco Boulevard, Shell Avenue, Marina Vista Way, and Interstate 680 (I-680), generate moderate to high traffic noise levels. Large trucks associated with the Refinery and other industrial sites that frequently travel along these roads can generate noise levels in the high

80-dBA range at 50 feet. Also, a rail line used by the Union Pacific Railroad Company (UPRR) and Amtrak to ferry passengers and freight, passes within approximately 3,000 feet northwest of the proposed tank farm site and approximately 50 feet north of the Refinery. UPRR transports goods to 23 states daily with a fluctuating number of trains that pass through Martinez. Amtrak currently operates a total of 44 trains per day along four daily routes that pass through the Amtrak Martinez Station. The closest airport to the Project site is Buchanan Field in Concord, approximately three miles to the southeast.

To further characterize the ambient noise environment in the Project area, 24-hour noise measurements were taken at four separate locations along the fence line within the Refinery in close proximity to either the proposed construction work sites or the nearest sensitive receptor to the proposed work sites, and outside of the Refinery along the Refinery fence line. Consistent with the City of Martinez ordinance, noise readings were taken with a noise monitor using an "A-weighting" scale and a slow response with microphones, utilizing a wind shield. The microphones were located approximately six feet above grade and more than 10 feet away from any wall. DNL noise levels that were calculated based on the 24-hour noise measurement readings are presented in Table 4.13-1. As can be seen in table, noise levels were consistent between the measurement days, with the largest difference between readings at the same location of only 1 dB DNL. An increase in noise level of less than 3 dB is not usually detectable by an average person. The noise monitoring locations are illustrated in Figure 4.13-2.

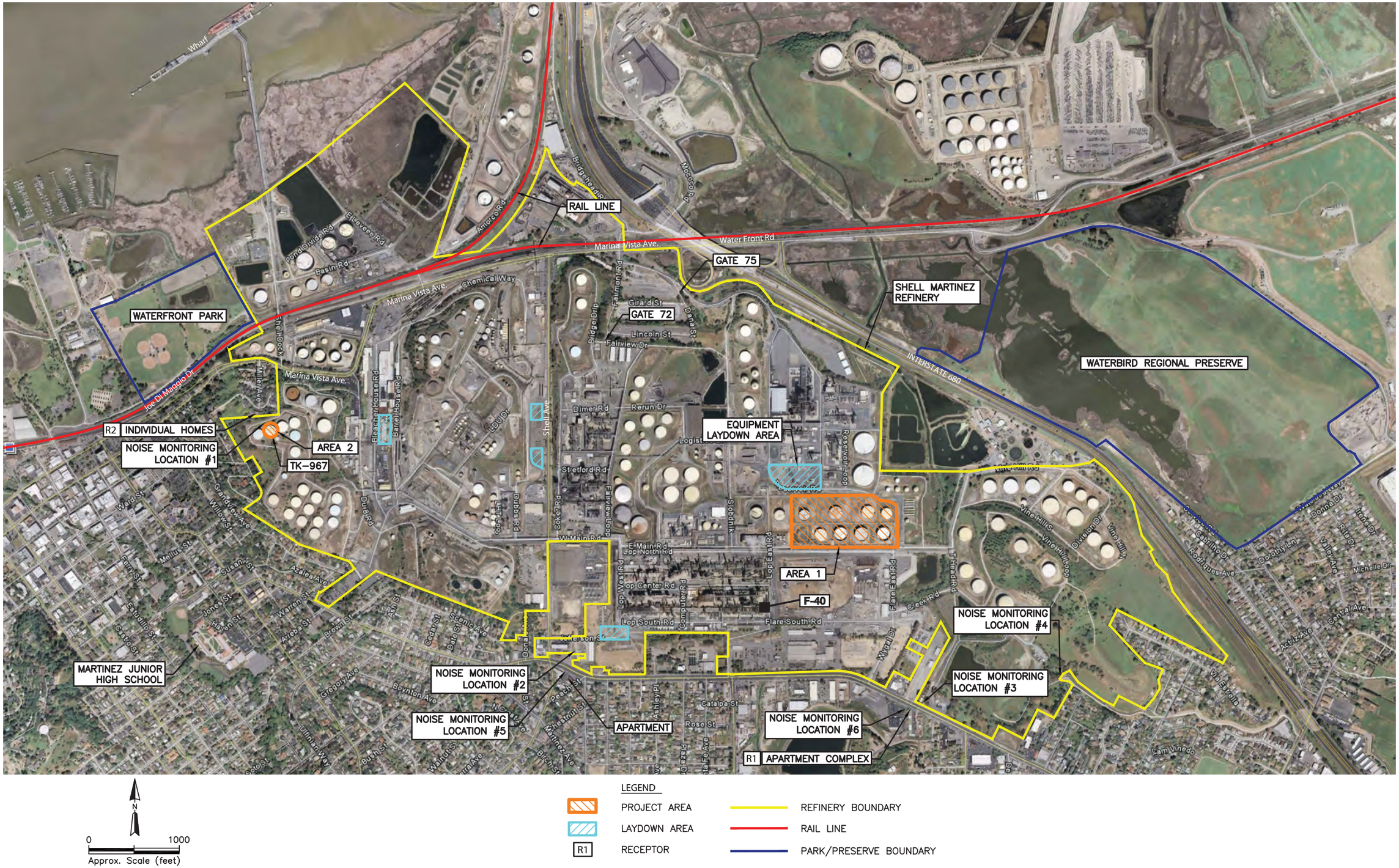
TABLE 4.13-1
AMBIENT DNL NOISE LEVELS IN THE STUDY AREA

Measurement Location	Start Date	DNL	Predominant Noise Sources
1. Opposite Refinery Tank 967	March 3, 2010	59	Railroad and Refinery operations.
	March 15, 2010	58	
2. Contra Costa electric parking lot on Refinery Property	March 3, 2010	70	Traffic on Pacheco Blvd, including large trucks and motorcycles, Refinery operations.
	March 4, 2010	70	
	March 15, 2010	70	
3. Refinery walking path parking lot	March 3, 2010	71	Traffic on Pacheco Blvd, including large trucks and motorcycles.
	March 4, 2010	71	
	March 15, 2010	71	
4. Refinery walking path	March 4, 2010	58	Limited traffic on Refinery roadway, and Refinery Operations.

NOTE: Duration of measurements was 24 hours.

SOURCE: ERM, 2011.

In addition to the long-term noise measurements, short-term noise monitoring was conducted at four locations outside the Refinery on the evening of March 16, 2010, for approximately 20 minutes each. For comparison purposes, the noise monitors at Locations 2 and 3 logged measurements at the same time as the noise monitors at Locations 5 and 6, respectively. For the short-term noise monitoring data, see Table 4.13-2.



SOURCE: Google Earth

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Figure 4.13-2

Noise Monitoring and Sensitive Receptor Locations

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TABLE 4.13-2
AMBIENT SHORT-TERM NOISE LEVELS IN THE STUDY AREA

Measurement Location	Measurement Period	L_{eq}
2. Contra Costa electric parking lot on Refinery Property	6:22 p.m. to 6:44 p.m.	66
5. Outside Winters Auto Sales, off Refinery Property, opposite of Location 2	6:22 p.m. to 6:44 p.m.	73
3. Refinery walking path parking lot	7:00 p.m. to 7:20 p.m.	67
6. Road between Ace Truck Box and Sunshine Village Apartments	7:00 p.m. to 7:20 p.m.	66

NOTE: Short-term measurements were collected on Tuesday, March 16, 2010.

SOURCE: ERM, 2011.

Sensitive Receptors

Human response to noise varies considerably from one individual to another. Effects of noise at various levels can include interference with sleep, concentration, and communication and can cause physiological and psychological stress and hearing loss. Given these effects, some land uses are considered more sensitive to ambient noise levels than others. In general, residences, schools, hotels, hospitals, and nursing homes are considered to be the most sensitive to noise. Facilities such as churches, libraries, and cemeteries, where people tend to pray, study, and/or contemplate are also sensitive to noise. Recreational areas can also be considered sensitive to noise due to the potential for noise to disturb the recreational experience of recreationalists. Commercial and industrial uses are considered the least noise-sensitive.

Sensitive receptors in the Project area include individual homes that surround the Refinery to the west, east, and south, the Martinez Junior High School to the southwest, as well as a regional preserve east of the Refinery and a park west of the Refinery. Specific sensitive receptors in the Project area, including approximate distances to the closest part of the Project, are described in Table 4.13-3. For the purposes of the noise analysis, there are two separate Project areas. Project Area 1 is the proposed tank farm site and Project Area 2 is the Tank-967 site. With the exception of Las Juntas Elementary School, the closest sensitive receptor locations are illustrated in Figure 4.13-2.

4.13.2.3 Regulatory Setting

Federal, State, and local agencies regulate different aspects of environmental noise. Federal and State agencies generally set noise standards for mobile sources such as aircraft and motor vehicles, while regulation of stationary sources is left to local agencies. Local regulation of noise involves implementation of general plan policies and noise ordinance standards. Local general plans identify general principles intended to guide and influence development plans; local noise ordinances and codes establish standards and procedures for addressing specific noise sources and activities. Noise issues relevant to the Project are addressed by the policies in the Contra Costa County and City of Martinez general plans and by the County and City municipal codes.

TABLE 4.13-3
CLOSEST SENSITIVE RECEPTORS

Description	Address	Closest Project Area	Approximate Distance to Closest Project Area
Apartment Complex (R1)	3570 Pacheco Boulevard	Area 1	2,000 feet
Residences (R2)	1434 to1444 Dineen Street	Area 2	150 feet
Waterbird Regional Preserve	Northwest of Refinery, on Joe Di Maggio Drive	Area 1	1,800 feet
Martinez Waterfront Park	Northeast of Refinery, along I-680	Area 2	1,100 feet
Martinez Junior High School	1600 Court Street	Area 2	2,200 feet
Las Juntas Elementary School	4105 Pacheco Boulevard	Area 1	4,300 feet

SOURCE: ERM, 2011.

Federal

Federal regulations establish noise limits for medium and heavy trucks (i.e., more than 4.5 tons, gross vehicle weight rating) under the Code of Federal Regulations, Title 40, Part 205, Subpart B. The federal truck pass-by noise standard is 80 dBA at 15 meters (approximately 50 feet) from the vehicle pathway centerline. These standards are implemented through regulatory controls on truck manufacturers.

State of California

The State of California establishes noise limits for vehicles licensed to operate on public roads. For heavy trucks, the State pass-by standard is consistent with the federal limit of 80 dBA. The State pass-by standard for light trucks and passenger cars (i.e., less than 4.5 tons, gross vehicle rating) is also 80 dBA at 15 meters from the vehicle pathway centerline. These standards are implemented through controls on vehicle manufacturers and by legal sanction of vehicle operators by State and local law enforcement officials.

Local

In California, local regulation of noise involves implementation of general plan policies and noise ordinance standards or codes. Local general plans identify general principles intended to guide and influence development plans, and noise ordinances and codes tend to set forth the specific standards and procedures for addressing particular noise sources and activities. General plans recognize that different types of land uses have different sensitivities toward their noise environment.

Contra Costa County

The Noise Element of the Contra Costa County General Plan (Contra Costa County, 2010) sets various goals and policies that apply to all development projects in the County. Most of these policies address land use compatibility for evaluating the acceptability of existing and future

exterior noise levels at new projects proposing noise-sensitive receptors and are not directly applicable to the Project. Noise from construction activities in Contra Costa County is considered exempt from applicable standards during daytime hours, although the County has not defined "daytime" or "normal work hours" for construction noise. Instead, the County uses project-specific conditions of approval to regulate construction noise levels for projects that require County approvals.

The General Plan Noise Element establishes a DNL standard for outdoor noise levels in residential areas of 60 dB. However, the County recognizes that a DNL of 60 dB or less may not be achievable in all residential areas due to economic or aesthetic constraints. Implementation of Noise Element Measure 11-b requires the County to evaluate the noise impacts of a proposed project upon existing land uses in terms of the applicable federal, State, and local codes, and the potential of adverse community response, based on a significant increase in existing noise levels.

City of Martinez

Although the Project would not be constructed within the City of Martinez, residents within the City would be potentially affected by Project-related noise; therefore, this analysis includes consideration of the City's General Plan and Municipal Code. The City of Martinez is in the process of a two-year update of the City of Martinez General Plan. The current General Plan was developed in 1973 and has amendments made between 1973 and 1995 added as appendices. The current General Plan includes a separately bounded *Noise Element* that was adopted by the Martinez City Council in November 1985 (City of Martinez, 1985).

The 1985 *Noise Element* identifies major sources of community noise, noise control techniques, and existing noise levels as well as predicts future noise levels. It establishes noise criteria for land use planning, suggests mitigation measures for noise control, and requires the City of Martinez to develop a noise ordinance. The Noise Element establishes an exterior noise standard of 60 dB L_{dn} and an interior noise standard of 45 dB L_{dn}. The Noise Element requires construction activities in residential areas to be limited by the City of Martinez Noise Ordinance.

The City of Martinez Municipal Code Section 8.34.020, *Noise Standards*, limits exterior noises to an L_{dn} of 60 dBA, which equates to a maximum of 60 dBA between the hours of 7:00 a.m. and 10:00 p.m. and a maximum of 50 dBA between the hours of 10:00 p.m. and 7:00 a.m. The City of Martinez Municipal Code Section 8.34.030, *Noise Regulations*, states that no person shall cause a source of noise to exceed the standards set forth in Section 8.31.020 at the location where the noise disturbance is experienced. Section 8.34.030 also prohibits certain acts, including construction and demolition, between the hours of 7:00 p.m. and 7:00 a.m. on Monday through Friday and between the hours of 5:00 p.m. and 9:00 a.m. on Saturdays, Sundays, and holidays unless a permit is obtained from the City of Martinez Noise Control Officer (City of Martinez, 2011).

4.13.2.4 Project Baseline

Baseline conditions for this noise analysis reflect pre-Project conditions at the existing Refinery in February 2010, when the Notice of Preparation was filed by the County for the Project. Pre-Project conditions include ambient DNL levels measured in the high 50-dBA range to the low 70-dBA range and the closest sensitive receptors are residences as close as 150 feet from the proposed Tank 967 retrofits site and Martinez Waterfront Park is approximately 1,100 feet from Tank 967. The nearest residence to the proposed tank farm site is along Pacheco Boulevard at a distance of approximately 2,000 feet (see Figure 4.13-2).

4.13.3 Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse noise impacts if it would result in:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

b) Exposure of persons to or generation of, excessive ground borne vibration or ground borne noise levels;

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the Project;

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the Project area to excessive noise levels; or

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the Project area to excessive noise levels.

Approach to Analysis

Noise level estimates for the Project presented in this section were prepared by Environmental Resource Management (ERM) and independently reviewed by the County's consultant, Environmental Science Associates (ESA). For details of data, calculations, and assumptions used to determine Project-related noise levels, refer to the *Shell Crude Tank Replacement Project, Noise Assessment* (ERM, 2011), which can be obtained from the County for review. The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines and on the guidance provided by the Contra Costa County General Plan and the City of Martinez General Plan and the City of Martinez Municipal Code. The significance of Project-related noise impacts were determined based on the following specific significance thresholds.

Short-Term Construction Noise Impacts

Short-term noise level increases from construction activities would be considered substantial and would cause significant impacts if construction activities would be conducted outside of normal working hours. Contra Costa County does not have noise-related performance standards or definitions of "daytime" or "normal" working hours; however, for purposes of this impact analysis, normal working hours are considered to be those identified in Section 8.34.030 of the City of Martinez Municipal Code (i.e., 7:00 a.m. to 7:00 p.m. Monday through Friday, and 9:00 a.m. to 5:00 p.m. on Saturdays, Sundays, and holidays). Construction noise nuisance-related impacts would also be considered significant if noise reduction best management practices are not implemented and if nearby residents are not properly notified of planned construction activities.

Long-term Operational Noise Impacts

Long-term operational noise impacts would be significant if Project-related operations would increase the ambient DNL noise level at a noise-sensitive land use by more than 3 dBA, or cause the overall noise level to exceed the Contra Costa County or City of Martinez DNL standard for outdoor noise levels in residential areas of 60 dBA.

Vibration Impacts

A numerical threshold to identify the point at which a vibration impact occurs has not been identified by County or City standards or codes. Therefore, a vibration velocity threshold of 72 VdB identified by the Federal Transit Administration is used in this analysis to determine the significance of vibration impacts related to adverse human reaction (FTA, 2006). This PPV level has been found to cause annoyance at residences where people normally sleep.

4.13.4 Discussion of Criteria with No Noise Impacts

Review and comparison of the setting circumstances and Project characteristics with each of the six significance criteria stated above show that no noise impacts would result for the a (operations only), e, and f criteria. The following discussion provides the reasoning to support this conclusion.

a) Operations of the Project would not result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

As explained in more detail under Section 4.13.5 below, there would be no impact associated with proposed operations at the Refinery or the Marine Terminal because the Project's operational noise levels would be within the acceptable noise levels for residential uses as identified by the Contra Costa County General Plan, the City of Martinez General Plan, and the City of Martinez Municipal Code standards.

e) The Project would not expose people residing or working in the Project area to excessive airport-related noise levels

The Project site is not within an airport land use plan and is approximately 3 miles northwest of Buchanan Field in Concord. The Project would not involve the development of noise-sensitive land uses that would be exposed to excessive aircraft noise and average ambient noise levels in the Project area would be greater than average over flight noise levels that Refinery workers would be exposed to. Therefore, there would be no impact associated with this criterion.

f) The Project would not expose people residing or working in the Project area to excessive noise levels within the vicinity of a private airstrip.

The Project area is not located within the vicinity of a private airstrip. Consequently, no noise impact associated with private airstrips would occur.

4.13.5 Discussion of Impacts and Mitigation Measures

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies

Impact 4.13-1: Project construction activities could violate County and City construction time-of-day restrictions. (*Less than Significant with Mitigation)*

Short-term noise from construction activities would conflict with Contra Costa County General Plan standards if Project construction activities would be conducted outside of normal working hours. Contra Costa County does not have noise-related performance standards or definitions of "daytime" or "normal" working hours; however, for purposes of this impact analysis, normal working hours are considered to be those identified in Section 8.34.030 of the City of Martinez Municipal Code (i.e., 7:00 a.m. to 7:00 p.m. Monday through Friday, and 9:00 a.m. to 5:00 p.m. on Saturdays, Sundays, and holidays). Chapter 3, *Project Description*, does not identify the proposed daily construction schedule for the Project. Therefore, to ensure that Project construction activities would not violate Contra Costa County and City of Martinez construction time-of-day restrictions, Mitigation Measure 4.13-1 shall be implemented.

> **Mitigation Measure 4.13-1:** All Project construction activities shall be limited to the hours of 7:00 a.m. to 7:00 p.m. Monday through Friday, and 9:00 a.m. to 5:00 p.m. on Saturdays, Sundays, and holidays.

Significance after Mitigation: Less than Significant.

b) Exposure of persons to or generation of, excessive ground borne vibration or ground borne noise levels

Impact 4.13-2: Project construction activities would generate ground borne vibration levels. (*Less than Significant)*

Several activities during the construction phase of the Project would create temporary sources of vibration. These activities would include the demolition of three tanks, site grading and dike modifications, and the construction of new tanks. During these operations, the following equipment may be used: a concrete industrial saw; multiple haul trucks; one grader; one crane; two tractors/loaders/backhoes, a water truck; two forklifts; and a pile driver. Out of these pieces of equipment, pile driving has the highest typical vibration velocity of 104 VdB at 25 feet followed by bulldozers and loaded trucks with 87 VdB at 25 feet and 86 VdB at 25 feet, respectively.

A pile driver may be required for foundation construction associated with the new tanks at Project Area 1. The nearest residential sensitive receptor to Project Area 1, is an apartment complex (R1) approximately 2,000 feet to the southeast. Using the vibration velocity for a pile driver at 25 feet and the vibration attenuation equation identified by the Federal Transit Administration (FTA, 2006), the vibration level that would occur from the pile driver at the nearest residential receptor is estimated to be 47 VdB, below which would be below the threshold of 72 VdB.

As shown in Figure 4.13-2, the nearest sensitive receptors to Project Area 2 are a collection of individual residences (R2) northwest of Tank 967. Construction at Project Area 2 would require the use of one forklift and one haul truck. Because there are no readily available vibration velocity levels for forklifts, vibration from operation of a forklift was conservatively assumed to be the same as that of a haul truck. Using the vibration velocity at 25 feet for loaded trucks, the vibration that would be felt by the individual residences to the north of Tank 967 is estimated to be 68 VdB. This vibration velocity would be less than the significance threshold of 72 VdB. Project vibration-related impacts would be less than significant.

Mitigation: None required.

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c) Would the Project result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the Project?

Impact 4.13-3: Operations of the Project would increase local ambient noise levels. (*Less than Significant)*

Operational activities that would be associated with the Project would generate noise primarily from mixers and pumps that would be installed as part of the new tank construction (Area 1). Project-related operations would not require any additional long-term workers at the Refinery. The types and numbers of noise-generating equipment that would be installed at the Refinery as part of the Project are shown in Table 4.13-4. This equipment includes replacement of seven

smaller existing electric tank mixers with in-tank mixers of higher horsepower ratings and the addition of five new mixers. In addition, nine new pumps would be installed. Table 4.13-4 shows typical noise levels that would be associated with the use of the noise-generating equipment at 3 feet from the source and 2,000 feet from the source, which is the approximate distance from the Project noise sources to the nearest residence.

TABLE 4.13-4
EQUIPMENT NOISE LEVELS ASSOCIATED WITH THE PROJECT

Type of Equipment	Number of Units	Horsepower Rating Per Unit	Typical Noise Level (dBA)		
			Leq at 3 feet	DNL at 2,000 feet	Combined DNL at 2,000 feet
In-Tank Mixer	1	60	91	41	41
In-Tank Mixer	9	75	91	41	50
In-Tank Mixer	2	50	91	41	44
Heat Circulation Pump	2	150	94	44	47
Process Wastewater Pump	6	75	91	41	49
Tank Dewatering Pump	1	22	91	41	41
All Equipment Operating Simultaneously					**54**

SOURCE: ERM, 2011.

DNL noise levels at 2,000 feet from the source are shown for single units, for the combined noise level of multiple units, and for all equipment operating simultaneously. Noise levels at 2,000 feet from the source assume 24 hours of continuous operation and are expressed as DNL with the appropriate noise penalty for nighttime use. The DNL noise level for the combined operation of the new and modified equipment to be installed as part of the Project would be 54 dBA at the nearest residential receptor (i.e., an apartment building designated as R1). This level would be less than the County and City exterior DNL noise thresholds of 60 dBA. Thus, operational impacts that would be associated with the Project would be less than significant.

Potential noise impacts associated with increased vessel traffic at Refinery Marine Terminal would not increase the level of noise, but would increase the number of days per year that marine terminal noise would be generated. Extensive noise measurements were collected for operations of the marine terminal in 2005 to support the California State Lands Commission's review for Shell's Marine Terminal Lease Consideration Project (CSLC, 2010). The measured marine terminal noise levels were found to be acceptable at the nearest offsite residential receptors (i.e., DNL of approximately 57 dBA) when compared to applicable standards (i.e., DNL of 60 dBA). Because the marine terminal operational noise levels would not change as a result of the Project, there would be no marine terminal related impact.

Mitigation: None required.

d) Would the Project result in a substantial temporary or periodic increase in ambient noise levels in the Project vicinity above levels existing without the Project?

Impact 4.13-4: Project construction activities would temporarily increase local ambient noise levels in the vicinity of the Project site. (*Less than Significant with Mitigation*)

Project construction is scheduled to begin in 2012 and to be completed by 2015. On-site construction activities would take place in the two Project areas identified on Figure 4.13-2, including:

- Area 1 – Construction at the location of the replacement, new, and refurbished crude oil storage tanks; and
- Area 2 – Construction at the location of the roof retrofit work on Tank 967.

Construction noise levels at and near the two proposed project areas would fluctuate depending on the particular construction activities and the particular type, number, and duration of use of various types of construction equipment. The effect of construction noise would depend upon how much noise would be generated by construction activity, the distance between construction activities and the nearest noise-sensitive receptors, and the existing noise levels at those receptor locations.

Construction in Area 1 would comprise the bulk of construction activity with the demolition of three existing tanks, grading, and construction of new tanks and refurbishment of an existing tank. The worst-case noise activity for this area is assumed to be when grading and tank construction would occur simultaneously. The closest sensitive receptor to these activities is identified as R1, located approximately 2,000 feet southeast of the main tank construction area. The magnitude of construction noise generated would depend upon the activity or the equipment being used at a given time. Refer to Figure 4.13-2 for the locations of Project Area 1 and Sensitive Receptor R1 and see Table 4.13-5 for the estimated construction noise levels that would result at the nearest residences.

Table 4.13-5 shows typical noise levels produced by various types and durations of use of construction equipment that would potentially be used at Project Area 1. Pile driving may or may not be required. Typical noise levels at 50 feet from the source are shown for each type of equipment. In addition, noise levels when attenuated by the distance from the sources to the closest sensitive receptor are shown as DNL to account for the usage of the equipment during daytime hours only. Although an unrealistic and highly conservative assumption, Table 4.13-5 also presents the combined effect of all of the construction equipment operating simultaneously during a single day.

In addition to on-site construction equipment at Area 1, there would be on-road haul trucks that would make 15 round trips per day, which would temporarily affect ambient noise along the proposed haul route, which would be from the Refinery Gate 75 at the north end of the Refinery to the I-680 on- and off-ramps northeast of the Refinery. There are no sensitive receptors between the I-680 on- and off-ramps and the Refinery. Therefore, offsite haul truck trips that would be associated with construction activities at Project Area 1 would result in less than significant impacts.

TABLE 4.13-5
NOISE LEVELS FROM CONSTRUCTION EQUIPMENT FOR PROJECT AREA 1

Equipment	Typical Noise Level 50 feet from Source (dBA)	Hours Per Day	Daytime Usage Factor[1]	DNL 2,000 feet from Source (dBA)[2]
1 Crane	83	4	0.27	43
1 Forklift	80	6	0.40	42
1 Forklift	80	6	0.40	42
1 Grader	85	6	0.40	47
1 Rubber-Tired Dozer	85	6	0.40	47
1 Tractor/Loader/Backhoe[4]	85	7	0.47	48
1 Tractor/Loader/Backhoe[4]	85	8	0.53	48
1 Pile Driver	101	8	0.53	64
1 Water Truck	88	8	0.53	51
All Equipment (with Pile Driver)				**65**
All Equipment (without Pile Driver)				**56**

1 The daytime usage factor is derived from 15 daytime hours (7 a.m. to 10 p.m.).
2 DNL has been calculated assuming zero ground shielding to provide a conservative prediction of the noise levels (i.e., noise levels may be lower than those predicted).

SOURCE: ERM, 2011.

Noise generating activities as a result of construction in Area 2 would involve the retrofit of the existing fixed roof on Tank 967 to an internal floating roof. The closest sensitive receptors that would be exposed to construction noise in the vicinity of Area 2 are residences identified as R2, and would be located approximately 150 feet northwest of the Tank 967 construction area. See Figure 4.13-2 for the locations of Project Area 2 and Sensitive Receptor R2 and Table 4.13-6 for the estimated construction DNL noise levels that would result at the nearest residences.

TABLE 4.13-6
NOISE LEVELS FROM CONSTRUCTION EQUIPMENT DNL FOR PROJECT AREA 2

Equipment	Typical Noise Level 50 feet from Source (dBA)	Hours Per Day	Daytime Usage Factor [1]	DNL 150 feet from Source (dBA)[2]
1 Forklift	80	4	0.27	60
1 Haul Truck	88	1	0.07	62
All Equipment Operating Simultaneously				**64**

1 The daytime usage factor is derived from 15 daytime hours (7 a.m. to 10 p.m.).
2 Attenuation factors to account for topography and ground effects have been applied to reflect forklift usage in the bermed area adjacent to Tank 967 and haul truck activity on the adjacent access road.

SOURCE: ERM, 2011.

Table 4.13-6 shows typical noise levels produced by the equipment that would be used at Project Area 2 (i.e., a forklift and haul truck) for associated durations. Typical noise levels at 50 feet from the source are shown for both types of equipment. In addition, noise levels when attenuated by the distance from the sources to the closest sensitive receptor are shown as DNL to account for the usage of the equipment during daytime hours only. Table 4.13-6 also presents the combined effect of both of the construction equipment pieces operating simultaneously during a single day.

The total increase in ambient noise levels that would be associated with Project construction is presented in Table 4.13-7. The total noise would be the combined effect of baseline noise levels with construction equipment noise levels to determine the Project-related increase from baseline conditions that would result due to Project construction activities. Increases from the baseline, or ambient noise levels, are also shown in Table 4.13-7.

TABLE 4.13-7
PROJECT CONSTRUCTION NOISE INCREASE SUMMARY

	DNL Noise Levels (dBA)				
Noise Source	**Receptor**	**Baseline**	**Project**	**Total**	**Increase from Baseline**
Area 1 Construction Equipment (with Pile Drivers)	R1	71	65	72	+1
Area 1 Construction Equipment (without Pile Drivers)	R1	71	56	71	0
Area 2 Construction Equipment	R2	58	64	65	+7

SOURCE: ERM, 2011.

For Area 1, the short-term increase due to Project construction noise levels above the existing baseline, with or without use of pile drivers, would be no more than 1 dBA, which would not likely be perceived as a substantial increase at the nearest residences. For Area 2, the short-term increase due to Project construction noise levels could be as much as 7 dBA above the existing baseline due to the daily use of the forklift and haul truck. The use of these pieces of equipment would primarily be limited to the beginning of the construction period at Project Area 2 related to offloading materials at the site. The offloading would not occur during the majority of Tank 967 construction and the actual construction activities required to install the internal floating roof tank would be expected to generate lower noise levels compared to those presented in Table 4.13-7.

Nonetheless, the increase in ambient noise levels that would be caused by forklift and haul truck activity in the vicinity of Project Area 2 could be perceived by nearby residents as a nuisance. Therefore, implementation of Mitigation Measure 4.13-1 (above), which would limit construction activity to daytime hours and implementation of Mitigation Measure 4.13-4 (below), which would require the use of best management practices and notification to nearby residences, would be required to ensure that short-term noise nuisance-related impacts associated with construction activities at Project Area 2 would be reduced to less than significant levels.

Vehicular traffic to and from the Project sites would increase due to construction workers arriving and leaving during construction. Under the worst-case scenario for Project Area 1, a maximum of up to 100 construction workers would arrive at Gate 72 between 6:00 a.m. and 7:00 a.m. and leave at 6:00 p.m. Conservatively assuming that each worker would arrive in a separate vehicle, this would translate to a maximum of 100 vehicle trips per hour of arrival and departure. Marina Vista Avenue, the road leading to Gate 72, has a section of road to the west of the Refinery where residences are not located with a speed limit of 35 miles per hour (mph). Although most workers would be expected to arrive from the east of Marina Vista Avenue where the speed limit is lower and there are no residences, to be conservative, the analysis assumes all commuter trips would originate from west of Marina Vista where the speed limit is 25 mph and where residences are present.

For Area 2, five workers would be transported via a single diesel bus (a more conservative assumption than via a mini-van) from the Gate 72 parking lot to and from the Tank 967 construction area between 8:00 a.m. and 5:00 p.m. The Refinery maximum speed limit for trucks is 10 mph and for cars is 20 mph. It is conservatively assumed that the average speed of the bus would be 10 mph near Project Area 2. The estimated DNL that would be associated with this diesel bus would be 25 dBA. The average measured DNL at Noise Monitoring Location 1 was 58 dBA. The total DNL with vehicle traffic and baseline for Area 2 is 58 dBA, essentially unchanged from the baseline noise levels. Therefore, the additional noise from construction worker vehicles to the existing baseline noise levels would be negligible, and would result in a less than significant impact.

Mitigation Measure 4.13-4: Shell shall implement the following construction noise nuisance control measures for the duration of the approximately six-month period of construction at Tank 967:

- Use equipment with enclosures and high-performance mufflers to the extent feasible;
- Place construction equipment at locations to maximize the distance to the nearest residences; and
- Notify nearby residents of the planned construction schedule at least one month prior to the scheduled activities at Project Area 2. Notification shall include the types of equipment that are to be used during construction activities at Project Area 2 and include contact information of a designated construction noise coordinator who will maintain communication with affected residences throughout the Tank 967 construction period. Shell's construction noise coordinator shall also disseminate Project information to businesses, and implement a complaint and response tracking program.

Significance after Mitigation: Less than Significant.

4.14 Population and Housing

4.14.1 Introduction

This section analyzes the Project's relationship to population and housing. Discussed are the physical and regulatory setting, the baseline for determining environmental impacts, the significance criteria used for determining environmental impacts, and potential impacts associated with construction, operation, and maintenance of the Project.

4.14.2 Setting

4.14.2.1 Regional and Local Setting

Shell's Martinez Refinery (Refinery) is located approximately 25 miles northeast of San Francisco (see Project Description Figure 3-1) adjacent to the community of Martinez. Approximately 20 percent of the Refinery is located within the corporate limits of the City of Martinez. The remainder of the Refinery is in an unincorporated area of the County. All of the CTRP components would be constructed within the County.

Contra Costa County is divided into three distinct regions – West County, Central County, and East County – the boundaries of which are delineated by hills and protected open space. Most of the County's residential and employment opportunities are located in the West County and Central County areas. The Central County area, where the CTRP is located in the north central portion, is the largest of the three areas, including ten of the nineteen cities in Contra Costa and over half of the total population. Central County is composed of mostly low density bedroom communities that have developed in the flat valleys between the East Bay Hills and the Diablo Range to the east, extending north and south of Mt. Diablo. The CTRP is surrounded by the Refinery, and is located toward the eastern side of the Refinery property, which itself is bordered by the City of Martinez on the west through south sides of the Refinery. The closest homes to the proposed tanks of the CTRP are located to the south approximately 0.4 miles from the nearest tanks and the nearest Project component to residences, TK-967 is located about 150 feet from the nearest homes.

4.14.2.2 Regulatory Setting

Contra Costa County General Plan

The Contra Costa County General Plan contains goals, policies and implementation measures that apply to all development projects in the unincorporated areas of the County. However, the General Plan contains no goals, policies or implementation measures that are applicable to the CTRP in the context of population and housing (Contra Costa County, 2010).

4.14.2.3 Project Baseline

Baseline conditions reflect the ongoing operation of the Refinery as it existed at the time of the issuance of the NOP (February 2010), as an oil refinery, including on going operations and maintenance activities.

4.14.3 Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause significant adverse impacts to population and housing if it would:

a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure);

b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere; or

c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere.

4.14.4 Discussion of No Population and Housing Impacts

Review and comparison of the setting circumstances and Project characteristics with each of the three significance criteria stated above, clearly show that no population and housing-related impacts would result for all criteria. The following discusses the reasoning supporting this conclusion:

a-c) Induce substantial population growth in an area, either directly or indirectly. / Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere. / Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere.

The temporary increase in the local labor force of up to 100 workers during construction is unlikely to contribute to any significant increase in the local population, or create any significant demand for increased local housing as there is a well established worker base in the area which serves the five Bay Area refineries on this type of project and others. Furthermore, as there is no permanent increase in the labor force for CTRP operations, no long term impact to population and housing would be likely to occur.

4.14.5 Discussion of Impacts and Mitigation Measures

There would be no population and housing-related impacts.

4.15 Public Services

4.15.1 Introduction

This section analyzes the Project's relationship to public services. Discussed are the physical and regulatory setting, the baseline for determining environmental impacts, the significance criteria used for determining environmental impacts, and potential impacts associated with construction, operation, and maintenance of the Project.

4.15.2 Setting

4.15.2.1 Regional and Local Setting

Shell's Martinez Refinery (Refinery) is located approximately 25 miles northeast of San Francisco (see Section 3, *Project Description*, Figure 3-1) adjacent to the community of Martinez. Approximately 20 percent of the Refinery is located within the corporate limits of the City of Martinez. The remainder of the Refinery is in an unincorporated area of the County. All of the CTRP components would be constructed within the County.

Fire Protection

The Contra Costa Fire Protection District (CCFPD) provides fire and emergency medical services to a 304 square mile area including nine cities and five unincorporated areas with a population of more than 600,000. The Fire District has 30 fire stations that respond to more than 45,000 incidents annually.

The Fire District location closest to the Refinery is Station #12, located approximately one quarter of a mile south of the Refinery at 1240 Shell Ave in Martinez. Additional services are available from Station #14, located approximately half of a mile southwest of the Refinery at 521 Jones St in Martinez.

The Refinery maintains a trained fire-fighting / emergency response force and equipment on-site to provide emergency response capabilities. Trained staff includes 8 Emergency Medical Technicians, 20 employees trained in Advanced First Aid, 30 Confined Space Rescue team members and 12 members of the Refinery's Health and Safety Department who act as the command staff. There are 110 Volunteer Fire Crew members, of which 30 are day shift employees and 80 are shift workers. The 80 are split into 20 per shift team there are 8 designated on each shift to immediately respond with two fire engines. Among other portable fire suppression and emergency equipment provided, the Refinery maintains 4 engines, 2 dry chemical units and a Utility Truck equipped with EMS supplies, Rescue gear and fire apparatus. There are also multiple hydrants, water monitors and hose reels located on the fixed fire water system. The fire water system also supplies certain units on-site that are equipped with water deluge systems. The Refinery fire department emergency response time goal is to provide on-site coverage at the incident within 10 minutes of notification. Past drills have produced drill response times that meet this goal.

In the event of an emergency involving transportation of the Refinery products or materials, the Response Action Team is called. This six-member team trained in highly specialized in techniques potentially required when dealing with tanker truck or rail car leaks, tanker truck rollovers, tank car derailments and other transportation incidents. Training takes place at the Transportation Technology Center Hazardous Materials Facility in Pueblo, Colorado or at other selected locations.

The Refinery is also a participating member of the Petrochemical Mutual Aid Organization (PMAO) comprised of refineries and chemical plants in the San Francisco Bay Area which provide assistance to one another in the form of fire-fighting equipment, fire control materials, and staff in the event of a major fire or similar emergency at one of their locations.

Police Protection

Public protection services are provided in Contra Costa County by various city police departments and the County Sheriff. The Refinery site is served by the Contra Costa County Sheriff's Office and the California Highway Patrol. The County Sheriff’s Office employs 720 sworn personnel and 332 general employees for a total staff of 1,052. The Sheriffs’ Patrol Division provides uniformed law enforcement services to the residents who either live in Contra Costa's 521 square miles of unincorporated land, a contract city or a special district.

The California Highway Patrol also provides public protection to the area, and the station closest to the Refinery is the Contra Costa County Station, located on 5001 Blum Road in Martinez approximately 2 miles east of the Refinery.

In addition to the police protection services provided by the County’s Sheriff’s Office, the State Highway Patrol and the City of Martinez Police Department, the Refinery maintains a contract security force to provide on-site security. Refinery site access is controlled by an extensive security program including a perimeter fence serving as a physical barrier to prevent unknowing and unauthorized entry. When open, all entry gates are staffed with security personnel for surveillance.

Public Schools

The Martinez Unified School District (MUSD) provides public school services to the project area. The project area is served by Las Juntas Elementary School, located at 4105 Pacheco Boulevard; Martinez Junior High, located at 1600 Court Street; Alhambra High School, located at 150 E Street; and by Vicente Martinez High School, located at 614 F Street (MUSD, 2011). For the 2009-2010 school year, total enrollment was 345 at Las Juntas Elementary School, 918 at Martinez Junior High, and 1280 at Alhambra High School, and 85 for Vicente Martinez High School (California Department of Education, 2011).

Parks

The closest local parks to the Project are Cappy Rick’s Park, a one-acre park located approximately 0.5 miles southwest of the project site and Waterfront Park, a 150-acre park located northeast of the project site across Marina Vista Avenue (City of Martinez, 2011).

Other Public Facilities

Other public facilities in the community include medical facilities and libraries. There are eight hospitals in Contra Costa County including the Contra Costa Regional Medical Center (CCRMC) located at 2500 Alhambra Avenue in Martinez, approximately one mile from the Project.

The closest library is the Contra Costa County Public Library in Martinez, approximately 1.25 miles from the Refinery, on 401 Ferry Street in Martinez.

4.15.2.2 Regulatory Setting

Contra Costa County General Plan

The Contra Costa County General Plan provides goals and policies to support adequate public services for the community (Contra Costa County, 2010). These goals and policies are summarized as follows:

- Ensure a high standard of police and fire protection, emergency and medical response services for all citizens and properties through out Contra Costa County.
- Assure the provision of adequate primary, secondary, and college facilities in the County.
- Assure high quality civic, medical, and other community facilities are provided to meet the broad range of needs within unincorporated areas of the County.

4.15.2.3 Project Baseline

Baseline conditions reflect the ongoing operation of the Refinery as it existed at the time of the issuance of the NOP (February 2010), as an oil refinery, including on going operations and maintenance activities.

4.15.3 Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts to public services if it would:

a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

   1. Fire Protection
   2. Police Protection
   3. Schools
   4. Parks
   5. Other public facilities

4.15.4 Discussion of No Public Services Impacts

Review and comparison of the setting circumstances and Project characteristics with the significance criteria stated above, clearly show that no impacts on public services would result for all criteria. The following discusses the reasoning supporting this conclusion:

a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

1. Fire Protection

Given that the Refinery currently provides internal fire protection and emergency services and has adequate emergency personnel, equipment and response times, the Project would not increase the demand for fire protection services. Therefore, it is not expected that the Project would affect service ratios or response times or increase the use of existing fire protection or emergency facilities such that substantial physical deterioration, alteration, or expansion of these facilities would occur.

2. Police Protection

Given that the Shell Martinez Refinery currently provides internal security services and has adequate protection personnel, equipment and response times, the Project would not increase the demand for police protection services. Therefore, it is not expected that the Project would affect service ratios or response times or increase the use of existing police facilities such that substantial physical deterioration, alteration, or expansion of these facilities would occur. No significant impacts from construction or operation would occur.

3. Schools

As the Project does not include a residential component, there would be no additional children in the Martinez Unified School District. Therefore, no new facilities would be necessary to serve the Project and no adverse environmental impacts from facility construction and operation would occur. No significant impacts from construction or operation would occur.

4. Parks

While there are local parks in the general vicinity of the Refinery, as is discussed in Section 4.16, *Recreation*, the temporary increase in the local labor force of up to 100 workers during construction is unlikely to contribute to any significant increase in use of local recreational facilities including parks. Furthermore, as is discussed 4.14, *Population and Housing*, there is a well established worker base in the area which serves the five Bay Area refineries and it is unlikely that this temporary increase would generate any new usage of local parks. No significant impacts from construction or operation would occur.

5. Other Public Facilities

The Project would not directly or indirectly induce substantial population growth in the area (see Section 4.14, *Population and Housing*). Any short-term increase in population due to construction activities is considered to be minimal, as there is a well established worker base in the area which serves the five Bay Area refineries. The Project would be constructed entirely within Refinery property, and therefore would not require physical alteration of public facilities. No impacts would occur.

4.15.5 Discussion of Impacts and Mitigation Measures

There would be no impacts to public services.

4.16 Recreation

4.16.1 Introduction

This section analyzes the Project's relationship to recreational resources. Discussed are the physical and regulatory setting, the baseline for determining environmental impacts, the significance criteria used for determining environmental impacts, and potential impacts associated with construction, operation, and maintenance of the Project.

4.16.2 Setting

Contra Costa County and the City of Martinez contain numerous recreational facilities, including major parks and open space areas, local parks, and private recreational facilities.

4.16.2.1 Regional and Local Setting

Shell's Martinez Refinery (Refinery) is located approximately 25 miles northeast of San Francisco (see Section 3, *Project Description*, Figure 3-1) adjacent to the community of Martinez. Approximately 20 percent of the Refinery is located within the corporate limits of the City of Martinez. The remainder of the Refinery is in an unincorporated area of the County. All of the CTRP components would be constructed within the County.

Regional Parks and Major Open Space Areas

Regional parks and major open space areas provide places where people can enjoy active and passive recreation activities that focus on interaction with the natural environment. These activities typically include nature studies, camping, hiking, observing the natural landscape, and the like. Regional parks and major open space areas often encompass hundreds or even thousands of acres and are typically established in order to protect uniquely valuable natural resources. Therefore, each regional park and open space area itself is unique and offers specific recreational opportunities that are not otherwise available in the immediate vicinity of most Bay Area residents. Within Contra Costa County, regional parks and open spaces areas are owned and managed by federal and state governments, the East Bay Regional Parks District, and municipalities. Regional parks and open space areas within ten miles of the Project site include the Carquinez Strait Regional Shoreline Park, the Martinez Regional Shoreline, Crockett Hills Regional Park, Sobrante Ridge Regional Park, John Muir National Historic Park, Briones Regional Park, Acalanes Ridge Open Space, and Lime Ridge Open Space. The closest regional park is the Waterbird Regional Preserve located approximately one quarter mile, to the northeast of the nearest CTRP tank, across Interstate 680 (Contra Costa County, 2010; City of Walnut Creek, 2007; EBRPD, 2011).

Local Parks

Local parks are areas set aside for active and passive recreational uses in the immediate vicinity of their users. These parks might include play apparatus for children, play areas, sports fields and courts, swimming pools, community centers, picnic areas, and open grass areas. Local parks are

found in developed areas and often serve as focal points for neighborhoods and communities. They are places where residents can meet and enjoy their leisure time together and where community events can be held. The closest local parks to the Project area are Cappy Rick's Park, a one acre park located approximately 0.5 miles southwest of the Project site and Waterfront Park, a 150 acre park located northeast of the Project site across Marina Vista Avenue (City of Martinez, 2011).

Private Recreational Facilities

Numerous privately-owned (commercial) recreational facilities are located within Contra Costa County and the City of Martinez. These facilities provide recreational opportunities for both children and adults for a fee. Private recreational facilities in the County include amusement parks, exercise and fitness centers, golf courses, and skating rinks. In addition to private recreational resources surrounding the project site, the Refinery maintains an on-site recreational facility located at 1635 Pacheco Boulevard. The Shell clubhouse is used periodically for public meetings and various response drills involving public agencies. The facility is controlled by Shell's security staff and is open to the public when a special event has been scheduled.

4.16.2.2 Regulatory Setting

Contra Costa County General Plan

The Open Space Element of the Contra Costa County General Plan contains goals and policies related to parks and recreation (Contra Costa County, 2010). These goals and policies are summarized as follows:

- Develop a sufficient amount of conveniently located, properly designated parks and recreational facilities to serve the needs of all residents.
- Preserve major parklands and areas of natural beauty or historical interest for future generations.
- Promote active and passive recreational enjoyment of the County's physical amenities.
- Preserve a well balanced distribution of local parks.
- Distribute and manage recreational activity according to an area's carrying capacity, with special emphasis on controlling adverse environmental impacts.

4.16.2.3 Project Baseline

Baseline conditions reflect the ongoing operation of the Refinery as it existed at the time of the issuance of the NOP (February 2010), as an oil refinery, including on going operations and maintenance activities.

4.16.3 Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts to recreation if it would:

a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.

b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment.

4.16.4 Discussion of No Recreation Impacts

Review and comparison of the setting circumstances and Project characteristics with each of the two significance criteria stated above, clearly show that no recreation-related impacts would result for both criteria. The following discusses the reasoning to support this conclusion:

a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.

The temporary increase in the local labor force of up to 100 workers during construction is unlikely to contribute to any significant increase in use of local recreational facilities. Furthermore, as there would be no permanent increase in the labor force for CTRP operations, no impact to recreational facilities would occur.

b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment.

Additional parks and recreational facilities would not be necessary as a result of the CTRP. The Project does not impact on any parks or recreational facilities. Thus, there would be no impact related to construction.

4.16.5 Discussion of Impacts and Mitigation Measures

There would be no impacts associated with recreation.

4.17 Transportation/Traffic

4.17.1 Introduction

This section analyzes the Project's relationship to transportation and traffic. Discussed are the physical setting; the regulatory setting; the baseline for determining environmental impacts; the significance criteria used for determining environmental impacts; and potential impacts related to the Project. When impacts are determined to be significant or potentially significant, mitigation measures are identified to avoid or reduce the significance. Because construction would be more traffic-intensive than operations, this section focuses on impacts related to construction, including potential impacts to roadways that are adjacent to or within the Project area and could therefore be affected by construction, and roadways that are potential access routes for construction workers, materials delivery, and other equipment trucks.

4.17.2 Setting

Shell's Martinez Refinery (Refinery) is located approximately 25 miles northeast of San Francisco (see Section 3, *Project Description*, Figure 3-1) in Martinez, California. The site is located between Shell Avenue on the west, Interstate 680 (I-680) on the east, Marina Vista Avenue on the north, and Pacheco Boulevard on the south. Regional and local roadways near the Refinery site are described below in Section 4.17.2.1, and shown in Figure 4.17-1, *Regional and Local Roadways*.

4.17.2.1 Roadway Network

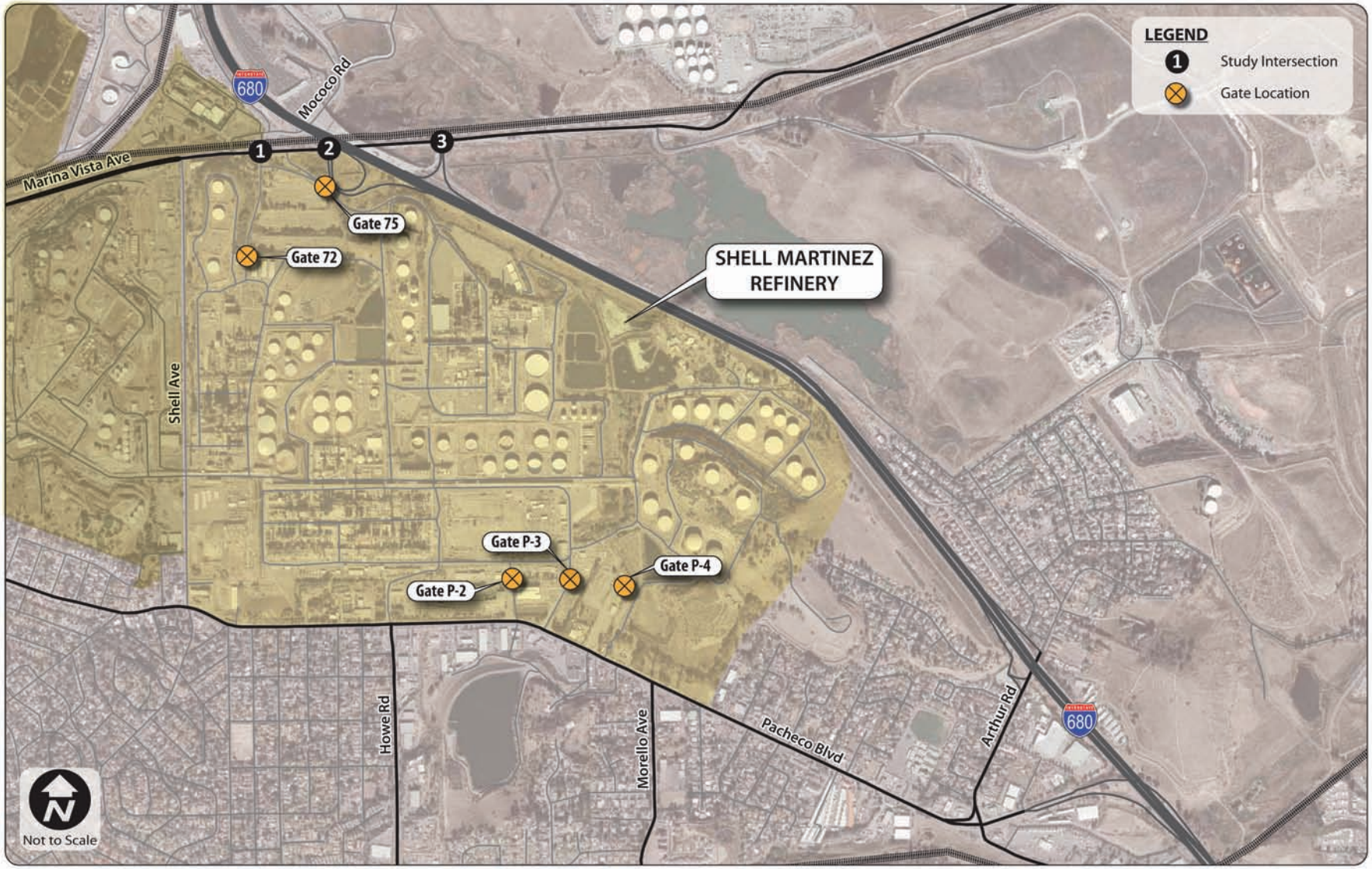
Regional Roadways

Interstate 680 (I-680) is a six- to eight-lane freeway running in a north-south direction along the east side of the Refinery. Traffic from the Refinery can access I-680 at either the Marina Vista Avenue or Arthur Road interchanges. I-680 extends south through southern Contra Costa County towards San Jose, and north across the Benicia Bridge to Solano County. The most recent data published by Caltrans indicates the Annual Average Daily Traffic (AADT) on the segment of the freeway in the Project area (south of the Benicia Bridge) is about 102,000 vehicles (Caltrans, 2010a).

Local Roadways

Marina Vista Avenue provides a link between I-680 and downtown Martinez. Marina Vista Avenue has two lanes with a left turn lane and bicycle lanes from the Escobar Street/Marina Vista Avenue couplet to the I-680 northbound ramps[1]. Marina Vista Avenue is a designated truck route.

[1] Marina Vista Avenue becomes Waterfront Road east of I-680 and technically the I-680 northbound on and off ramps terminate on Waterfront Road just a short distance from the start of Marina Vista Avenue. Because the traffic study conducted for the Project refers to Marina Vista Avenue for both north and southbound I-680 exits, this section will continue to use the same terminology as the traffic study but it is to be understood that the northbound I-680 exit actually terminates on Waterfront Road.



SOURCE: Fehr & Peers

Shell Martinez Project EIR . 209699

Figure 4.17-1
Regional and Local Roadways

Access to the Refinery is achieved via the Marina Vista Avenue/Mococo Road intersection, which leads to several internal access gates within the Refinery as well as from Pacheco Boulevard.

Pacheco Boulevard provides a link between I-680 and downtown Martinez via an interchange just east of the Refinery. The segment of Pacheco Boulevard from I-680 to Morello Avenue has one through lane in each direction with a center two-way left-turn lane. West of Morello Avenue toward Shell Avenue, Pacheco Boulevard widens to a five-lane section – two lanes in each direction with one center two-way left-turn lane. From Shell Avenue east to I-680, Pacheco Boulevard is a designated a truck route. Pacheco Boulevard serves a northbound off-ramp and southbound on-ramp at I-680. Access to the Refinery site area is via Gates P-2, P-3, and P-4, off Pacheco Boulevard (see Figure 4.17-1, *Regional and Local Roadways*).

Arthur Road is a two-lane collector roadway with a partial interchange at I-680 (northbound on-ramp and southbound off-ramp).

Shell Avenue is a two-lane collector roadway that provides a connection between Pacheco Boulevard and Marina Vista Avenue. It is a north-south oriented roadway that bisects the Refinery.

Existing Intersection Traffic Volumes

Based on a review of the area in the vicinity of the Refinery, the vehicle traffic, and estimated Project trip generation and distribution, the following three intersections were identified for detailed analysis because they are the most likely to be affected by Project-related traffic (Fehr & Peers, 2010):

1. Marina Vista Avenue at Mococo Road;
2. Marina Vista Avenue at I-680 Southbound Ramps; and
3. Marina Vista Avenue at I-680 Northbound Ramps.

Weekday intersection turning movement and vehicle classification counts were collected at the study intersections from 6:00 a.m. to 9:00 a.m. and 4:00 p.m. to 7:00 p.m. in March 2010. Field reconnaissance was also performed in which lane configurations, turn pocket lengths, speed limits, and signal phasing data were collected. In addition, traffic signal timing data were collected for the signalized intersections from Contra Costa County and California Department of Transportation (Caltrans) staff (Fehr & Peers, 2010). Existing intersection lane configurations and peak-hour traffic volumes are presented in Figure 4.17-2, *Existing Intersection Lane Configurations and Peak Hour Turning Movements.*

Existing Intersection Levels of Service

Operations of the signalized study intersections were evaluated using the level of service (LOS) calculation method developed by the Contra Costa Transportation Authority (CCTA), as well as the calculation method described in Chapter 16 of the 2000 Highway Capacity Manual (HCM) – Special Report 209 (Transportation Research Board, 2000). The CCTA method uses various intersection characteristics (including traffic volumes, lane geometry, and signal phasing) to estimate an intersection volume-to-capacity (V/C) ratio. The HCM method incorporates

SOURCE: Fehr & Peers

Shell Martinez Project EIR . 209699

Figure 4.17-2
Existing Intersection Lane Configurations and Peak Hour Turning Movements

additional signal timing information to estimate the average control delay per vehicle measured in seconds. Control delay is the portion of the delay attributed to traffic signal operations and includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Definitions of intersection LOS under the CCTA and HCM methodologies are available in the transportation impact analysis. Traffix software package was employed to analyze study intersections utilizing the CCTA LOS method and Synchro software package was used to analyze study intersections using the HCM method (Fehr & Peers, 2010).

Heavy truck counts were also collected at the study intersections and for the purposes of the LOS analysis, it was assumed that trucks would have an operational equivalency of two passenger cars.[2] As shown in Table 4.17-1, all three study intersections are currently operating at acceptable service levels during both peak hours (Fehr & Peers, 2010).

TABLE 4.17-1
EXISTING INTERSECTION LEVELS OF SERVICE (LOS)

Intersection	Traffic Control[a]	Peak Hour	HCM LOS Method[b]		CCTA LOS Method[c]	
			Delay	LOS	V/C Ratio	LOS
1. Marina Vista Avenue at Mococo Road	Signal	a.m. p.m.	9.9 9.4	A A	0.29 0.46	A A
2. Marina Vista Avenue at I-680 Southbound Ramps	Signal	a.m. p.m.	13.4 10.7	B B	0.46 0.35	A A
3. Marina Vista Avenue at I-680 Northbound Ramps	Signal	a.m. p.m.	10.7 9.8	B A	0.38 0.26	A A

[a] Signal – Signalized intersection
[b] LOS based on average intersection control delay according to *Highway Capacity Manual* (Transportation Research Board, 2000).
[c] CCTA volume-to-capacity (v/c) ratios. LOS based on *Technical Procedures* (Contra Costa Transportation Authority, 2009).

SOURCE: Fehr & Peers, 2010

4.17.2.2 Transit Service

Existing transit service in the vicinity of the Refinery is provided by the Central Contra Costa Transit Authority (CCCTA), which is the primary bus service provider in central Contra Costa County. Three CCCTA bus routes operate near the Refinery on weekdays and one transit route on weekends. The nearest bus stop to the site is along Pacheco Boulevard near the entrance to Gate P-4 of the Refinery.

[2] The Contra Costa County Transportation Authority (CCTA) LOS methodology does not include truck percentages as an input in the LOS calculations; therefore to account for trucks in the CCTA LOS analysis, trucks were assumed to have a passenger car equivalent (PCE) of two cars per truck. For consistency, PCE was also used for the HCM LOS analysis.

4.17.2.3 Pedestrian Facilities

There are no substantial pedestrian facilities in the proximity of the Refinery. The majority of traffic intersections in the area do not include sidewalks, crosswalks, or pedestrian signals. The intersection of Marina Vista Avenue at Mococo Road has crosswalks on the eastbound and southbound approaches along with pedestrian signals.

4.17.2.4 Bike Facilities

Bikeway facilities are designated as Class I, Class II, or Class III. Class I bikeways are dedicated paths, separated from vehicular traffic. Class II bike lanes are striped bikeways within the paved roadway. Class III bike routes are designated bikeways, but not striped, that share the road's pavement with motor vehicles. Class II bicycle lanes exist along Marina Vista Avenue, west of the I-680 northbound ramps. Class II bicycle lanes also exist along segments of Pacheco Boulevard.

4.17.2.5 Emergency Access

There are five gates within the Refinery that provide access for emergency vehicles. Three entrance and exit gates are located in the southern portion of the Refinery along Pacheco Boulevard, and two gates are located in the northern portion of the Refinery near Marina Vista Avenue and Mococo Road.

4.17.2.6 Regulatory Framework

The development and regulation of the transportation network in the vicinity of the Refinery primarily involves state and local jurisdictions. Applicable state and local laws and regulations related to traffic and transportation issues are discussed below.

State

California Department of Transportation

Caltrans manages interregional transportation, including management and construction of the California highway system. In addition, Caltrans is responsible for permitting and regulation of the use of state roadways. Within proximity of the Project site, I-680 is the only facility that falls under Caltrans' jurisdiction. Caltrans' construction practices require temporary traffic control planning "during any time the normal function of a roadway is suspended" (Caltrans, 2010b). In addition, Caltrans requires that permits be obtained for transportation of oversized loads and transportation of certain materials, and for construction-related traffic disturbance.

Regional

Contra Costa County General Plan

The Contra Costa General Plan Transportation and Circulation Chapter provides information about the transportation needs of the County (Contra Costa County, 2010). The Plan also includes LOS standards for the County. The following policies and implementation measures may pertain to the Project:

Policy 5-13: Physical conflicts between vehicular traffic, bicyclists, and pedestrians shall be minimized.

Policy 5-16: Emergency response vehicles shall be accommodated in development of project design.

Implementation Measure 5-d: The County shall establish and maintain an Area of Benefit program to collect fees on new development for roadway and related transportation improvements specified in the Circulation Element. Fees shall be based on traffic generated by a use and the costs of transportation improvements necessary to maintain acceptable Levels of Service with the cumulative amount of development authorized by adopted plans.

The significance criteria presented in the *Contra Costa General Plan* level of service standards were used to determine study intersection performance. Impacts would be considered significant if the Project construction traffic would cause any of the following to occur:

- Intersection operations to change from LOS low-D (defined as average delay of 45 seconds using the HCM method (or volume-to-capacity ratio of 0.84 using the CCTA LOS method), or better to LOS high-D, E, or F;
- Deterioration in already unacceptable operations by a change in V/C ratio of more than 0.01 or a change in average delay of more than 5 seconds.

Contra Costa Countywide Transportation Plan

The 2009 Contra Costa Countywide Comprehensive Transportation Plan (CTP) provides information about the goals and strategies established by the CCTA in the effort to address changes in countywide population and utilization of the existing and future transportation system (CCTA, 2009). It appears that the goals and strategies outlined in the CTP would not directly pertain to the Project.

4.17.2.7 Project Baseline

The environmental setting generally constitutes the baseline for purposes of analyzing potential impacts on transportation and traffic.

4.17.3 Significance Criteria

Consistent with CEQA Guidelines Appendix G (Environmental Checklist), the Project would have a significant impact if it would:

a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit;

b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways;

c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks;

d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment);

e) Result in inadequate emergency access; or

f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.

In addition to the above-listed criteria, the following criterion is derived from common engineering practice to apply to the project-specific analysis presented herein:

g) Cause substantial damage or wear of public roadways by increased movement of heavy vehicles.

4.17.4 Discussion of No Impacts on Transportation/Traffic

Review and comparison of the setting circumstances and Project characteristics, with the significance criteria stated above, clearly show that no impacts would be associated with criteria c) through f). The following provides a discussion of each topic area for which there would be no transportation and traffic impact.

c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?

The proposed construction and operations of the Project would not involve aircraft, would not be near an airport (e.g., the nearest airport is Buchanan Field, about four miles from the Refinery), nor would the Project intrude into aircraft flight paths or air traffic spaces. Therefore, the Project would have no impact on air traffic patterns.

d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

The proposed construction and operations of the Project would not involve redesign or reconfiguration of roadways. There would be no incompatible uses nor would there be roadway design changes. Therefore, the Project would have no impact on road hazards.

e) Result in inadequate emergency access?

The Refinery includes multiple access locations for emergency vehicles. As discussed in the Section 4.17.2, *Setting*, there are five gates within the Refinery that provide access for all vehicle types, and it is assumed that there would be no changes at the Refinery under existing and Project conditions. The construction-related activities would not prevent emergency vehicles from accessing the Refinery. Therefore, there would be no impact related to emergency access.

f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?

The Project would not directly or indirectly eliminate alternative transportation corridors or facilities (e.g., bike paths, lanes, bus turnouts, etc.). In addition, the Project would not involve obstruction, redesign or reconfiguration of roadways nor would the Project include changes in policies or programs that support alternative transportation. Therefore, the Project would not conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities. As discussed in Section 4.17.2, *Setting*, there are few pedestrian and bicycle facilities in proximity to the Refinery, with limited activity near the site. Bicycle activity on Marina Vista Avenue and Pacheco Boulevard are accommodated in Class II bicycle lanes. No impact would occur.

4.17.5 Discussion of Impacts and Mitigation Measures

Approach to Analysis

The discussion of impacts is based on a transportation impact analysis conducted by Fehr & Peers to determine the extent to which the Project and associated construction activities may increase the peak-hour traffic to and from the existing refinery site over time (Fehr & Peers, 2010). No long-term operations-related impacts would occur under the Project. Peak-hour travel demand estimates based on the amount of additional construction vehicle trips, and the effect on the surrounding transportation network, were evaluated.

a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?

b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?

Impact 4.17-1: Project construction would temporarily increase traffic volumes on area roadways. (*Less than Significant*)

Travel Demand Estimate

As presented in Chapter 3, *Project Description*, the Project includes crude storage tank replacements at the Refinery, which would involve replacing two existing crude oil storage tanks as well as a crude oil mix tank with three new larger crude oil storage tanks, construction of a new mix tank, and refurbishments or retrofits to two other storage tanks. It is anticipated that approximately 100 additional workers would be needed at the Refinery for construction activities. The construction activities are expected to produce approximately 15 additional truck trips per day to the Refinery. Once completed, the Project would not increase the number of workers at the Refinery.

Trip Generation

The traffic impacts associated with the Project would involve trips produced by the proposed construction activities at the site. Peak-hour trip generation estimates are presented in Table 4.17-2. Peak hour trip generation estimates were developed for each of the construction components based on the estimated truck traffic and worker trips provided by Refinery staff.

TABLE 4.17-2
PEAK HOUR PROJECT TRIP GENERATION ESTIMATES

Traffic Type	AM Peak Hour		PM Peak Hour	
	In	Out	In	Out
Project Construction Traffic				
Worker[a]	100	0	0	100
Truck[b]	30	0	0	30
Total Project Trips	**130**	**0**	**0**	**130**

[a] Workers are assumed to access the site through Gate 72, while trucks are assumed to access the site through Gate 75; both gates take access from Marina Vista Avenue at the Mococo Road intersection.
[b] These values represent total number of passenger car equivalents. It was assumed that the trucks would have a passenger car equivalent of two (thus the actual number of trucks would be half of what is shown).

SOURCE: Fehr & Peers, 2010

Construction activities at the Refinery are anticipated to generate the highest number of hourly worker and truck delivery trips between 6:00 a.m. and 7:00 a.m. during the morning peak period, and between 5:00 p.m. and 6:00 p.m. during the afternoon peak period. Based on the assumptions provided by Refinery staff, construction activities would generate about 100 vehicle (worker) trips and about 30 passenger-vehicle equivalent trips due to truck deliveries during both peak hours (Fehr & Peers, 2010).

Trip Distribution

Project trips were assigned to the study intersection network based on the following assumptions:

- 67 percent of all construction-related traffic would come from the south and 33 percent would come from the north along I-680;
- All construction worker and delivery truck trips would access the Refinery via Gates 72 or 75 off Marina Vista Avenue;
- Access to Pacheco Boulevard would be achieved via the I-680/Pacheco Boulevard and I-680/Arthur Road interchanges; and
- Access to Marina Vista Avenue would be achieved via the I-680/Marina Vista Avenue interchange.

Existing Plus Project Intersection Levels of Service

Existing plus Project intersection peak-hour traffic volumes are presented in Figure 4.17-3. The results of the existing plus project LOS analysis are presented in Table 4.17-3. The results indicate that all of the study intersections would continue to operate at acceptable service levels during both peak hours (LOS B or better). The proposed construction activities and associated increased trips would not cause any significant impacts to local traffic conditions.

TABLE 4.17-3
EXISTING PLUS PROJECT INTERSECTION PEAK HOUR LEVELS OF SERVICE

Intersection	Peak Hour	HCM Method[a]				CCTA LOS Method[b]			
		Existing		Plus Project		Existing		Plus Project	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Marina Vista Avenue / Mococo Road	AM	9.9	A	11.1	B	0.29	A	0.32	A
	PM	9.4	A	12.9	B	0.46	A	0.56	A
2. Marina Vista Avenue / I-680 Southbound Ramps	AM	13.4	B	15.5	B	0.46	A	0.55	A
	PM	10.7	B	11.1	B	0.35	A	0.38	A
3. Marina Vista Avenue / I-680 Northbound Ramps	AM	10.7	B	12.9	B	0.38	A	0.44	A
	PM	9.8	A	10.0	B	0.26	A	0.29	A

[a] LOS based on average intersection control delay according to *Highway Capacity Manual* (Transportation Research Board, 2000).
[b] CCTA volume-to-capacity (v/c) ratios. LOS based on *Technical Procedures* (Contra Costa Transportation Authority, 2009).

SOURCE: Fehr & Peers, 2010

Mitigation: None required.

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g) Cause substantial damage or wear of public roadways by increased movement of heavy vehicles?

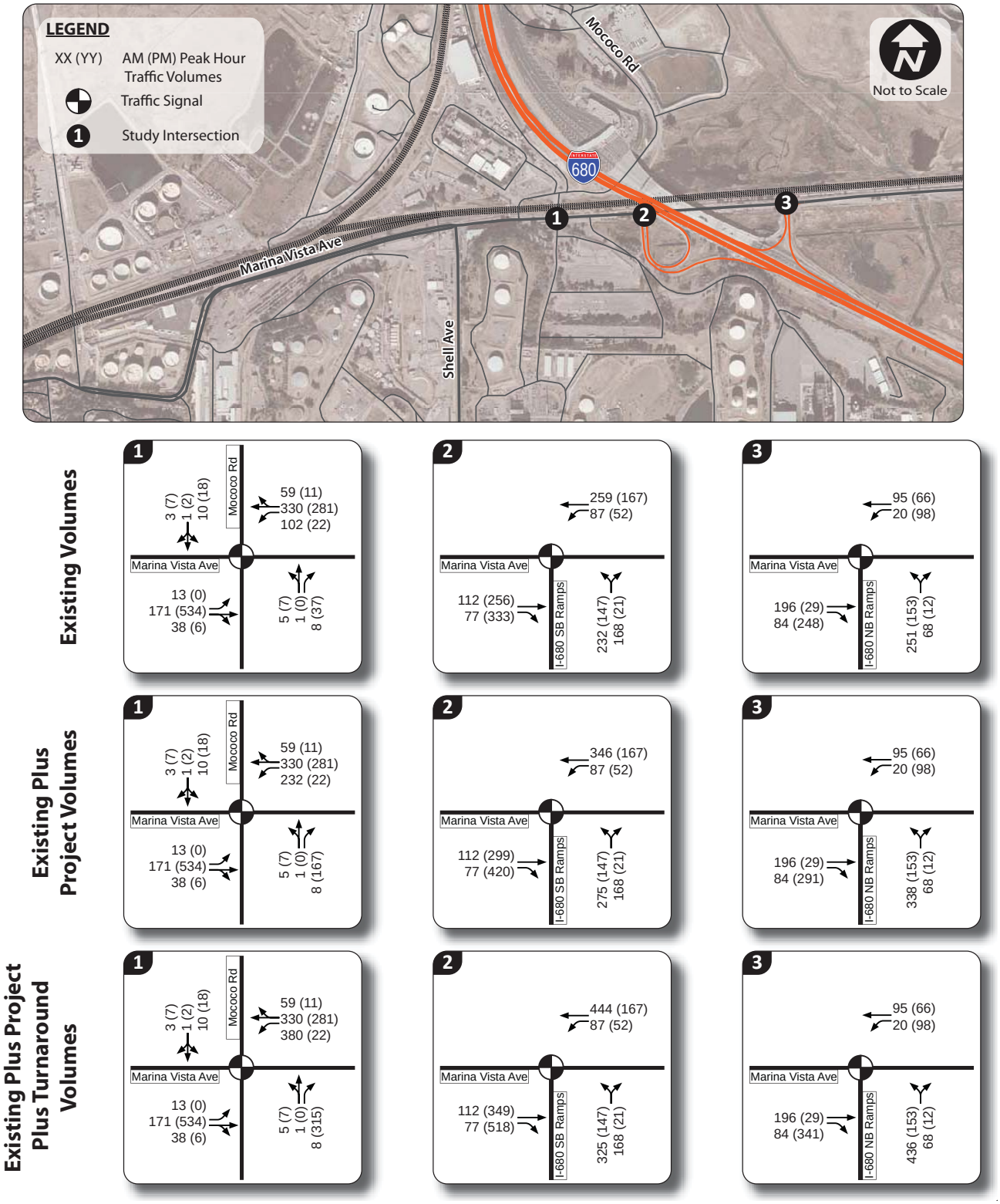
Impact 4.17-2: Traffic generated by the Project could contribute to pavement wear-and-tear on area roadways. (*Less than Significant with Mitigation*)

The use of big trucks to transport equipment and material to and from the Project work sites could affect road conditions on the designated haul routes by increasing the rate of road wear. The degree to which this impact would occur depends on the roadway design (pavement type and thickness) and the existing condition of the road. Freeways, such as I-680, are designed to handle a mix of vehicle types, including heavy trucks. The Project's impacts are expected to be negligible on those roads. Arterial and collector streets, such as Marina Vista Avenue are likewise designed to handle a mix of vehicle types. However, because of the potential for excessive road wear due to Project construction trucks, measures are identified to mitigate this potentially significant impact.

> **Mitigation Measure 4.17-2:** Prior to project construction, Shell shall document road conditions for all routes that will be used by project-related vehicles. Shell shall also document road conditions after project construction is completed. The pre- and post-

construction conditions of the haul routes shall be reviewed, by Public Works Department staff. Shell shall enter into an agreement prior to construction that will detail the pre-construction conditions and the post-construction requirements of a rehabilitation program. Roads damaged by construction would be repaired to a structural condition equal to that which existed prior to construction activity. A cash bond/deposit to finance damage to County/City roadways shall be required. An encroachment permit may be required from the City/County and a transportation/haul permit may be also required for any extra-legal loads used during construction.

Significance after Mitigation: Less than Significant.



SOURCE: Fehr & Peers

Shell Martinez Project EIR . 209699

Figure 4.17-3
Existing plus Project Intersection Peak Hour Turning Movements

4.18 Utilities and Service Systems

4.18.1 Introduction

This section analyzes the Project's relationship to utilities and service systems. Discussed are the physical and regulatory setting, the baseline for determining environmental impacts, the significance criteria used for determining environmental impacts, and potential impacts associated with construction, operation, and maintenance of the Project.

4.18.2 Setting

4.18.2.1 Regional and Local Setting

Shell's Martinez Refinery (Refinery) is located approximately 25 miles northeast of San Francisco (see, Section 3, *Project Description*, Figure 3-1) adjacent to the community of Martinez. Approximately 20 percent of the Refinery is located within the corporate limits of the City of Martinez. The remainder of the Refinery is in unincorporated Contra Costa County. All of the Project components would be constructed within the County.

Water Service

The Contra Costa Water District (CCWD) provides water service to developed areas of eastern and central Contra Costa County. The Refinery gets it raw water from the CCWD (see Section 3.5.1, *Water Use*, for more information). Potable water needs at the Refinery are served by the City of Martinez.

Wastewater Service

The Refinery's effluent treatment plant located onsite processes all Refinery wastewater and a portion of the sanitary waste for Refinery facilities located on the west side of the Refinery. Central Contra Costa Sanitary District treats the portion of Refinery sanitary wastes for the Refinery facilities located on the east side of the Refinery.

Stormwater Drainage

The drainage facilities at the Refinery fall under the jurisdiction of Contra Costa County and its Flood Control and Water Conservation District. See Section 4.10, *Hydrology and Water Quality*, for further discussion of drainage in the Project area.

Solid Waste Disposal

The Contra Costa County Health Services Department, Environmental Health Division is certified by the California Department of Resources Recycling and Recovery (CalRecycle) as the Local Enforcement Agency (LEA) for Solid Waste in Contra Costa County. Two permitted, large-volume landfills are active in Contra Costa County, including Keller Canyon Landfill and West Contra Costa Sanitary Landfill. The Keller Canyon Landfill operated by Republic Services

is located east of the Refinery at 901 Bailey Road in Pittsburg near State Route 4 and is used by the Refinery for all non-hazardous wastes disposal. It serves the eastern and central portions of Contra Costa County and is a Class II facility with a projected remaining life span of 40 years. Hazardous waste generated by the Refinery is sent to the Clean Harbors Landfill in Buttonwillow, located in the Central Valley, approximately 20 miles west of Bakersfield. Reclamation of metal, such as the scrap metal that would be produced by the demolition of tanks under the Project, is handled by Plant Reclamation, a company located in Richmond, to the southwest of the Refinery.

Energy Service

The majority of the electricity needs of the Refinery are provided by Shell's onsite cogeneration unit and Pacific Gas & Electric Company (PG&E) provides the remainder of electricity. Shell also obtains natural gas from PG&E.

4.18.2.2 Regulatory Setting

Contra Costa County General Plan

The Contra Costa County General Plan contains goals and policies pertaining to water supply, solid waste, and sanitary sewer facilities within its Public Facilities/Services Element, Growth Management Element, and Conservation Element (Contra Costa County, 2010). The Public Facilities/Services Element establishes goals and policies and implementation measures that address the vital infrastructure and public services that must be provided. The Growth Management Element establishes performance standards related to the provision of essential public utilities/services. The Conservation Element presents goals and policies for resource protection, including energy and water. These goals and policies are summarized as follows:

Water Use, Conservation, and Demand:

- Require that water service systems meet regulatory standards for water delivery, water storage, and emergency water supplies.
- Require demonstration that adequate water quantity and quality can be provided based on information furnished or made available to the County from consultations with the appropriate water agency.
- Encourage reclamation of water as a supplement to existing water supplies.

Wastewater:

- Require that wastewater treatment capacity can be provided and that treatment facilities operate in compliance with waste discharge requirements established by the California Regional Water Quality Control Board.

Solid Waste:

- Consider solid waste disposal capacity in County land use planning and permitting.
- Encourage solid waste resource recovery (including recycling, composting, and waste to energy) so as to extend the *life* of sanitary landfills, reduce environmental impact, and to make use of a valuable resource.

Contra Costa Ordinance

Construction and Demolition Debris Recovery Ordinance

The intent of this ordinance is to reduce the quantity of construction and demolition debris disposed in landfills as required by State law. The Ordinance requires owners of all construction or demolition projects that are 5,000 square feet in size or greater to demonstrate that at least 50 percent of the construction and demolition debris generated on the jobsite are reused, recycled, or otherwise diverted.

Contra Costa Countywide Integrated Waste Management Plan

As required by the California Integrated Waste Management Act, Contra Costa County adopted a *Countywide Integrated Waste Management Plan* and *Source Reduction and Recycling Element* (SRRE). The Integrated Waste Management Act establishes waste management goals, objectives, and policies related to solid waste disposal, facilities siting, household hazardous waste collection and disposal, and to implementation of programs to achieve plan goals. The SRRE establishes policies and goals related to source reduction, recycling, composting, special waste, and public information and education, and programs designed to achieve SRRE goals.

4.18.2.3 Project Baseline

Baseline conditions reflect the ongoing operation of the Refinery, as it existed as an oil refinery at the time that the Notice of Preparation for the Project was issued (February 2010), including on going operations and maintenance activities.

4.18.3 Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts to utilities and service systems if it would:

a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board;

b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;

c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;

d) Not have sufficient water supplies available to serve the project from existing entitlements and resources, or if new or expanded entitlements are needed;

e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it does not have adequate capacity to serve the project’s projected demand in addition to the provider’s existing commitments;

f) Be served by a landfill without sufficient permitted capacity to accommodate the project’s waste disposal needs; or

g) Not comply with federal, State and local statutes and regulations related to solid waste.

4.18.4 Discussion of No Utilities and Service Systems Impacts

Review and comparison of baseline conditions and Project characteristics in the context of the significance criteria stated above demonstrates that no utilities and service systems impacts would result for criteria a), b), c), d), e) or g).

a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board

The Project would not exceed the existing wastewater treatment requirements of the Regional Water Quality Control Board (RWQCB)'s National Pollutant Discharge Elimination System (NPDES) permit for the Refinery. The Project would not result in any appreciable increase in wastewater volume or decrease in wastewater quality relative to existing conditions at the Refinery. There would be no impact related to criterion a).

b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects

The Project would not require or result in construction of new water or wastewater treatment facilities or expansion of existing facilities. Any increase in long-term water demand that would be associated with the Project would be negligible and would not result in any appreciable increase in wastewater volume relative to existing conditions at the Refinery. There would be no impact related to criterion b).

c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.

The Project would not require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects. The volume of storm water that would fall within the existing containment berms for the proposed tank farm site would not change because the surface area of the containment area would not change. There would be no impact related to criterion c).

d) The Project would have sufficient water supplies available to serve the project from existing entitlements and resources, and new or expanded entitlements would not be needed.

The Project would not require any new or expanded water service entitlements. Water use during construction of the Project would be temporary and would be primarily related to dust suppression and concrete production. During operations, increased water use that would primarily be associated with new tank steam coils would be negligible. There would be no impact related to criterion d).

e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it does not have adequate capacity to serve the project's projected demand in addition to the provider's existing commitments

Any wastewater that would be produced by the Project would be treated onsite at the Refinery's Effluent Treatment Plant (ETP). The ETP has adequate capacity to serve the Project in addition to serving the existing needs of the Refinery. The Project would not result in construction of new water or wastewater treatment facilities or expansion of existing facilities. There would be no impact related to criterion e).

g) The Project would comply with federal, state and local statutes and regulations related to solid waste.

Project-related disposal of unsalvageable materials would occur at authorized sites in accordance with all applicable statutes and regulations. Contractors that would haul construction waste to Contra Costa County transfer stations or landfills would be required to comply with Contra Costa County Ordinance 2004-16 regarding construction and demolition debris. There would be no impact related to criterion g).

4.18.5 Discussion of Impacts and Mitigation Measures

f) Would the Project be served by a landfill without sufficient permitted capacity to accommodate the Project's waste disposal needs?

Impact 4.18-1: Project construction would temporarily increase the flow of solid waste to area landfills. (*Less than Significant*)

Long-term operations of the Project would result in a negligible increase in solid waste compared to existing conditions at the Refinery. However, the Project would increase solid waste generation at the Refinery during the up to three-year dismantling and construction period. Tanks proposed for demolition would be drained and cleaned, and materials would be recycled prior to demolition. Demolished equipment would be cut up and salvaged. Non-hazardous waste (materials that could not be recycled) would be disposed of at Keller Canyon Landfill and hazardous waste materials would be profiled and disposed of at Clean Harbors Landfill. Because the vast majority of demolition materials would be salvaged and recycled, the expected volume of non-salvageable hazardous and non-hazardous solid wastes would not be substantial. These landfill facilities have adequate capacity to support the solid waste disposal needs of the Project. Accordingly, the Project would result in a less-than-significant impact related to solid waste disposal capacity.

Mitigation: None required.

CHAPTER 5
Other CEQA Considerations

CEQA requires an EIR to consider the significant environmental effects of a proposed project (CEQA Guidelines §15126.2). Direct and indirect, short- and long-term effects of the Project are analyzed in Chapter 4 of this document. This chapter considers significant and unavoidable impacts in Section 5.1, significant irreversible environmental effects in Section 5.2, growth-inducing impacts in Section 5.3, cumulative impacts in Section 5.4, and effects found to not be significant in Section 5.5.

5.1 Significant Unavoidable Impacts

Section 21100(b)(2)(A) of CEQA requires an EIR to identify significant environmental effects that cannot be avoided if the project is implemented. Most of the impacts of the Project would be less than significant or could be mitigated to a less than significant level. However, the Project would result in the following significant impacts that can be mitigated but not reduced to a level of insignificance without adopting an alternative project proposal:

- **Aesthetics, Biological Resources, Hazards and Hazardous Materials, and Hydrology and Water Quality:** During operation, the potential for an accidental crude oil spill from CTRP-related vessels at the Shell Marine Terminal (MT) or those transiting to and from the MT would have a significant and unavoidable direct impact on sensitive resources within the San Francisco Bay region (see Impacts 4.1-1, 4.1-3, 4.4-2, 4.9-1, and 4.10-3). This impact could also interact cumulatively when combined with another spill in the region (see Impacts 5-1, 5-3, 5-4, and 5-5).

- **Biological Resources:** Operation of marine vessels associated with the CTRP could introduce invasive species to the San Francisco Bay Region (Impacts 4.4-1 and 5-2).

5.2 Significant Irreversible Environmental Effects

Section 21100(b)(2)(B) of CEQA requires that an EIR identify any significant effect on the environment that would be irreversible if the project were implemented. Section 15126.2(c) of the CEQA Guidelines describes irreversible environmental changes as follows:

> Uses of nonrenewable resources during the initial and continued phases of the project may be irreversible since a large commitment of such resources makes removal or nonuse thereafter unlikely. Primary impacts and, particularly, secondary impacts (such as highway improvement which provides access to a previously inaccessible area) generally commit future generations to similar uses. Also irreversible damage can result from environmental accidents associated with the project.

Construction and operations associated with the Project would require some non-renewable resources, such as diesel and gasoline for construction vehicles and equipment, and marine vessel diesel and residual fuel oil for crude oil shipping. However, use of non-renewable resources during construction would be limited to the approximate 36-month construction period. The temporary, construction-related increase would not result in significant use of non-renewable resources and would not commit future generations to similar uses. With regard to long-term operations, use of marine vessel diesel and residual fuel oil for increased crude oil shipping would be limited to approximately one additional vessel call at the MT per week. This increase in crude oil shipping would not represent a significant use of non-renewable resources and would not commit future generations to similar uses.

Accidents, such as the release of crude oil during MT operations, could trigger irreversible environmental damage. During operation, the potential for an accidental crude oil spill from CTRP-related vessels at or near the MT could cause significant irreversible changes to the environment within the San Francisco Bay region (see Impacts 4.1-1, 4.1-3, 4.4-2, 4.9-1, and 4.10-3). In addition, marine vessels associated with MT operations could introduce invasive species to the San Francisco Bay Region that could cause irreversible damage to biological resources (see Impact 4.4-1).

5.3 Growth-Inducing Impacts

Section 15126.2(d) of the CEQA Guidelines states that an EIR should 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.” Growth can be induced in a number of ways, including through the elimination of obstacles to growth, through the stimulation of economic activity within the region, or through precedent-setting action. CEQA requires a discussion of how a project could increase population, employment, or housing in the areas surrounding the project as well as an analysis of the infrastructure and planning changes that would be necessary to implement the project.

Section 4.14, *Population and Housing*, analyzes the Project’s overall effect on population and housing, including growth-inducing considerations. The temporary increase in the local labor force of up to 100 workers during construction would not contribute to any significant increase in the local population as there is a well established worker base in the area that serves the five Bay Area refineries for projects similar to the CTPR. Furthermore, because the CTRP would not increase product throughput at the Refinery and there would be no permanent increase in the labor force for CTRP operations, no long term impact to population would be likely to occur. Therefore, construction and operations associated with the Project would not encourage new development or induce population growth. In sum, the Project would neither directly nor indirectly induce short-term or long-term population growth.

5.4 Cumulative Impacts

Public Resources Code section 21083(b)(2) states that a significant effect on the environment includes the possible effects of a project "that are individually limited but cumulatively considerable." As defined by CEQA, "cumulatively considerable' means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects." (*Id.*) Stated another way, "a cumulative impact is created as a result of a combination of the project evaluated in the EIR together with other projects causing related impacts" (CEQA Guidelines § 15130(a)(1)). The CEQA Guidelines require that:

- Cumulative impacts shall be discussed when they may be significant;
- The discussion may be more general than that for the individual project impacts, but that the discussion should reflect the potential extent, severity, and probability of the impact;
- The cumulative impact analysis may be based on either a list of past, present, and probable future projects or a summary of projections from an adopted General Plan or other adopted planning document; and
- Reasonable options for mitigating or avoiding the project's contribution to significant cumulative impacts shall be discussed, noting that for some cumulative impacts the only feasible mitigation may involve the adoption of ordinances or regulations rather than the imposition of conditions on a project-by-project basis.

This EIR uses a combination of a plan-based approach and a list-based approach to determine whether any significant cumulative impact would occur. From a plan-based perspective, the technical analyst for each resource area considered the Project in light of its consistency or conflict with the assumptions and projections of the Contra Costa County General Plan and other applicable planning documents identified in Section 5.4.1. From a list-based perspective, Project impacts were analyzed in combination with the impacts of the other Shell Refinery projects identified in Section 5.4.2.1, other local non-Shell Refinery and pipeline projects are identified in Section 5.4.2.2, and impacts of the past, present, and reasonably foreseeable projects identified in Section 5.4.2.3. In reaching a conclusion for each resource area, five considerations were made: (i) the geographic scope of the cumulative impact area for that resource; (ii) the timeframe within which Project-specific impacts could interact with the impacts of other projects; (iii) whether a significant adverse cumulative condition presently exists to which Project impacts could contribute; (iv) the significance of the incremental Project-specific contribution to cumulative conditions; and (v) whether any cumulative impact is significant. The analysis of cumulative impacts for each resource area analyzed in Sections 4.1 through 4.18 of this document is set forth in Section 5.4.3.

5.4.1 General and Regional Plans Considered in the Cumulative Analysis

To determine the effects of projects that may not be well defined or are unforeseen, this analysis considered the following planning documents:

- Contra Costa County General Plan;
- City of Martinez;
- Contra Costa Congestion Management Plan;
- Contra Costa Clean Water Program;
- Bay Conservation and Development Commission (BCDC) Plans; and
- San Francisco Bay Area Regional Water Quality Control Board (RWQCB).

These adopted plans have been prepared by local agencies to meet the requirements of State law. These plans are comprehensive, long-term visions for physical development within the region. For example, the Contra Costa County General Plan, adopted in 2005 and reprinted in 2010, includes specific goals and policies to preserve and enhance existing development and to provide for orderly and appropriate new development until approximately the year 2020. County land use and development actions and approvals must be consistent with the General Plan.

5.4.2 Specific Projects Considered in the Cumulative Analysis

Incremental, Project-specific impacts could interact with the continuing impacts of past projects and/or the impacts of other projects currently under consideration as well as reasonably foreseeable future projects. Other projects at the Shell Martinez Refinery and at other existing refineries in the County are likely to cause impacts that are similar to those anticipated to result from the Project. Other, non-refinery projects also could cause similar, potentially overlapping impacts with those of the Project (see Table 5-1).

5.4.2.1 Other Shell Refinery Projects

A number of other Shell Martinez Refinery projects have recently been implemented/permitted, or are currently in the permit process. In addition, ongoing maintenance activity projects are implemented at the Refinery on a routine basis. Below are general descriptions of these other Shell Refinery projects.

Recent Projects

The following Shell Martinez Refinery projects have either recently been undertaken or have been permitted within the last five years:

- **New Ethanol Storage Tank (November 2006).** This project provides the capability of producing California Air Resources Board (CARB) Phase III Reformulated Gasoline by blending ethanol into gasoline at the Refinery truck terminal. The project included demolition of an old gasoline tank and construction a new ethanol tank at the same location.

- **Wastewater Junction Box Water Scrubbers Installation (March 2007).** This project improves compliance with Bay Area Air Quality Management District (BAAQMD) Regulation 8, Rule 8 (*Wastewater Collection and Separation Systems*) by installing emission controls on sewer junction box vents. It included installation of low-pressure water seals (simple water scrubbers) on several sewer junction box vents around the Refinery.

- **Replacement of CARB Enhanced Vapor Recovery for Refinery Gasoline Dispensing Facility (August 2009).** This project includes the replacement of existing Phase II vapor recovery with an Enhanced Vapor Recovery (EVR) CARB certified Phase II system on the Refinery's underground gasoline storage tank to control emissions from vehicle fueling.

- **Intra-Refinery Pipeline (December 2009).** The Crude Tank Replacement Project (CTRP) is a scaled-down version of a similar project that was the subject of a Land Use Permit (LUP) application filed by Shell in November 2006 (2006 project). The 2006 project application was withdrawn in 2007 due to a review of project economics and reprioritization of capital spending by Shell. In addition to increased crude oil storage capacity (new tanks), the 2006 project included modifications to two of Shell's sulfur plants and an intra-Refinery pipeline. While the intra-Refinery pipeline was a stand-alone project that did not require discretionary permits [see Contra Costa County Code §84-63.410 (b)(1)], it was included in the 2006 project because it could be used either to supply crude oil to existing tanks or could be used to supply the new tanks included in the 2006 project. Upon withdrawal of the 2006 LUP application, Shell obtained the required ministerial permits for construction of the intra-Refinery pipeline and the pipeline became fully operational in December 2009. The pipeline is now being used to supply existing tanks with crude oil.

- **Catalytic Reformer Energy Recovery (CRU) Energy Efficiency Project (May 2011).** The CRU Energy Efficiency Project, involves the installation of a new heat exchanger at the CRU, and was originally proposed as part of the CTRP. However, it can only be undertaken during a CRU turnaround, which occurs in designated intervals for safety, environmental, and operational reasons. Therefore, the CRU Energy Efficiency Project was removed from the CTRP so that it could be installed during the 2011 CRU turnaround, which occurred April 8 - May 9, 2011. The improvement associated with the CRU Energy Efficiency Project is achieved through heat recovery and a resulting reduction in furnace firing, which in turn results in a commensurate reduction in GHG emissions, expressed as CO_2e. The reductions in emissions at the CRU are being realized by the CRU F-49 furnace.

- **Distillates Hydrotreater Energy Recovery (DHT) Energy Efficiency Project (third or fourth quarter, 2011).** Similar to the CRU project, the DHT Energy Efficiency Project was originally part of the CTRP. However, due to delays in the anticipated timing of the issuance of the Land Use Permit for the CTRP, the DHT project has been removed from the CTRP and will be implemented independently in mid 2011. This project will reduce fuel consumption and associated GHG emissions through the activation of an existing idle heat exchanger. The reduction in CO_2e emissions have been estimated by quantifying baseline and projected CO_2e emissions assuming the DHT F-13909 will typically operate as a startup/shutdown furnace rather than continuously as it currently operates.

Project in the Permit Process

California State Lands Commission Marine Terminal Lease

The California State Lands Commission (CSLC) recently granted Shell a new 30-year lease for its marine terminal operations. The new lease was granted by the CSLC on June 23, 2011. The CSLC certified the EIR prepared for the consideration of the new 30-year lease describes the marine terminal operations and evaluates the impacts of the new lease, including evaluation of future vessel traffic impacts (CSLC, 2011). The assumptions and basis for the proposed CTRP are aligned with the forecasted activity of the marine terminal lease operations.

New Aeration and Clarifier Tanks at Wastewater Treatment Plant Project

Shell is proposing to construct a new aeration tank (biotreater) and clarifier and the accompanying support equipment (new analyzers and instrumentation, piping,) at its Wastewater Treatment Plant. Shell currently operates two biotreaters in parallel at the plant. The primary objective of this project is to provide a spare system for the effluent treatment plant (ETP-2) biotreater and clarifier tanks while they are out of service for mandatory maintenance work. This project would have the added benefit of providing an increased reliability for means of compliance with the Refinery's National Pollutant Discharge Elimination System permit requirements during upsets, scheduled inspection, and maintenance periods. This project would not allow for an increase in wastewater processing or capacity or Refinery expansion. After the maintenance work on the ETP-2 tanks is complete, Shell intends to operate the new tanks in addition to the existing system to improve the reliability and performance of the overall waste water treatment process.

Marine Oil Terminal Engineering and Maintenance Standards

The Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS) proposed by CSLC were approved by the California Building Standards Commission, and became effective on February 6, 2006. MOTEMS are codified in California Code of Regulations Title 24, Part 2, Chapter 31F (*Marine Oil Terminals*). Operators/owners of facilities deemed "high risk," such as the Shell terminal, must complete certain tasks required by CSLC and be subject to an audit process. Work on the tasks and demonstration of compliance is currently being completed by Shell. The standards apply to all existing and new marine oil terminals in California, and include criteria for inspection, structural analysis and design, mooring and berthing, geotechnical considerations, and fire, piping, mechanical, and electrical systems. Compliance with the standards is monitored and enforced by CSLC. Because Shell must comply with these standards, the resultant risk of small oil leaks and spills is reduced. Crude oil deliveries to the Shell Martinez terminal would be subject to the improvements made under the new MOTEMS requirements. These improvements are anticipated to include seismic retrofits of the existing berths and associated equipment.

Maintenance Activities

Operation of the Refinery requires substantive ongoing maintenance activities. Maintenance is needed so that all Refinery process units operate within their design parameters, and to ensure that products meet quality and quantity goals. Regular maintenance is essential to the overall safe operation of the Refinery.

In addition to ongoing maintenance activities, scheduled maintenance actions called turnarounds are also necessary. The term "turnaround" refers to the period of time when refinery equipment is not available to process feedstocks, as opposed to refinery equipment's typical 24-hour-per-day, 365-day-per-year operation. There are a number of reasons to schedule a time when equipment would be out of operation. Some of these reasons are:

- To perform maintenance on critical equipment;
- Replace equipment that has reach an end of life condition;
- To upgrade existing refinery equipment and vessels;
- To renew catalysts;
- To make connections for new equipment being installed; and
- To repair and renew piping and equipment before they fail.

Turnarounds are termed major when significant portions of the Refinery are shut down; minor turnarounds may affect only certain units, or parts of the total Refinery. Major turnarounds occur at four- to six-year intervals and minor turnarounds typically occur at two- to three-year intervals. These turnarounds are part of the Refinery's normal ongoing maintenance program and do not typically require permits or environmental review. A major turnaround may also offer the opportunity to work on other downstream equipment that is shut down in connection with the equipment and processes directly subject to the turnaround.

When a turnaround involves more than ordinary and routine maintenance, permits may be required. Following are examples of maintenance activities that occurred in the last five years and that required permits:

- **Replacement of Alkylation Unit Reactor No. 4 (August 2007).** Alkylation units convert light end crudes to more usable products (e.g., gasoline, etc.). This maintenance project included replacement of equipment that had reached end of life conditions, replacement of Stratco Reactor No.4 in the Alkylation Unit, and minor changes were made to piping, valves, flanges, and instrumentation.

- **Enhancement of Naphtha Hydrotreater Unit Processing (Heat Exchanger Installation) (October 2008).** This maintenance activity included changes to the Naphtha Hydrotreater Unit and associated equipment in order to improve naphtha processing flexibility. The maintenance project included installation of a new heat exchanger and replaced several pumps and vessel internals.

- **Replacement of Sulfur Recovery Unit 3 Catalytic Oxidizer (August 2009).** This maintenance project improved compliance with SO_2 limits by increasing efficiency and improving reliability of the abatement device for Sulfur Recovery Unit 3 and replacement of an existing catalytic oxidizer and associated oxidizer preheater with a new thermal oxidizer.

- **Replacement of Alkylation Unit Reactors Nos. 2 and 3 (February 2010).** This maintenance project included replacement of equipment that had reached end of life conditions, replacement of Stratco Reactors Nos.2 and 3 in the Alkylation Unit, and minor changes were made to piping, valves, flanges, and instrumentation.

- **Catalytic Cracking Unit Reactor and Stripper Revamp (March 2010).** This maintenance project included replacement of equipment that had reached end of life conditions, replacement of riser, primary cyclones, plenum, secondary cyclone, and steam stripping internals in the reactor, replacement of steam stripping internals in the spent catalyst stripper vessel, replacement of a heat exchanger, and minor tray and piping changes in the gas plant.

- **Catalytic Reformer Unit Energy Efficiency Project (May 2011).** This project improves energy efficiency of the CRU by the installation and use of a heat exchanger and minor changes to piping, valves, and flanges.

5.4.2.2 Local Non-Shell Refinery, Pipeline and Other Projects in the Local Area

ConocoPhillips Clean Fuels Expansion Project (CFEP)

ConocoPhillips sought approval of a land use permit for the CFEP. The CFEP objective is to add new facilities and modify existing facilities to produce additional clean fuels from heavy gas oil produced by the ConocoPhillips Rodeo Refinery and sold into the heavy gas oil and fuel markets. The project involved a number of changes to the refinery in Rodeo and involved the installation of a new hydrogen plant operated by a third party at the refinery. An EIR was prepared by Contra Costa County Community Development Department and the Final EIR was certified by Contra Costa County on May 8, 2007. The project became operational in 2009.

Valero Improvement Project

Valero proposed a series of modifications and additions to its Benicia refinery. The project would provide the ability to process lower grades of raw crude and provide flexibility to substitute raw crudes. In addition, the project would optimize operations for efficient production of clean burning fuels. This project was approved by the City of Benicia in 2003 and is currently undergoing a multi-year implementation period.

Chevron Richmond Refinery's Energy and Hydrogen Renewal Project

The proposed Chevron Richmond Refinery's Energy and Hydrogen Renewal Project would involve a series of modifications and additions to the Richmond refinery. The project would modify or replace existing equipment and install new refining equipment. All units would be located within the boundaries of the existing refinery, generally placed among similar existing equipment. The project would modify, replace, and install typical refining equipment – piping, heat exchangers, instrumentation, catalytic reactors, fractionation equipment, pumps, compressors, furnaces, tanks, and their associated facilities, as well as some refinery buildings and infrastructure. Changes would include construction and installation of new facilities as well as replacement of or modifications to existing facilities. The project was approved by the City of Richmond in July 2008; however, the project has not yet been fully implemented. As of June 2011, the project is once again under review by the City of Richmond and is being changed to some unknown degree.

Chevron Long Wharf Lease Renewal

Chevron is seeking a renewal of its CSLC lease on its Long Wharf tanker pier in San Francisco Bay. No physical changes or construction are involved in this project. The CSLC published a Final EIR (SCH No. 98112080) on March 7, 2007 for the proposed lease renewal. Implementation of the project is ongoing.

Air Products Local Area Pipeline Network Project

Air Products and Chemicals Inc. (Air Products) owns and operates a hydrogen plant located within the Shell Martinez Refinery. In September 2009, a Draft EIR was published describing a local area pipeline network project proposed by Air Products. The proposed pipelines would originate at another existing Air Products hydrogen plant at the Tesoro Golden Eagle Refinery and travel westward about 2.6 miles in an unpopulated area along Waterfront Road, where they would connect with the existing Air Products Hydrogen Plant at the Shell Martinez Refinery. The two pipelines, one for hydrogen and the other for fuel gas, would be installed in the same trench to minimize impacts. The primary objective of this project is to maintain adequate, available, and efficient supply of hydrogen for the two refineries (Tesoro and Shell) by allowing the transfer of hydrogen and fuel gas (hydrogen plant feed and fuel) and connecting the existing Air Products hydrogen plants at both refineries. The project would provide for hydrogen supply at the Martinez Refinery for the processing of products to meet the cleaner-burning fuel standards. The CTRP does not involve changes to the process units that would affect hydrogen demand. Construction of the Air Products pipeline is proposed over a 3-month period in 2012. The EIR for the project was certified in May 2011 by the County.

Praxair Contra Costa Pipeline Project

Praxair is proposing to develop an approximately 21.3-mile hydrogen pipeline from the Chevron Richmond Refinery to the Shell Martinez Refinery. This pipeline would include a 1.1-mile lateral pipeline extension to the ConocoPhillips Refinery in Rodeo, California. The pipeline would transport hydrogen that is produced at the Chevron Refinery and not required for Chevron's own operations. The Praxair Contra Costa Pipeline Project would consist of construction of approximately 13.5 miles of new pipeline and the reuse of approximately 7.8 miles of an existing Chevron pipeline previously used to transport natural gas. The project would also include the construction of approximately 2.2 miles of natural gas pipeline. Although the hydrogen pipeline is proposed to terminate at the Shell Martinez Refinery, Shell currently has no agreement in place with Praxair for future hydrogen supply. As stated previously, the CTRP does not involve changes to the process units that would affect hydrogen demand. A Draft EIR was released in 2010 and Contra Costa County is currently preparing a Final EIR for the project.

Other local development projects, the impacts of which could interact with those of the Project, are listed in Table 5-1.

TABLE 5-1
POTENTIAL PROJECTS FOR CUMULATIVE EFFECTS EVALUATION

Project Name	Location	Description	Status/Schedule	Distance From Project
Various Shell Martinez Refinery Projects	Contra Costa County/City of Martinez	See Section 5.4.2.1 for full details.	See Section 5.4.2.1 for full details.	Within the Refinery.
ConocoPhillips Clean Fuels Expansion Project (CFEP)	Contra Costa County	ConocoPhillips sought approval of a land use permit for the CFEP. The CFEP objective is to add new facilities and modify existing facilities to produce additional clean fuels from heavy gas oil produced by the ConocoPhillips Rodeo Refinery and sold into the heavy gas oil and fuel markets. The project involved a number of changes to the refinery in Rodeo and involved the installation of a new hydrogen plant operated by a third party at the refinery. An EIR was prepared by Contra Costa County Community Development Department and the Final EIR was certified by Contra Costa County on May 8, 2007.	The project became operational in 2009.	8 miles
Valero Improvement Project	City of Benicia	Valero proposed a series of modifications and additions to its Benicia refinery. The project would provide the ability to process lower grades of raw crude and provide flexibility to substitute raw crudes. In addition, the project would optimize operations for efficient production of clean burning fuels.	Approved by the City of Benicia in 2003 and is currently undergoing a multi-year implementation period.	3.5 miles
Chevron Richmond Refinery's Energy and Hydrogen Renewal Project	City of Richmond	The proposed Chevron Richmond Refinery's Energy and Hydrogen Renewal Project would involve a series of modifications and additions to the Richmond refinery. The project would modify or replace existing equipment and install new refining equipment. All units would be located within the boundaries of the existing refinery, generally placed among similar existing equipment. The project would modify, replace, and install typical refining equipment – piping, heat exchangers, instrumentation, catalytic reactors, fractionation equipment, pumps, compressors, furnaces, tanks, and their associated facilities, as well as some refinery buildings and infrastructure. Changes would include construction and installation of new facilities as well as replacement of or modifications to existing facilities.	The project was approved by the City of Richmond in July 2008; however, the project has not yet been fully implemented. As of June 2011, the project is once again under review by the City of Richmond and is being changed to some unknown degree.	16 miles
Chevron Long Wharf Lease Renewal	City of Richmond	Chevron is seeking a renewal of its CSLC lease on its Long Wharf tanker pier in San Francisco Bay. No physical changes or construction are involved in this project.	The CSLC published a Final EIR on March 7, 2007 for the proposed lease renewal. Implementation of the project is ongoing.	17 miles
Air Products Local Area Pipeline Network Project	Contra Costa County	Air Products and Chemicals Inc. (Air Products) owns and operates a hydrogen plant located within the Shell Martinez Refinery. In September 2009, a Draft EIR was published describing a local area pipeline network project proposed by Air Products. The proposed pipelines would originate at another existing Air Products hydrogen plant at the Tesoro Golden Eagle Refinery and travel westward about 2.6 miles in an unpopulated area along Waterfront Road, where they would connect with the existing Air Products Hydrogen Plant at the Shell Martinez Refinery. The two pipelines, one for hydrogen and the other for fuel gas, would be installed in the same trench to minimize impacts. The	The EIR for the project was certified in May 2011 by the County. Construction of the Air Products pipeline is proposed over a 3-month period in 2012.	Between 0 to 2 miles

TABLE 5-1 (Continued)
POTENTIAL PROJECTS FOR CUMULATIVE EFFECTS EVALUATION

Project Name	Location	Description	Status/Schedule	Distance From Project
Air Products Local Area Pipeline Network Project (cont.)		primary objective of this project is to maintain adequate, available, and efficient supply of hydrogen for the two refineries (Tesoro and Shell) by allowing the transfer of hydrogen and fuel gas (hydrogen plant feed and fuel) and connecting the existing Air Products hydrogen plants at both refineries. The project would provide for hydrogen supply at the Martinez Refinery for the processing of products to meet the cleaner-burning fuel standards. The CTRP does not involve changes to the process units that would affect hydrogen demand.		
Praxair Contra Costa Pipeline Project	Contra Costa County and the Cities of Richmond, Martinez, Hercules, and potential San Pablo	Praxair is proposing to develop an approximately 21.3-mile hydrogen pipeline from the Chevron Richmond Refinery to the Shell Martinez Refinery. This pipeline would include a 1.1-mile lateral pipeline extension to the ConocoPhillips Refinery in Rodeo, California. The pipeline would transport hydrogen that is produced at the Chevron Refinery and not required for Chevron's own operations. The Praxair Contra Costa Pipeline Project would consist of construction of approximately 13.5 miles of new pipeline and the reuse of approximately 7.8 miles of an existing Chevron pipeline previously used to transport natural gas. The project would also include the construction of approximately 2.2 miles of natural gas pipeline. Although the hydrogen pipeline is proposed to terminate at the Shell Martinez Refinery, Shell currently has no agreement in place with Praxair for future hydrogen supply. As stated previously, the CTRP does not involve changes to the process units that would affect hydrogen demand.	A Draft EIR was released in 2010 and Contra Costa County is currently preparing a Final EIR for the project.	Between 0 to16 miles
San Francisco Water Emergency Transit Authority Ferry System Expansion – Proposed Martinez Terminal	City of Martinez	Construction and operation of a comprehensive and environmental friendly public water transit system of ferries, feeder buses, and terminals to increase regional mobility in the Bay Area. The project includes a proposed terminal in Martinez.	The site specific EIR has not yet been conducted for the proposed Martinez Terminal	1.0 mile
Trans-Bay Cable	Carquinez Straits	The Trans Bay Cable Project would involve the installation of a submarine high voltage direct current (HVDC) transmission cable and associated onshore facilities that would transmit electrical power and provide a dedicated connection between the East Bay near Pittsburg and the electrical transmission and distribution facilities serving the northern San Francisco peninsula.	Final EIR certified by City of Pittsburg in 2006	1.1 miles
AMORCO Marine Oil Terminal	Approximately 600 feet west of the Benicia-Martinez Bridge.	Tesoro is seeking approval for a new lease for its existing AMORCO MOT. It is currently unknown whether this proposed project would require any substantial changes to the existing terminal.	An application has been filed with the California State Lands Commission. The NOP has not yet been issued for the project.	1.1 miles
Plains All American Pipeline Martinez Marine Terminal 20-year Lease Consideration	Martinez, CA	Proposed new 20-year lease of 5.04 acres of California sovereign lands would allow Plains All American Pipeline to continue its marine oil terminal operations for vessel transfers of crude oil and petroleum products. The terminal enables transfers to on-land storage facilities approximately two miles east of the City of Martinez, south shore of Carquinez Strait, and approximately one mile east of the Benicia Bridge.	NOD filed August 2005	1.7 miles

TABLE 5-1 (Continued)
POTENTIAL PROJECTS FOR CUMULATIVE EFFECTS EVALUATION

Project Name	Location	Description	Status/Schedule	Distance From Project
Bay View Estates Housing Development	End of Central Avenue east of I-680, Martinez	144 lot subdivision and rezone.	Draft EIR has been released.	1.5 miles
Paseos Housing Development	1,000 Howe Road, City of Martinez	Housing development with 70 dwelling units.	Project has been approved, but development has been delayed.	0.8 mile
Seal Island Estates	End of Central Avenue, Martinez	22 Lot subdivision and rezone.	County is working on a Final MND for the project. No construction date has been determined.	1.6 miles
Land Use Permit to amend conditions of approval.	2520 and 2530 Pacheco Boulevard, Martinez	Land use permit to allow a shared access driveway between the two tax parcels.	unknown	500 feet
Belmont Terrace	Off Pacheco Boulevard, near Blum Road.	128 single family units.	35 lots (last phase) is currently under construction.	1.5 miles
Other Contra Costa County Projects	Unincorporated Contra Costa County	21 small residential developments/subdivisions (less than 15 units) and requests to legalize units and structures; an antenna project; an organic recycling center project; and renewal of two existing telecommunications facility permits.	Under review, approved, or delayed.	0.4 mile to 5 miles.
City of Martinez Housing Projects	City of Martinez	Three small (under 50 units) residential housing projects that will include a combined total of 59 dwelling units.	Projects have been approved, but development has been delayed.	Between 0.7 mile and 1.9 miles.

SOURCES: Contra Costa County, 2010; City of Martinez, 2010; California State Lands Commission, 2011.

5.4.3 Areas of Potential Cumulative Impacts

5.4.3.1 Aesthetics

Projects listed in Section 5.4.2, *Specific Projects Considered in the Cumulative Analysis*, that could produce visual changes at or near the Refinery with the potential to create cumulative visual effects, include:

Shell Refinery Projects

- New Ethanol Storage Tank (2006) – New tank in place of an old tank;
- Intra-Refinery Pipeline (2009) – Above ground pipeline improvements.
- California State Lands Commission (CSLC) MT Lease – Updates existing lease and considers future vessel traffic, including that which is related to the Project;
- New Aeration and Clarifier Tanks at Wastewater Treatment Plant;
- The Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS) – Projects anticipated include seismic mitigation of existing berths and equipment;

Shell Maintenance Projects

- Replacement of Alkylation Unit Reactor No. 4 (2007);
- Replacement of Alkylation Unit Reactors Nos. 2 and 3 (2010) - Replacement of Stratco Reactors Nos. 2 and 3 and changes to piping, valves, flanges;
- Catalytic Cracking Unit Reactor and Stripper Revamp (March 2010) - Replacement of equipment that had reached end of life conditions;

Local Non-Shell Refinery and Pipeline Projects

- ConocoPhillips Clean Fuels Expansion Project (CFEP) (2009) - A new hydrogen plant at the refinery in Rodeo became operational in 2009;
- Valero Improvement Project (2003) – Optimization for production of clean burning fuels, approved by the City of Benicia in 2003, in a seven-year implementation period;
- Chevron Richmond Refinery's Energy and Hydrogen Renewal Project (2008) – Construction of new and replacement of existing facilities, approved but not yet implemented;
- Air Products Local Area Pipeline Network Project (Construction 2011) - The proposed pipelines originates at the Tesoro Golden Eagle Refinery and travels westward about 2.6 miles to the Shell Martinez Refinery;
- Praxair Contra Costa Pipeline Project (2011) - 21.3-mile hydrogen pipeline from the Chevron Richmond Refinery to the Shell Martinez Refinery, though Shell has no agreement for future hydrogen supply;

Other Projects in the Project Area

- San Francisco Water Emergency Transit Authority – Proposed Martinez Terminal;
- AMORCO Marine Oil Terminal – 600' west of Benicia Martinez Bridge;

- Plains All American Pipeline Martinez Marine Terminal 20-year Lease Consideration – 2 Miles east of Martinez; and
- Assorted Housing Developments in Martinez and Contra Costa County.

The long list of local refinery and pipeline projects is indicative of active industry in the area. ConocoPhillips, Tesoro, Valero, Chevron, and Shell all have substantial projects in the area, most of which are within existing refineries. New equipment associated with other projects particularly large new pieces of equipment, such as tanks, would be contributors to incremental visual change. The positive visual effect of that incremental change would be that of Refinery renewal because renewed equipment is a component of maintaining the industrial landscape. However, when that industrial renewal expands and the new equipment encroaches or dominates other valued landscapes, such as waterways, scenic ridgelines, or gateways, then cumulative visual impacts become apparent. This usually happens over time as individual components get larger and the Refinery becomes more visually dominant. This is the case with the proposed new larger tanks. However, implementation of Mitigation Measure 4.1-4 would ensure that the aesthetic impacts that would be associated with the Project tanks would not be cumulatively considerable. Therefore, the cumulative impact would be mitigated to less than significant.

The recently certified CSLC EIR for the Shell MT Lease[1] considered future vessel traffic along the Carquinez Strait, including the increase in vessel traffic related to the CTRP. In its evaluation, the CSLC considered the Carquinez Strait as a scenic waterway and concluded in Impact VR-1 that …"tankers would be berthed at the Shell Terminal in a manner consistent with existing conditions [and] …impacts associated with continued operations are adverse, but less than significant" (CSLC, 2011). The CSLC EIR further states that Bay area vessel movements "are everyday occurrences in the visual environment … that have occurred and will continue to occur over the next 20 years." The cumulative impacts analysis in the CSLC EIR similarly concludes in Impact CUM-VR-1 that "cumulative tanker operations ... are considered to be an adverse, but less than significant impact." Given that the vessel traffic associated with the CTRP is part of and less than the traffic considered in the CSLC EIR, the vessel traffic associated with the CTRP is similarly considered to be less than cumulatively considerable.

Impact 5-1: Multiple accidental crude oil and/or petroleum product spills from marine vessel activity would result in cumulative impacts to scenic vistas and scenic resources within view of a state scenic highway. *(Significant and Unavoidable)*

While the likelihood that crude oil and/or petroleum product spills would occur in similar timeframes such that the impact of these spills would overlap is highly unlikely. If such an incident would occur it would cause significant impacts on local scenic vistas and scenic resources within view of state scenic highways similar to those described in Section 4.1 (see Impacts 4.1-1 and 4.1-3 discussions). Assuming that marine vessel operations and traffic associated with the CTRP would be one of the contributors to a multiple accidental petroleum product spill; the CTRP would represent a cumulatively considerable significant and unavoidable impact. Even though

[1] The EIR was certified on June 23, 2011.

implementation of all spill related mitigation measures described in Impacts 4.1-1 and 4.1-3 would be implemented, this impact would still remain significant and unavoidable.

Mitigation: No additional mitigation is available.

Significance after Mitigation: Significant and Unavoidable.

5.4.3.2 Agriculture and Forest Resources

While the potential for non-Refinery cumulative projects to adversely affect agriculture and forestry resources facilities exists, the CTRP has no project-related direct impacts on agriculture and forestry resources. Thus the CTRP presents no cumulatively considerable impacts to agriculture and forestry facilities.

5.4.3.3 Air Quality

Based on BAAQMD guidance, if a project would result in an increase in POC, NOx, PM10, or PM2.5 of more than its respective average daily or annual mass significance thresholds, then it would also be considered to contribute considerably to a significant cumulative impact. In developing thresholds of significance for air pollutants, BAAQMD considered the emission levels for which a project's individual emissions would be cumulatively considerable. If a project would exceed the identified significance thresholds, its emissions would be cumulatively considerable, and if a project would not exceed the significance thresholds, its emissions would not be cumulatively considerable. Therefore, implementation of Mitigation Measures 4.3-2, 4.3-3a, and 4.3-3b, which would require Project related emissions to not exceed BAAQMD significance thresholds, would ensure that the criteria pollutants generated by the Project would not be cumulatively considerable.

Regarding Toxic Air Contaminant (TAC)-related cumulative impacts on nearby sensitive receptors, the Project-related operational activities would result in a cancer risk of less than 10 in one million and the operations of the Project would not expose persons to TACs such that a non-cancer Hazard Index of 1.0 would be exceeded. Therefore, the Project TAC emissions would not be cumulatively considerable.

With regard to odor-related cumulative impacts, the BAAQMD considers an average of five or more confirmed complaints per year over a three year period to be a sign of a significant odor-related impact. BAAQMD odor complaint data compiled for the Refinery between January 1, 2007 and December 31, 2009, indicate that there have been two confirmed complaints associated with odors emanating from the Refinery during the three year baseline period. The complaints equal an average of less than one confirmed complaint per year during the three-year baseline period. Therefore, the Refinery is not considered to be a significant generator of objectionable odors and there is no existing cumulative odor-related effect. Therefore, the Project would not be cumulatively considerable.

5.4.3.4 Biological Resources

Terrestrial Resources

This analysis evaluates whether the impacts of the Project, together with the impacts of cumulative development, would result in a cumulatively significant impact on special-status species, wetlands and other waters of the U.S., or other biological resources protected by federal, state, or local regulations or policies (based on the significance criteria and thresholds presented earlier). This analysis then considers whether the incremental contribution of the Project to this cumulative impact would be considerable. Both conditions must apply in order for a Project's cumulative effects to rise to the level of significance. For a complete list on projects considered in this cumulative analysis refer to Section 5.4.2.

The geographic context for analysis of cumulative impacts to biological resources in this EIR encompasses the Refinery, the MT, and surrounding areas. Past projects, including industrial development, infrastructure, commercial areas, and residences have already caused adverse cumulative effects on biological resources in the Project area. The Refinery, and therefore the tank farm site, is a developed urban, industrial site with minimal suitable habitat. The MT is located along a major shipping channel supporting multiple marine oil terminals in the Central, San Pablo, and Suisun Bays, as well as the Ports of Stockton and Sacramento. In short, there is an existing cumulative impact on biological resources in the Project area without the Project.

Environmentally protective laws and regulations have been applied with increasing rigor since the early 1970s. These include the California Endangered Species Act, Federal Endangered Species Act, and the Clean Water Act, as described in Section 4.4.2.2, above. The Project and other likely future projects within the vicinity of the Refinery would be required to comply with local, state, and federal laws and policies and all applicable permitting requirements of the regulatory and oversight agencies intended to address potential impacts on biological resources, including wetlands, other waters of the U.S., and special-status species. Additionally, future projects would be required to demonstrate that they would not have significant effects on these biological resources, although it is possible that some projects may be approved even though they would have significant, unavoidable impacts on biological resources. The impact analysis in Section 4.4, *Biological Resources*, has shown that the Project would result in no impacts on terrestrial biological resources.

Marine Resources

As discussed in Biological Resources Sections 4.4.5 and 4.4.6, most routine operations of the CTRP would not result in any impacts to marine resources and would be less than significant (see Section 4.4, Biological Resources). Thus, most routine operations would not contribute cumulatively to biological resources impacts. The one exception would be associated with the introduction of invasive species from hull fouling or ballast water (see Impact 4.4-1). In addition to impacts associated with routine operations, the Project would also result in an increased risk of accidental crude oil spills from increased tanker traffic to the MT due to the CTRP (see Impact 4.4-2). These potential cumulative impacts related to increased tanker traffic are discussed below.

Impact 5-2: Potential cumulative impacts to biological resources from the introduction of invasive species from hull fouling or ballast water. (*Significant and Unavoidable).*

The release of non-native aquatic organisms attached to or associated with the submerged portion of a vessel or its appurtenances, including, but not limited to, sea chests, propellers, anchors, and associated chains (collectively called hull fouling) or from the discharge of ballast water into Bay-Delta waters could impair Bay-Delta habitats and associated biological communities, fish migration, and the preservation of rare and endangered species, fish spawning, and wildlife habitat essential for protected and managed fish species.

As discussed in Biological Resources Impact 4.4-1, the introduction of non-native species into the Bay-Delta ecosystems can result in ecosystem-wide changes to the aquatic community. Compliance with mitigation measures imposed by the CSLC for the recently approved 30-year lease renewal of the MT would reduce the impact related to the potential for invasive non-native species to be introduced to Bay-Delta water; however, impacts would continue to be significant.

Mitigation: Implement Mitigation Measure 4.4-1.

Significance after Mitigation: Even with the proposed mitigation measure, this cumulative impact would remain significant and unavoidable.

Impact 5-3: The proposed increase in crude oil receipts by tanker vessel could increase the cumulative risk to Marine Resources associated with accidental crude oil and petroleum product spills. *(Significant and Unavoidable)*

While the likelihood that crude oil and/or petroleum product spills would occur in similar timeframes from separate sources, such that the impact of these spills would overlap is highly unlikely, if such an incident would occur it would cause significant and unavoidable cumulative impacts. In such a scenario, should a vessel related to the CTRP be involved, implementation of spill prevention and response measures such as those required by the CSLC indentified in the certified Shell MT EIR would reduce the Project's contribution to the cumulative impact, but the Project would continue to be cumulatively considerable. Implementation of the Mitigation Measures 4.4-2 and 4.9-1 would ensure that the County is informed of the CSLC spill prevention and response measures and any changes to them.

Mitigation: Implement Mitigation Measures 4.4-2 and 4.9-1.

Significance after Mitigation: Even with the proposed mitigation measures, this cumulative impact would remain significant and unavoidable.

5.4.3.5 Cultural and Paleontological Resources

The geographic scope of potential cumulative effects with respect to cultural resources usually is limited to areas within the physical footprint of a proposed project. As analyzed in Section 4.5, *Cultural Resources*, with the implementation of the recommended mitigation measures, the Project

would have a less-than-significant impact on undiscovered archeological resources, paleontological resources, or human remains.

Because none of the cumulative projects listed in Section 5.4.2, *Specific Projects Considered in the Cumulative Analysis*, would be developed on the Project site, the incremental, Project-specific less-than-significant impacts could not combine with the impacts of these other projects to cause a cumulative impact on cultural resources. Project impacts to cultural resources would not be cumulatively considerable and the cumulative impacts would be less than significant.

5.4.3.6 Energy Conservation

The potential cumulative effects with respect to energy conservation include use of the electric grid from which the Project would occasionally draw power during operations and from use of transportation fuels primarily during construction. Predominant source of incremental electricity will come from PG&E grid although there will be infrequent times in which Shell's cogeneration plant will provide the power. The Project would cause less than significant incremental impacts relating to the consumption of energy and the use of transportation energy. The projected demand on operational electricity requirements is estimated to be approximately 3,500 MW-hrs per year, which is only a 0.4 percent increase over the existing Refinery baseline usage. The Project's incremental less-than-significant impact relating to the consumption of electrical energy would not be cumulatively considerable.

The Project's less-than-significant incremental impact relating to the use of transportation energy and efficient use of transportation is not expected to combine with the incremental impacts of other projects to cause an adverse cumulative impact on energy conservation. Project-related transportation impacts would be limited to the construction phase, which could overlap with the transportation needs (including fuel needs) of previously-approved past projects, as well as other present or future projects. Similarly, given that the energy used by the construction labor force and energy used in transporting materials to the sites would be likely to be used elsewhere should either the Project and/or cumulative projects not be constructed, the Project's less-than-significant incremental usage of transportation energy would not be cumulatively considerable.

5.4.3.7 Geology, Soils and Seismicity

The geographic scope of potential cumulative effects with respect to geology and soils is usually limited to individual project sites. The Project includes construction of a new crude oil storage tank, replacement of storage tanks with new tanks, refurbishment of an old tank. While the Project could result in impacts related to ground shaking, liquefaction, slope stability, and erosion hazards, all facilities would be constructed according to modern seismic design standards and implementation of Mitigation Measure 4.7-1 would reduce Project-related potential impacts that would result from seismic hazards to a less-than-significant level. Therefore, the Project would not result in significant impacts associated with geology and soils. Because the Project impacts would be less than significant and the geographic scope of those impacts would be limited to the Project site, the Project in combination with projects within and outside the Refinery would not

result in a significant cumulative effect. Therefore the project's contribution would not be cumulatively considerable.

5.4.3.8 Greenhouse Gas Emissions

GHG emissions is inherently a cumulative concern, in that the significance of GHG emissions is determined based on whether such emissions would have a cumulatively considerable impact on global climate change. Although the geographic scope of cumulative impacts related to GHG emissions is global, this analysis focuses on the State, the region, and this Project's direct and/or indirect generation and offset of GHG emissions. The Project would result in no net increase of CO_2e and would not conflict with the State's GHG reduction goals or the BAAQMD 2010 CAP measures. Therefore, the Project-specific incremental impact on GHG emissions would not be cumulatively considerable and cumulative impacts would be less than significant.

5.4.3.9 Hazards and Hazardous Materials

As discussed in Sections 4.9.5 and 4.9.6, routine operations of the CTRP would either not result in any impacts associated with hazards or hazardous materials or, would be less than significant (see the discussion of Impacts 4.9-2 through 4.9-4); thus, routine operations would not contribute cumulatively to hazards-related impacts. However, operations would include the risk of accidental crude oil spills from increased tanker traffic to the MT due to the CTRP (see Impact 4.9-1). The potential cumulative hazards and hazardous materials impact from this increased tanker traffic is discussed below.

Impact 5-4: Accidental crude oil spills could have cumulative hazardous effects in the Central Bay, San Pablo Bay, Carquinez Strait, and Suisun Bay. *(Significant and Unavoidable)*

While the likelihood that petroleum product spills would occur in similar timeframes from separate sources such that the impact of these spills would overlap is highly unlikely, if such an incident would occur it would cause significant and unavoidable impacts. Should a vessel related to the CTRP be involved in such a scenario, implementation of spill prevention and response measures such as those required by the CSLC in the certified Shell MT EIR would reduce the Project's contribution to the cumulative impact, but the impact would remain significant and unavoidable. Implementation of the Mitigation Measures 4.4-2 and 4.9-1 would ensure that the County is informed of the CSLC spill prevention and response measures and any changes to them.

Mitigation: Implement Mitigation Measures 4.4-2 and 4.9-1.

Significance after Mitigation: Even with the proposed mitigation measures, this cumulative impact would remain significant and unavoidable.

5.4.3.10 Hydrology and Water Quality

Short-term Construction

Concurrent construction of the Project and the projects in the vicinity (identified in Section 5.4.2) could result in increased erosion and subsequent sedimentation, which could cumulatively affect water quality of the receiving waters including the Peyton Slough and the Carquinez Strait. The increased erosion and runoff could also cause flooding downstream. Surface water quality could also be affected through inadvertent release of fuels or other hazardous materials to stream channels or storm drains, or discharge from dewatering activities. However, as described above, Shell would prepare and implement a SWPPP, comply with the County Ordinance requirements, and install BMPs to control erosion, stormwater runoff, and sedimentation downstream. The impact therefore would be less than significant. With regulatory compliance and BMP implementation, the Project would not contribute considerably to cumulative impacts during construction.

Long-term Operation

Proposed Tanks

Concurrent implementation of the Project and the projects in the vicinity (identified in Section 5.4.2) could result in long term impacts related to water quality. There would be negligible effects to water quality from the change in the tank farm site reconfiguration. The Project impacts are anticipated to be less than significant. In combination with other projects in the area, the additive effect on the storm runoff downstream could cause a cumulative impact; however, the Project is not expected to have a cumulative contribution toward downstream flooding or the receiving water quality. Shell would continue to implement its long term stormwater plan that involves continuation of routing stormwater to its storm sewer system regulated by its NPDES permit. The Project would comply with the water quality requirements of the permit and would not be cumulatively considerable. The cumulative impact would be less than significant.

Marine Terminal

Impact 5-5: Operations at the MT could cumulatively affect water quality in the Bay. *(Significant and Unavoidable)*

While the likelihood that petroleum product spills would occur in similar timeframes from separate sources such that the impact of these spills would overlap is highly unlikely, if such an incident would occur it would cause significant and unavoidable impacts water quality in the Bay. Should a vessel related to the CTRP be involved in such a scenario, implementation of spill prevention and response measures such as those required by the CSLC in the certified Shell MT EIR would reduce the Project's contribution to the cumulative impact, but the impact would remain significant and unavoidable. Implementation of the Mitigation Measures 4.4-2 and 4.9-1 would ensure that the County is informed of the CSLC spill prevention and response measures and any changes to them.

Mitigation: Implement Mitigation Measures 4.4-2 and 4.9-1.

Significance after Mitigation: Even with the proposed mitigation measures, this cumulative impact would remain significant and unavoidable.

5.4.3.11 Land Use and Planning

The construction and operation of the CTRP, in addition to other Refinery projects and other non-refinery development, would not result in cumulative impacts to land use. Development and its cumulative effects are considered in the development of the Contra Costa County General Plan, the Project would be consistent with the adopted General Plan and its applicable land use designations and policies adopted for the purpose of avoiding or mitigating environmental effects.

If cumulative land use impacts were to occur in Contra Costa County, the Project's contribution to those impacts would be less than cumulatively considerable because the Project would not result in a change to existing land use or conflict with adopted plans at the CTRP or surrounding Refinery area.

5.4.3.12 Mineral Resources

According to the CGS and the Contra Costa County General Plan, no mineral resource deposits have been identified in the immediate vicinity of the Project. As described in Section 4.12.5, the Project would result in no impact on availability of mineral resources; no mitigation would be required. The Project along with potential other Refinery projects would be located on developed land within the Refinery and is not expected to result in a significant cumulative impact on mineral resources. Non-Refinery projects outside the Refinery could affect the availability of mineral resources and have a cumulative impact. However, the Project would have no effect therefore would not have a cumulatively considerable contribution to the cumulative impact to mineral resources.

5.4.3.13 Noise

The geographic scope of potential cumulative noise impacts is the area within which the Project would be audible. If mitigated as recommended, the Project would cause a less-than-significant nuisance related to an increase in local ambient noise levels. The simultaneous construction of other projects could increase the potential for impacts to nearby sensitive receptors from construction noise. Other projects constructed simultaneously with the Project that could affect ambient conditions at nearby sensitive receptors would be subject to applicable County or City noise standards, the imposition of which would reduce each project's incremental contribution during construction to a less-than-significant level. None of the cumulative projects would cause a cumulative impact to which the Project's incremental less-than-significant, short-term impact on noise could contribute. Therefore, when considered in combination with cumulative development, the Project's incremental contribution to temporary noise impacts from construction would not be cumulatively considerable.

5.4.3.14 Population and Housing

While the potential for non-Refinery cumulative projects to adversely affect local population and housing exists, the CTRP has no project-related direct impacts on these resources. Thus the CTRP presents no cumulatively considerable impacts to population and housing facilities.

5.4.3.15 Public Services

While the potential for non-Refinery cumulative projects to adversely public services exists, the CTRP has no project-related direct impacts on local public services. Thus the CTRP presents no cumulatively considerable impacts to public services.

5.4.3.16 Recreation

While the potential for non-Refinery cumulative projects to adversely affect parks and recreational facilities exists, the CTRP has no project-related direct impacts on recreational facilities. Thus the CTRP presents no cumulatively considerable impacts to recreational facilities.

5.4.3.17 Transportation and Traffic

The geographic scope of potential cumulative traffic impacts includes access routes to area freeways, state highways, and collector roadways used for haul routes and construction vehicles (trucks and workers) access to the Project site. Given the wide dispersion of state and interstate traffic along roadways that would be used by Project-related traffic, this analysis focuses on potential cumulative traffic impacts on roadways adjacent to the Project, including the roadways described in Section 4.17.2, *Setting*.

The construction activities associated with the Project would not result in long-term traffic-related impacts, due to the fact that construction of the Project is anticipated to be completed by Year 2015 and once completed, the number of workers at the refinery would not increase. The effects of the Project (see Impact 4.17-1) would be temporary, occurring during the estimated three-year construction period.

Impact 5-6: Potential cumulative traffic impacts could occur during the three-year Project construction period. *(Less than Significant with Mitigation)*

Potential cumulative traffic impacts could occur during the three-year Project construction period as a result: of (1) other projects that would generate increased traffic at the same time on the same roads as the Project, causing increased congestion and delays, and (2) infrastructure projects in roads that would be used by the CTRP construction workers and trucks, which could delay Project-generated vehicles traveling past the work zones of the other projects. Given the lack of certainty about the timing of other projects, it is prudent to conclude that significant cumulative traffic and circulation impacts could occur. Implementation of Mitigation Measure 5-6 (Construction Traffic Coordination) would minimize the collective effect of overlapping projects.

Mitigation Measure 5-6: Construction Traffic Coordination. Shell shall provide a haul route plan for review and approval of the County Public Works Department and obtain a transportation/haul permit, if required, for review and approval of the County Public Works Department. TCPs should include at a minimum, a defined haul route, timing of deliveries/trips to avoid peak hours (construction schedule).

Significance after Mitigation: Less than Significant.

5.4.3.18 Utilities and Service Systems

No cumulative impact or incremental contribution to a cumulative impact would result from implementation of the Project regarding water, wastewater, or storm water because the Project would have no impact on these systems. The Project's less than significant impact on solid waste generation would be limited to the construction phase. When combined with the solid waste generated by other development projects in the area, the Project's contribution to solid waste generated in the area would not be cumulatively considerable because the landfills that would serve the Project have sufficient capacity to accommodate the regional waste needs for several decades. There is no existing significant cumulative impact to which the Project's incremental impact could contribute.

5.5 Effects Found Not to Be Significant

The environmental effects of the Project are identified and discussed in detail in Chapter 4, *Environmental Setting, Impacts, and Mitigation Measures*. Except for those impacts discussed in Section 5.1 above that would be significant and unavoidable, all identified significant environmental effects of the Project can be mitigated to less than significant with the implementation of the mitigation measures identified in this EIR. The EIR further concludes that the Project would not have any effects in the following environmental areas:

- Agricultural and Forest Resources;
- Land Use;
- Mineral Resources;
- Population and Housing;
- Public Services; and
- Recreation.

CHAPTER 6
Alternatives Analysis

6.1 General Consideration of Alternatives

The California Environmental Quality Act (CEQA) requires a lead agency to analyze alternatives to a proposed project that could feasibly attain the basic objectives of the project while substantially reducing or eliminating significant environmental effects. The lead agency must identify an environmentally superior alternative among the alternatives and the proposed Project.

CEQA requires that the lead agency adopt mitigation measures or alternatives, where feasible, to substantially lessen or avoid significant environmental impacts that otherwise would occur. Where a lead agency has determined that, even after adoption of all feasible mitigation measures, a project as proposed would still cause significant environmental effects that cannot be substantially lessened or avoided, the agency, prior to approving the project as mitigated, first must determine whether, with respect to such impacts, there remain any project alternatives that are both environmentally superior and feasible within the meaning of CEQA.

CEQA provides the following guidance for discussing project alternatives:

- An EIR need not consider every conceivable alternative to a project. Rather, it must consider a reasonable range of potentially feasible alternatives that will foster informed decision-making and public participation (CEQA Guidelines § 15126.6(a)).
- An EIR is not required to consider alternatives that are infeasible (§ 15126.6(a)).
- The discussion shall focus on alternatives to the project or its location that are capable of avoiding or substantially lessening any significant effects of the project, even if these alternatives would impede to some degree the attainment of the project objectives, or would be more costly (§ 15126.6(b)).
- The range of alternatives shall include those that could feasibly accomplish most of the basic objectives of the project and could avoid or substantially lessen one or more of the significant effects (§ 15126.6(c)).
- The EIR shall include sufficient information about each alternative to allow meaningful evaluation, analysis and comparison with the proposed project (§ 15126.6(d)).

For the Project, factors considered when addressing the feasibility of an alternative include, without limitation, site suitability, ability to support infrastructure, general plan consistency, consistency with other plans or regulatory limitations, jurisdictional boundaries, economic

viability, and whether the Applicant reasonably can acquire, control, or otherwise have access to an alternative site. “Reduced project” alternatives often are developed to reduce significant adverse project impacts that are proportional to the size of the project. Given the nature of the Project, this analysis is focused on significant project impacts related to project footprint and design, rather than alternative project sites. Thus, the alternatives analysis identifies and evaluates scenarios under which various project designs and footprints are formulated to minimize specific impacts that otherwise would occur with the Project.

In addition, CEQA requires an EIR to evaluate a “no project” alternative to allow decision-makers to compare the impacts of approving the project with the impacts of not approving it (CEQA Guidelines § 15126.6(e)). The “no project” analysis evaluates the existing conditions at the time the Notice of Preparation was published as well as what reasonably would be expected to occur in the foreseeable future if the project were not approved, based on current plans, permits and available infrastructure and services. The “no project” alternative includes changes and on-going activities needed to keep the existing crude oil storage tanks in operation, such as regular major and minor, scheduled and unscheduled maintenance activities, and the expiration of existing facility permits at the expiration of their terms followed by decommissioning of the facilities in accordance with existing permit conditions or the renewal of existing permits with similar conditions to those currently in existence. The “no project” alternative is analyzed in Section 6.5.1.

6.1.1 Alternatives Screening Methodology

The evaluation of alternatives to the Project was completed using a screening process that consisted of three steps:

Step 1: Clarify the description of each alternative to allow comparative evaluation.

Step 2: Evaluate each alternative using CEQA criteria (defined below).

Step 3: Determine the suitability of the each alternative for full analysis in the EIR. Infeasible alternatives and alternatives that clearly offered no potential for overall environmental advantage were removed from further analysis.

Following the three-step screening process, the advantages and disadvantages of the remaining alternatives were carefully weighed with respect to CEQA’s criteria for consideration of alternatives. These criteria are discussed in greater detail below.

In order to comply with CEQA’s requirements, each alternative that has been suggested or developed for the Project has been evaluated in three ways:

- Does the alternative meet the most basic project objectives?
- Is the alternative feasible (legal, regulatory, and technical)?
- Does the alternative avoid or substantially lessen any significant effects of the Project (including consideration of whether the alternative itself could create significant effects potentially greater than those of the Project)?

6.1.2 Consistency with Project Objectives

CEQA Guidelines require the consideration of alternatives capable of eliminating or reducing significant environmental effects even though they may "impede to some degree the attainment of project objectives" (Section 16126.6(b)). Therefore, it is not required that each alternative meet all of Shell's objectives. The objectives of the Project are discussed below in Section 6.2.

6.1.3 Feasibility

CEQA Guidelines (Section 15364) define feasibility as:

> *. . . capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors.*

In addition, CEQA requires that the Lead Agency consider site suitability, economic viability, availability of infrastructure, general plan consistency, other regulatory limitations, jurisdictional boundaries, and proponent's control over alternative sites in determining the range of alternatives to be evaluated in the EIR (CEQA Guidelines Section 15126.6(f)). Feasibility can include three components:

- **Legal Feasibility:** Does the alternative have legal protections that may prohibit or substantially limit the feasibility of permitting the project?
- **Regulatory Feasibility:** Does the alternative have the potential to include lands that have regulatory restrictions that may substantially limit the feasibility of, or permitting of, the project within a reasonable period of time?
- **Technical Feasibility:** Is the alternative feasible from a technological perspective, considering available technology?

For the screening analysis, the legal, technical, and regulatory feasibility of potential alternatives was assessed. The assessment was directed toward reverse reason; that is, a determination was made as to whether there was anything about the alternative that would be infeasible on technical, legal, or regulatory grounds.

This screening analysis does not focus on relative economic factors or costs of the alternatives (as long as they are found to be economically feasible) since CEQA Guidelines require consideration of alternatives capable of eliminating or reducing significant environmental effects even though they may "impede to some degree the attainment of project objectives or would be more costly" (CEQA Guidelines Section 16126.6(b)).

6.1.4 Potential to Eliminate Significant Environmental Effects

CEQA requires that to be fully considered in an EIR, an alternative must have the potential to "avoid or substantially lessen any of the significant effects of the project" (CEQA Guidelines Section 16126.6(a)).

If an alternative was identified that clearly would not provide potential overall environmental advantage as compared to the Project, it was eliminated from further consideration. At the screening stage, it is neither possible, nor legally required, to evaluate all of the impacts of the alternatives in comparison to the Project with absolute certainty, nor is it possible to quantify impacts. However, it is possible to identify elements of an alternative that are likely to be the sources of impact and to relate them, to the extent possible, to general conditions in the subject area.

Section 6.3 below presents a summary of the potential significant environmental effects of the Project. The impacts identified in Section 6.3 are representative of those resulting from preliminary EIR preparation and were therefore used to determine whether an alternative met CEQA Guidelines Section 16126.6(a) requirements.

6.2 Project Objectives

The Project would increase crude oil storage capacity at the Shell Martinez Refinery (Refinery) in order to maintain current production levels. Shell's long-term prospect of providing fuels to the market hinges on the Refinery's ability to supplement diminishing San Joaquin Valley (SJV) crude oil feedstocks with other similar crudes. Without increased storage tank capacity, the Refinery would operate at greater risk of periodic crude oil shortages. The Project would reduce the risk of crude shortages by increasing the onsite crude oil storage capacity as the source of crude oil supply shifts from pipeline to vessel. The CTRP would not change the characteristics of the crude oil the Refinery processes. No physical modifications would be made at the Refinery's hydrocarbon processing equipment or at the Shell marine terminal (MT), and there would be no change in the existing Refinery permit conditions that limit emissions from the MT.

In summary, the objectives of the Project are to:

- Increase crude oil storage capacity at the Refinery to facilitate future operations at current production levels despite anticipated changes in the source of crude oil feed stocks with no increases in crude oil throughput at the Refinery;
- Maintain current operation and production levels of California Air Resources Board (CARB) mandated cleaner-burning gasoline and ultra low sulfur diesel (ULSD) fuels at the Refinery substituting imported crude oil by vessel for diminishing SJV crude by pipeline;
- Make no modifications to Refinery process equipment and operations, other than to provide criteria pollutant and greenhouse gas emission reduction measures; and
- Coordinate with the California State Lands Commission on the recently approved lease renewal for the MT to insure consistency between the CTRP LUP conditions and the conditions of the new MT lease.

6.3 Potentially Significant Impacts of the Project

As mentioned above, CEQA requires a review of a reasonable range of alternatives that could avoid or substantially lessen any of the significant environmental impacts of the Project. This EIR evaluates the potential impacts of implementing the Project. As discussed in Chapters 4 and 5, with implementation of the mitigation measures proposed in this EIR, the following significant and unavoidable environmental impacts would be associated with the Project, all of which are specifically related to the proposed increase in vessel activity at the MT:[1]

- **Aesthetics, Biological Resources, Hazards and Hazardous Materials, and Hydrology and Water Quality:** During operation, the potential for an accidental crude oil spill from CTRP-related vessels at the MT or transiting to and from the MT would have a significant and unavoidable direct impact on sensitive resources within the San Francisco Bay region (see Impacts 4.1-1, 4.1-3, 4.4-2, 4.9-1, and 4.10-3). This impact could also interact cumulatively when combined with another spill in the region (see Impacts 5-1, 5-3, 5-4, and 5-5).

- **Biological Resources:** Operation of marine vessels associated with the CTRP could increase the introduction of invasive species to the San Francisco Bay Region (see Impacts 4.4-1 and 5-2).

6.4 Alternatives Considered but Dismissed from Further Consideration in this EIR

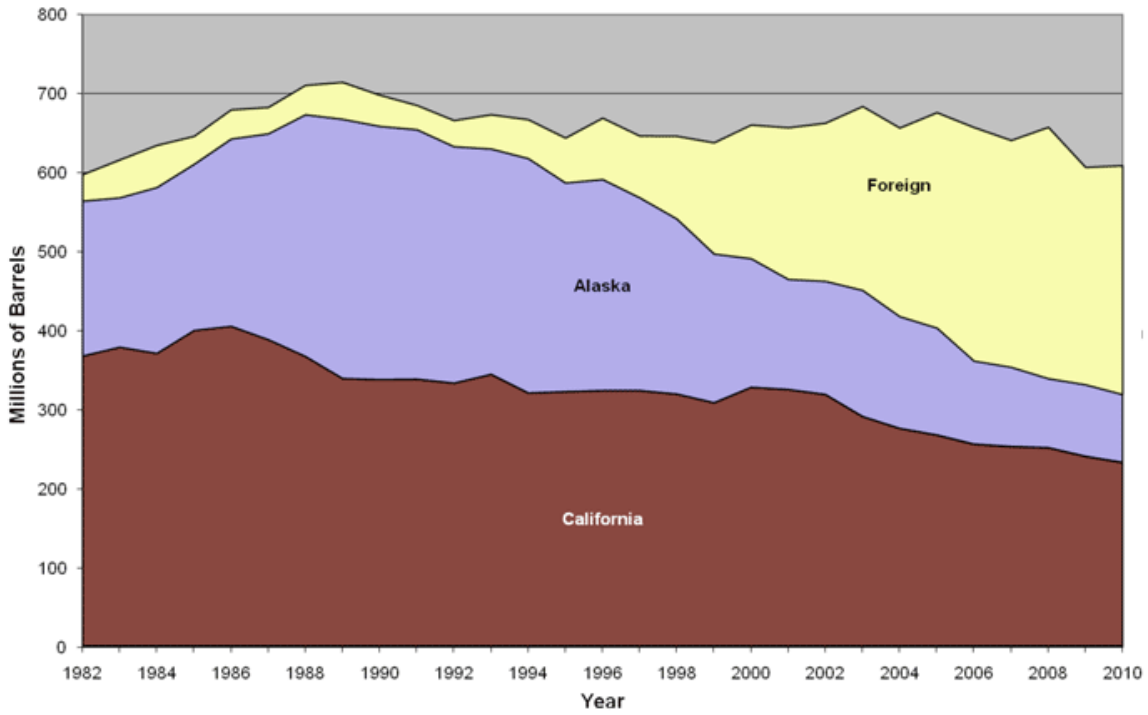
In addition to the alternatives analyzed in this EIR, other alternatives were considered, but were dismissed from further consideration, including pipeline delivery of crude oil from other sources, other locations for the crude oil replacement tanks, and development of fewer and/or smaller tanks. Below are descriptions of alternatives that were considered, but dismissed from further consideration in this EIR.

6.4.1 Pipeline Delivery of Crude Oil from Other Domestic Source(s)

Under this alternative, Shell would replace SJV crude oil with another domestic source that could be delivered by pipeline to avoid the potential effects of new and replacement tanks and increased vessel traffic at the MT. This would require a domestic or other North American source with a long-term supply, and a pipeline delivery system to the Refinery.

Data from and compiled by the California Energy Commission shown in Figure 6-1, *Crude Oil Supply Sources for California Refineries*, indicate domestic crude oil supply sources for California refineries have been declining, and foreign-source crude oil has been increasing. Alaskan and foreign crude oil, the predominant sources of non-Californian supply, is transported to California primarily by vessel, not pipeline.

[1] Note that after application of proposed mitigation measures, there are no significant impacts from the non-MT related portions of the CTRP.



SOURCE: CEC, 2011

Shell Crude Tank Replacement Project

Figure 6-1
Crude Oil Supply Sources for California Refineries

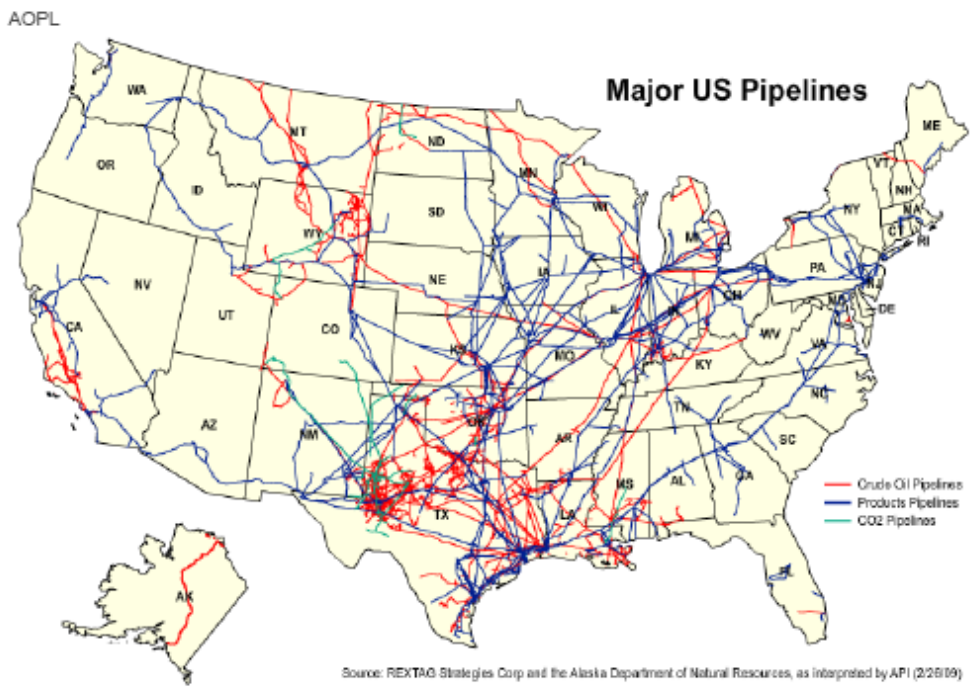
Figure 6-2, *Major Crude Oil and Petroleum Products Pipelines in the U.S.*, shows crude oil pipelines within California. Figure 6-2 illustrates the lack of crude oil pipeline connections between California and the rest of the Country. To deliver crude oil by pipeline to the Refinery, other than the crude oils from the SJV region, new construction of pipelines, bulk storage, and delivery systems would be required. If multiple sources of crude oil are needed, this alternative would require construction or modification of pipeline infrastructure in multiple locations.

This alternative was not developed further because the identification of a long-term source of crude oil, besides SJV crude, where one or multiple delivery systems could be utilized, was considered to be too speculative.

6.4.2 Alternate Versions of the CTRP

Project Location

Shell reviewed several locations in the Refinery in order to determine the optimum location for the affected tanks. The 539 Tank String area was selected for the Project because the existing tanks to be replaced are currently providing crude oil service. By replacing these tanks with larger tanks, Shell can schedule demolition and construction in order to minimize the duration of the temporary loss of crude oil storage. Also, by using the existing tank area that is currently in



SOURCE: Association of Oil Pipelines, 2010

Shell Crude Tank Replacement Project

Figure 6-2
Major Crude Oil and Petroleum Pipelines in the U.S.

crude oil service, there is minimal additional infrastructure needed for the site (e.g., piping, instrumentation, etc.) because the area is already in crude oil service. If a different location was selected, significant infrastructure development would be required to change the new area to provide crude oil storage service. One alternative initially considered was the construction of new tanks north of Marina Vista Avenue in closer proximity to the MT. This location was ruled out as technically infeasible because there is not sufficient available land for the required storage capacity.

Reduced Crude Oil Storage Capacity

The CTRP would result in an increase in storage capacity at the Refinery of approximately 800 thousand barrels (MBbl). The size and number of tanks for the CTRP was selected in order to:

1. Ensure that there would be adequate sized and number of tanks to accommodate the settling period of each tank. This is necessary because once a tank is filled, it must remain idle in order to allow for water to separate from the crude oil and settle to the bottom of the tank. During this idle period, the tank cannot be used for additional filling or discharge.

2. Ensure there would be an adequate number of tanks/volume for segregation of different crude oil types being off-loaded by either MT or pipeline, because each tank would store a specific crude oil and these crude oils would not be mixed in the storage tanks prior to discharging the crude oils to the crude oil mix tank (also part of the CTRP).

3. Ensure for enough storage volume to keep the Refinery running at normal rates between receipts of waterborne shipments.

An alternative was initially considered that would involve using fewer and/or smaller tanks. Shell estimates that a tanker carrying 360 to 640 MBbl would require at least two to three empty tanks to accept the full cargo. Once the first tank is filled, the vessel must interrupt discharging its cargo until another tank has been drained and has sufficient room to accept the remainder of the cargo. This vessel whose discharge is interrupted for lack of receiving tank room prevents the next arriving tanker from discharging its cargo. Having the right amount of available storage tank capacity minimizes wharf congestion, demurrage, and crude oil vessel emissions. As discussed in Chapter 3, the CTRP would increase the size of the three tanks, refurbish one tank, and add one new tank. This represents the minimum storage tank capacity for the expected volume of crude that would be brought in via the MT to maintain current production levels. Consequently, the alternative involving fewer or smaller tanks was rejected from further consideration because it would not meet the basic project objectives.

6.5 Alternatives to the Project

6.5.1 No Project Alternative

Description of the No Project Alternative

Under the No Project Alternative, the CTRP would not be implemented. The existing crude oil storage tanks would not be replaced, and crude oil storage capacity at the Refinery would be unchanged. Subject to the storage limitations discussed below, MT activity would increase as authorized under existing and future permits.

As SJV crude oil diminishes, more crude oil would be received at the MT. If the existing storage tank capacity remains unchanged, crude oil receipt would be constrained by storage capacity.

The existing crude oil storage capacity can accommodate a sustained volume of approximately 80,000 barrels per day of crude oil shipments across the MT, or approximately half of the Refinery's permitted capacity, and significantly less than normal operating levels. As SJV crude oil supply is diminished, crude oil deliveries by ship would increase until the 80,000 barrels per day capacity is reached. With pipeline deliveries continuing to decline, the Refinery would not be able to operate near its normal or permitted capacity. The drop in available crude oil feed would reduce the operating capacity of the Refinery, and could ultimately result in eventual closure of some or all of the Refinery facilities. However, per CEQA Guidelines Section 15145, closure of the Refinery is too speculative to be analyzed as part of the No Project Alternative.

Impacts and Relationship to Project Objectives

This alternative would avoid near-term effects associated with removal and replacement of the storage tanks, as well as the effects of shifting the mode of crude oil transport from pipeline to vessel transportation, such as additional vessel emissions. However, the Project objectives would

not be met. Potential consequences of the No Project Alternative include economic effects of reduced refining production in the Bay Area and physical effects of the eventual disposition of the Refinery if all or portions of the Refinery are decommissioned.

Aesthetics

Under the No Project Alternative, there would be no visible changes from the existing conditions. No impact would occur.

Agriculture and Forest Resources

Under the No Project Alternative, no changes would be made and the Refinery would begin to operate at reduced levels as crude supplies via pipeline decline. No impact to agricultural or forestry resources would occur.

Air Quality

Under the No Project Alternative, no changes would be made associated with the Project and the Refinery would begin to operate at reduced levels as crude oil supplies via pipeline would decline. Under the No Project Alternative, emissions associated with Refinery-related crude oil ship maneuvering, hotelling, crude oil pumping, and crude oil storage tanks would be approximately the same as existing baseline conditions. Therefore, there would be no air quality impact associated with the No Project Alternative.

Biological Resources

Under the No Project Alternative, no changes would be made and the Refinery would begin to operate at reduced levels as crude supplies via pipeline decline. No impact to biological resources would occur.

Cultural Resources

Under the No Project Alternative, no Project-related ground disturbance and associated impacts would occur. Therefore, the No Project Alternative would have no potential to result in impacts to cultural resources.

Energy Conservation

Under the No Project Alternative, no changes would be made and the Refinery would begin to operate at reduced levels as crude supplies via pipeline decline. The No Project Alternative would not be expected to have an adverse impact on energy resources through either increased demand or through increased consumption of a non-renewable source of energy. In addition, under the No Project Alternative, the CRU and DHT Energy Efficiency Projects would continue to be implemented, resulting in a net reduction of energy usage associated with the Refinery. Therefore, the No Project Alternative would result in a beneficial impact related to energy conservation.

Geology and Soils

Under the No Project Alternative, no Project-related activities or ground disturbance would occur. Therefore, the No Project Alternative would result in no impact to geology and soils.

Greenhouse Gas Emissions

Under the No Project Alternative, no changes would be made associated with the Project and the Refinery would begin to operate at reduced levels as crude oil supplies via pipeline would decline. Under the No Project Alternative, the CRU and DHT Energy Efficiency Projects would continue to be implemented, resulting in a net reduction of GHG emissions associated with the Refinery. Therefore, the No Project Alternative would result in a beneficial impact related to GHG emissions.

Hazards and Hazardous Materials

Under the No Project Alternative, no Project-related activities would occur that would change any aspect of hazards or hazardous materials handling. Therefore, the No Project Alternative would result in no impact to hazards or hazardous materials.

Hydrology and Water Quality

Under the No Project Alternative, no changes would be made and the Refinery would begin to operate at reduced levels as crude supplies via pipeline decline. The No Project Alternative would not involve any activities that would be likely to have hydrology or water quality impacts.

Land Use and Planning

Under the No Project Alternative, no changes would be made and the Refinery would begin to operate at reduced levels as crude oil supplies via pipeline decline. No impact related to land use or planning would occur.

Mineral Resources

Under the No Project Alternative, no changes would be made and the Refinery would begin to operate at reduced levels as crude supplies via pipeline decline. No impact related to mineral resources would occur.

Noise and Vibration

Under the No Project Alternative, no changes would be made associated with the Project and the Refinery would begin to operate at reduced levels as crude oil supplies via pipeline would decline. Under the No Project Alternative, noise levels associated with Refinery-related operations would be approximately the same as existing baseline conditions. Therefore, there would be no impacts associated with the No Project Alternative.

Population and Housing

Under the No Project Alternative, no changes would be made and the Refinery would begin to operate at reduced levels as crude oil supplies via pipeline decline. No impact related to population and housing would occur.

Public Services

Under the No Project Alternative, no changes would be made and the Refinery would begin to operate at reduced levels as crude supplies via pipeline decline. No impact to public services would occur.

Recreation

Under the No Project Alternative, no changes would be made and the Refinery would begin to operate at reduced levels as crude oil supplies via pipeline decline. No impact related to recreation would occur.

Transportation/Traffic

Under the No Project Alternative, no changes would be made, and the Refinery would begin to operate at reduced levels as crude supplies via pipeline decline. No impact related to transportation/traffic would occur.

Utilities and Service Systems

Under the No Project Alternative, no changes would be made and the Refinery would begin to operate at reduced levels as crude oil supplies via pipeline decline. No impact related to utilities and service systems would occur.

6.5.2 Alternative 1 – Crude Oil Storage at Other Bay Area Facilities

Description of Alternative 1

Under this alternative, Shell would use pipeline connections from other Bay Area marine terminals to transfer crude oil to the Refinery from other facilities (i.e., refineries and/or bulk storage plants). This alternative would allow for the Refinery to receive increased water borne crude oil without modifying the existing tanks and without receiving all of the crude oil supply across the MT.

This alternative would include:

- No modifications to existing Refinery crude oil storage tanks;
- Continued delivery of crude oil to the Refinery through the MT as it is currently; and
- Pipeline transfers of water borne crude oil from other Bay Area marine terminals and/or bulk storage plants to replace SJV crude oil supply as it declines.

This alternative could occur under the following scenarios:

1. Shell currently transfers some petroleum through the nearby Plains all American Pipeline (formerly Shore) Terminal (a storage only facility) via pipeline. There may be some ability to increase storage capacity at the Plains all American Pipeline facility and transfer petroleum to the Refinery.

2. Shell has two San Joaquin Valley pipelines that it leases capacity for transfers from other Bay Area refiners. Shell may be able to increase the Refinery's use of these pipelines, and/or increase the capacity of the pipelines.

3. Shell owns an existing pipeline that extends from the Richmond area to Antioch via Martinez. Currently, the end of the pipeline in Richmond goes to a demolished wharf facility. Hence, a portion of this pipeline, in combination with new pipelines, could be used for connections between other Bay Area terminals and the Refinery.

This alternative would require an agreement between Shell and another local terminal (or terminals) or bulk storage plant (or plants). Depending on condition and storage capacity at the other facility or facilities, this alternative could require new or upgraded pipeline infrastructure to provide safe transfer of crude oil to the Refinery. While this alternative would allow the Refinery to remain essentially unchanged because the future supply of crude oil would continue to be delivered by pipeline, the impacts of increased vessel calls and increased oil storage would be shifted from the MT and Refinery to other Bay Area locations. It is also unknown whether sufficient storage tank capacity exists at other locations and it is possible that additional storage tank capacity would be required at the other Bay Area location(s).

Impacts and Relationship to Project Objectives

This alternative would avoid the effects associated with removal and replacement of the tanks at the Refinery. Similar impacts could occur as a result of required facility modifications or upgrades at the other local terminals. The potential effects associated with crude oil deliveries from vessels and crude oil storage at other locations would be shifted from the MT and Refinery to other marine terminal(s) and refineries and/or bulk storage plants. Alternative 1 would fail to meet the Project objective of increasing crude oil storage capacity at the Refinery; however, the purpose of increasing crude oil storage capacity at the Refinery is to allow for future refining operations at current levels with less SJV crude oil feedstock deliveries. Although Alternative 1 would not increase crude oil storage capacity at the Refinery, it would essentially achieve the same result as increased storage capacity at the Refinery in that it would allow future refining operations at current production levels.

Aesthetics

Implementation of Alternative 1 could occur through use of several sources, each of which would have different potential visual effects. Use of existing facilities would not result in any visual changes to the Refinery or the Plains all American Pipeline Terminal. However, if storage were to be increased at the Plains all American Pipeline Terminal (or at other facilities described below) there could be similar visual effects from construction of additional tanks at those facilities.

Specific impacts would have to be evaluated in the context of each facility. If pipeline capacities were to be increased, below ground pipelines would have temporary construction impacts. Additional above-ground pipelines would cause long-term visual impacts. Specific impacts would have to be evaluated in the context of that facility.

Alternative 1 would allow the Refinery to remain essentially unchanged because the future supply of crude oil would continue to be delivered by pipeline. While significant impacts related to oil spills from increased vessel calls at the MT would not occur under this alternative, this impact would likely be shifted from the MT to other marine terminals in the Bay Area. Other impacts associated with tanks to increase oil storage capacity would also be shifted from the MT and Refinery to other locations. It is not known if there is sufficient storage tank capacity at other locations.

Agriculture and Forest Resources

Implementation of Alternative 1 would avoid development of the CTRP at the Refinery. However, as Alternative 1 would be likely to require the construction of a pipeline and potentially additional storage capacity at an offsite Bay Area location, this could result in potential impacts to agriculture and forestry resources due to the greater linear distance associated with a potential pipeline. Thus, potential impacts to agriculture and forestry resources under Alternative 1 would therefore be either about the same as the Project or slightly more than the Project.

Air Quality

Implementation of Alternative 1 would avoid development of the Project at the Refinery. Alternative 1 would require the use of pipeline connections from other Bay Area marine terminals to transfer crude oil to the Refinery from other facilities (i.e., other refineries and/or bulk storage plants). This alternative would allow the Refinery to receive foreign crude oil without modifying the existing tanks and without receiving all of the crude oil supply across the MT. Although less air pollutant emissions would be generated at the MT and the Refinery due to less vessel and tank emissions compared to the Project, these emissions would merely be transferred to another location in the Bay Area and the emission reduction measures proposed by Shell would not be implemented at the Refinery. Therefore, implementation of Alternative 1 would likely result in a greater amount of net air pollutant emissions. Also, depending on the location of the offsite storage and pipeline transfer operations and proximity to sensitive receptors, health risk and odor impacts from Alternative 1 could be the same as or greater than the Project.

Biological Resources

Implementation of Alternative 1 could occur through several sources each of which has different potential impacts on biological resources. Use of existing facilities would not result in any change in biological resources impacts associated with the Refinery or the Plains all American Pipeline Terminal (the Terminal). However, if storage were to be increased at the Terminal (or at other facilities described below) there could be similar biological resources impacts from construction of additional tanks at those facilities. Specific impacts would have to be evaluated in the context of each facility. If existing pipeline capacities were to be increased, below ground pipelines

would have temporary construction impacts and construction of additional above-ground pipelines would likely result in significant biological resources impacts. Specific impacts would have to be evaluated in the context of that facility.

This alternative would allow the Refinery to remain essentially unchanged because the future supply of crude oil would continue to be delivered by pipeline. While significant impacts related to oil spills from increased vessel calls at the MT would not occur under this alternative, this impact would likely be shifted from the MT to other marine terminals in the Bay Area.

Cultural Resources

Implementation of Alternative 1 would avoid development of the CTRP and the associated cultural resources-related impacts. However, Alternative 1 may require the construction of a pipeline and potentially additional storage capacity at an offsite Bay Area location, which would likely result in the same types of impacts that would occur under the Project. The potential impacts to cultural resources under Alternative 1 would therefore be approximately the same or greater than the Project because construction of pipelines would tend to cause more potential ground disturbance than the Project.

Energy Conservation

Implementation of Alternative 1 would avoid development of the Project at the Refinery. However, as Alternative 1 would be likely to require the construction of a pipeline and potentially additional storage capacity at an offsite Bay Area location, this could result in a greater use of construction-related fuel as well as greater operational demand for electricity to pump the crude oil over a greater distance. Thus, potential impacts to energy resources under Alternative 1 would therefore be greater than for the Project.

Geology and Soils

Implementation of Alternative 1 would avoid development of the CTRP and the associated geology and soils-related impacts. However, Alternative 1 may require the construction of a pipeline and potentially additional storage capacity at an offsite Bay Area location, which would likely result in the same types of impacts that would occur under the Project. The potential impacts related to geology and soils under Alternative 1 would therefore be approximately the same as the Project.

Greenhouse Gas Emissions

Implementation of Alternative 1 would avoid development of the Project at the Refinery. Alternative 1 would require the use of pipeline connections from other Bay Area marine terminals to transfer crude oil to the Refinery from other facilities (i.e., other refineries and/or bulk storage plants). This alternative would allow the Refinery to receive increased Alaskan and foreign crude oil without modifying the existing tanks and without receiving all of the crude oil supply across the MT. Although less GHG emissions would be generated at the MT and the Refinery due to less vessel emissions and indirect energy use compared to the Project, these emissions would merely

be transferred to another location in the Bay Area. Therefore, assuming implementation of Alternative 1 would include similar energy efficiency measures as those required under the Project, Alternative I would result in approximately the same amount of net GHG emissions at best and probably some increase in GHG emissions (due to additional pumping requirements from the pipelines) at worst, as those identified for the Project.

Hazards and Hazardous Materials

Alternative 1 would clearly avoid hazards related to construction and operation of the CTRP tanks on the Refinery. However, it could introduce some additional hazards through the operation of additional crude oil pipelines to and from the Refinery from an unknown location. Assuming that the crude oil was able to be off loaded from a nearby existing marine terminal, that marine terminal had existing tankage sufficient to accept the necessary volumes of crude oil to supply the Refinery similarly as that proposed for the CTRP, and that this crude oil could be carried to the Refinery with only limited modifications to existing pipelines; Alternative 1 would then have a reduced impact over the CTRP. However, if any new infrastructure would be required (new tanks, pipeline, etc.), it is likely that Alternative 1 would have similar effects on hazards and hazardous materials as that of the Project.

While significant impacts related to oil spills from increased vessel calls at the MT would not occur under this alternative, this impact would likely be shifted from the MT to other marine terminals in the Bay Area.

Hydrology and Water Quality

Implementation of Alternative 1 would avoid development of the CTRP at the Refinery. However, as Alternative 1 would be likely to require the construction of a pipeline and potentially additional storage capacity at an offsite Bay Area location, this could result in potential impacts to water quality due to the construction impacts from installation of new pipelines and potentially new tanks at some off-site location. These impacts would likely be the subject of a separate CEQA review. By virtue of the greater potential for disturbed area for construction of pipelines and tanks, Alternative 1 would be expected to have greater potential impacts to than the Project.

While significant impacts related to oil spills from increased vessel calls at the MT would not occur under this alternative, this impact would likely be shifted from the MT to other marine terminals in the Bay Area.

Land Use and Planning

Implementation of Alternative 1 would avoid development of the CTRP at the Refinery. However, as Alternative 1 would be likely to require the construction of a pipeline and potentially additional storage capacity at an offsite Bay Area location, this could result in potential new land use concerns from the construction of pipelines to other nearby facilities. The extent of these potential impacts to local land use would be likely to be the subject of future CEQA review depending on the routing and destination of the pipelines. However, even if the potential impacts from construction and operation of pipelines and offsite storage tanks for Alternative 1 could be

mitigated to some extent; it remains likely that land use impacts under this would be greater than for the Project.

Mineral Resources

Implementation of Alternative 1 would avoid development of the CTRP. However, Alternative 1 may require the construction of a pipeline and potentially additional storage capacity at an offsite Bay Area location, which could result in potential mineral resource impacts depending on the location of the pipeline and offsite storage. The potential impacts to mineral resources under Alternative 1 would therefore be either about the same as the Project or slightly more than the Project.

Noise and Vibration

Implementation of Alternative 1 would avoid development of the Project at the Refinery. Alternative 1 would require the use of pipeline connections from other Bay Area marine terminals to transfer crude oil to the Refinery from other facilities (i.e., other refineries and/or bulk storage plants). This alternative would allow the Refinery to receive increased Alaskan and foreign crude oil without modifying the existing tanks and without receiving all of the crude oil supply across the MT. This alternative would merely transfer noise sources from the Project sites to another location in the Bay Area and could require the development of new pipeline infrastructure, the construction of which could result in short-term noise nuisance impacts to additional noise sensitive receptors. Therefore, depending on the proximity to nearby sensitive receptor locations, implementation of Alternative 1 would likely result in similar, though slightly more, noise-related impacts compared to the Project.

Population and Housing

Implementation of Alternative 1 would avoid development of the CTRP at the Refinery. However, as Alternative 1 would be likely to require the construction of a pipeline and potentially additional storage capacity at an offsite Bay Area location, this could result in potential impacts to population and housing due to the potential for pipelines to require a substantially larger work force than the CTRP. Once again, as with the Project, there exists an established labor force in the area so this alternative would also be expected to have a similar lack of impacts on population and housing as the Project.

Public Services

Implementation of Alternative 1 would avoid development of the CTRP at the Refinery. However, as Alternative 1 would be likely to require the construction of a pipeline and potentially additional storage capacity at an offsite Bay Area location, this could result in potential increased use of public services due to the potential for pipelines to interact with more local public services than the CTRP. For the most part, the potential for this Alternative 1 to require significantly increased public services would be small and therefore Alternative 1 would have either about the same impacts as the Project or slightly more than the Project.

Recreation

Implementation of Alternative 1 would avoid development of the CTRP at the Refinery. However, as Alternative 1 would be likely to require the construction of a pipeline and potentially additional storage capacity at an offsite Bay Area location, this could result in potential recreational impacts due to the greater linear extent of pipeline construction and thus a greater potential to impact local recreational facilities. Thus, potential impacts to recreational resources under Alternative 1 would therefore be either about the same as or slightly more than the Project.

Traffic/Transportation

Implementation of Alternative 1 would avoid development of the CTRP at the Refinery. However, as Alternative 1 would be likely to require the construction of a pipeline and potentially additional storage capacity at an offsite Bay Area location, this could result in potential transportation/traffic impacts due to the potential for pipeline installations to temporarily disrupt transportation/traffic conditions. Because the road network serving by an offsite Bay Area location likely is similar in nature to the roads serving the Project, potential impacts to transportation/traffic conditions under Alternative 1 would be either about the same as the Project or slightly more than the Project.

Utilities and Service Systems

Implementation of Alternative 1 would avoid development of the Project at the Refinery. However, Alternative 1 would likely require the construction of a pipeline and potentially additional storage capacity at an offsite Bay Area location. This could result in limited impacts to utilities and service systems due to the construction of new tank and pipeline facilities. Thus, potential impacts to utilities and service systems under Alternative 1 would likely either be similar to or slightly more than the Project.

6.6 Environmentally Superior Alternative

CEQA Guidelines Section 15126.6(e)(2) requires an EIR to identify an environmentally superior alternative. If the environmentally superior alternative is the No Project Alternative, the EIR also must identify an environmentally superior alternative from among the other alternatives. In general, the environmentally superior alternative is defined as that alternative with the least adverse impacts to the project area and its surrounding environment.

Based on the analysis presented in Chapters 4, 5, and 6 of this document, the No Project Alternative clearly presents the least amount of impacts to the environment; although it would not meet any of the CTRP objectives (see Section 6.2). Furthermore, although too speculative to consider in this CEQA review, the No Project Alternative could potentially result in the eventual shutdown or closure of the Refinery which may require a separate CEQA review.

Depending on whether or not sufficient storage tank capacity, pipeline capacity, and related infrastructure is available or has to be built, Alternative 1 would tend to reduce some of the local impacts associated with the CTRP (visual, noise, air quality, to name a few). However, these

impacts would essentially be transferred from the vicinity of the Refinery to the vicinity of the nearby facility. It is likely that Alternative 1 would result in new impacts by virtue of the necessity to transport crude oil to the Refinery from longer distances than those from the MT under the CTRP. As Alternative 1 would also rely on crude oil transport by marine vessels, the same marine vessel-related impacts would likely occur. Consequently, the CTRP represents the Environmentally Superior Alternative by virtue of having less potential impacts than Alternative 1.

CHAPTER 7
Report Preparation

7.1 Report Authors

7.1.1 Lead Agency

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7.1.2 Consultants

Environmental Science Associates

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Matt Fagundes, Deputy Project Manager	Cumulative Impacts, Air Quality, Greenhouse Gas Emissions, Noise
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Tom Roberts, CWB	Biological Resources
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Coast and Harbor Engineering (Sub-consultant)

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Osprey Environmental (Sub-consultant)

Peter Hendricks, P.E.	Project Description, Hazards and Hazardous Materials

7.2 Agencies and Organizations Contacted

The Department of Conservation & Development submitted a copy of the Notice of Preparation and Notice of Completion[1] (via certified mail) to the following agencies and organizations:

- Adams Broadwell Joseph & Cardozo
- Bay Area Air Quality Management District
- Bay Trail Project
- Bay Point Municipal Advisory Committee
- Contra Costa County (CCC) Building Inspection Division
- CCC Health Department - Hazardous Materials Division
- CCC Health Department - Environmental Health
- CCC Public Works Engineering
- CCC PW Special District
- CCC PW Traffic
- CCC PW Flood Control
- CCC Clerk Recorder
- Contra Costa County - Fire Protection District
- Caltrans – Transportation Planning
- CA Dept. of Fish & Game, Region 3
- CA Department of Toxic Substance Control
- California Air Resources Board
- City of Martinez
- Contra Costa County Library
- California Highway Patrol
- Center for Biological Diversity
- Contra Costa Water District
- City of Benicia
- Communities for a Better Environment
- East Bay Regional Park District
- Marin County Planning Department
- National Marine Fisheries Service
- Northwest Information Center –Historical Resources Information System

[1] In Accordance with the CEQA guidelines, a Notice of Completion was also sent to all property owners and occupants whose property(ies) is/are contiguous to the Shell property.

- Martinez Library
- Martinez Unified School District
- State Water Resources Control Board - Department of Water Quality
- Regional Water Quality Control Board - San Francisco Bay Region
- State Clearinghouse - Office of Planning & Research
- San Francisco Bay Conservation & Development Commission
- Solano County-Department of Resource Management (Planning Services Division)
- State Lands Commission - Executive Office
- State Water Resources Control Board
- U.S. Army Corps of Engineers - San Francisco Bay District
- West Contra Costa Healthcare District (Nancy Casazza)
- US Fish and Wildlife Service

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Appendix A
NOP, Scoping Comments

ESA

Department of Conservation & Development

Community Development Division

County Administration Building
651 Pine Street
North Wing, Fourth Floor
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Phone: (925) 335-1217

Contra Costa County

Catherine O. Kutsuris
Director

Aruna Bhat
Deputy Director
Community Development Division

February 9, 2010

NOTICE OF PREPARATION
NOTICE OF SCOPING SESSION

FOR AN ENVIRONMENTAL IMPACT REPORT
FOR THE PROPOSED SHELL MARTINEZ
CRUDE TANK REPLACEMENT PROJECT
(County File: # LP10-2006)

FILED
FEB 09 2010
S.L. WEIR, COUNTY CLERK
CONTRA COSTA COUNTY
BY _____ DEPUTY

TO: ALL INTERESTED AGENCIES, ORGANIZATIONS AND INDIVIDUALS

I. INTRODUCTION:

The Shell Oil Products is proposing the Crude Tank Replacement Project at their Martinez Refinery. The project will require a land use permit under the Contra Costa County Industrial Safety Ordinance, Section 84-63.1002(d) (storage of more than 40,000 tons of Category B materials; crude oil).

II. PROJECT OBJECTIVES

Shell's objective for the Crude Tank Replacement Project is to increase oil storage capacity and maintain production levels as crude oil delivered by vessel replaces pipeline San Joaquin Valley crude oil as a feedstock.

The proposed project would allow Shell to continue to supply local markets with California Air Resources Board cleaner-burning gasoline and ultra low sulfur diesel fuels, as well as other products, by greater receipt of crude oil by vessel to offset the continuing decrease in supply of the San Joaquin Valley crude oil. The proposed project would not increase the crude oil throughput of the Shell Martinez Refinery or result in an increase in the production of existing products or by-products. No physical modifications will be made to the Refinery process equipment.

III. LOCATION OF PROJECT

The Shell Martinez Refinery is located 25 miles northeast of San Francisco, within the Community of Martinez. The Refinery is bounded by Pacheco Boulevard to the south and interstate 680 to the north, except for portions of the Refinery that border the Carquinez

Strait north of Marina Vista. The Refinery's primary processing area lies between Pacheco Boulevard and Marina Vista, and the wastewater treatment plant and wharf operations lie between Marina Vista and the Carquinez Strait. Approximately 20 percent of the Refinery is located within the corporate limits of the City of Martinez and the remainder within unincorporated Contra Costa County.

IV. PROPOSED PROJECT

A. The Proposed Project Consists of the Following Components:

- Replacement of two existing crude oil storage tanks and the existing crude oil mix tank with three new larger crude oil storage tanks, and construction of a new crude oil mix tank. The proposed Project will also include refurbishment of an existing storage tank to allow it to be returned to crude oil service. The proposed Project will result in an increase of storage capacity at the facility by approximately 700 thousand barrels (MBbl).

- Increase in the volume of crude oil shipments received at the marine terminal (approximately one additional ship per week) to maintain production levels as crude oil delivered by vessel replaces San Joaquin Valley crude oil received by pipeline.

- Implement emission reduction projects as proposed measures to reduce project emissions to, or below, CEQA thresholds.

Crude Oil Storage Tanks

As part of the proposed Project, two existing crude oil storage tanks and the existing crude oil mix tank will be replaced with three larger new crude oil storage tanks. An existing storage tank will be refurbished and a new mix tank will be constructed. The new crude oil storage tanks will increase crude oil storage capacity at Shell by approximately 700 MBbl. The existing crude oil storage tanks and mix tank will be decommissioned and removed; and the new storage tanks and mix tank will be built in the same area as the tanks they replace. The new crude oil storage tanks will be larger in diameter and taller than the tanks to be replaced. Tables 3-1 and 3-2 below provide dimensions and capacities for the existing and proposed storage tanks and mix tank.

Each of the replacement storage tanks will have either an internal or external floating roof, and will use primary and secondary roof seals, slotted guide poles, and covered roof vents to maintain vapor control for volatile organic compounds subject to BAAQMD Best Available Control Technology rules/regulations. Similar to the existing storage tanks, the new storage tanks and mix tank will be heated with steam coils to maintain the tank contents at a temperature that will facilitate pumping. The new crude oil storage tanks and mix tank will contain electric in-tank mixers similar to those used in the existing crude oil storage tanks and existing mix tank. Figure 3-1 is a schematic that depicts the addition of the new crude oil storage tanks and mix tank.

Table 3-1 *Existing Storage Tanks to be Replaced or Refurbished*

Shell Tank ID	Type	Working Capacity (MBbl)	Height (feet)	Diameter (feet)
TK-541	Mix Tank / External Floating Roof	55	41	120
TK-544	External Floating Roof	78	40	144
TK-545	External Floating Roof	79	40	144
TK-1128	Fixed Roof	56	40	120

Table 3-2 *New and Refurbished Crude Oil Storage Tanks*

Shell Tank ID	Type	Working Capacity (MBbl)	Height (feet)	Diameter (feet)
TK-541 – New	External Floating Roof	293	70	190
TK-544 – New	External Floating Roof	293	70	190
TK-545 – New	External Floating Roof	293	70	190
TK-1127 – New	Mix Tank / External Floating Roof	56	40	120
TK-1128 – Refurbished	Internal Floating Roof	56	40	120

Figure 3-1 *Schematic of New Crude Oil Tanks*

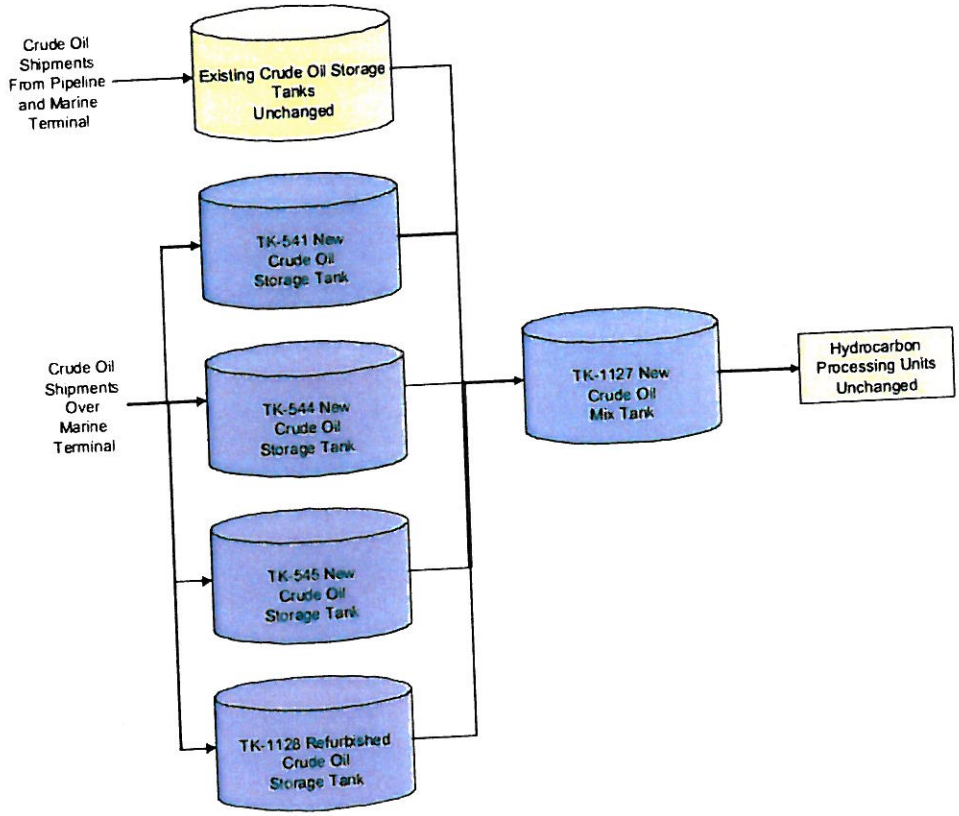
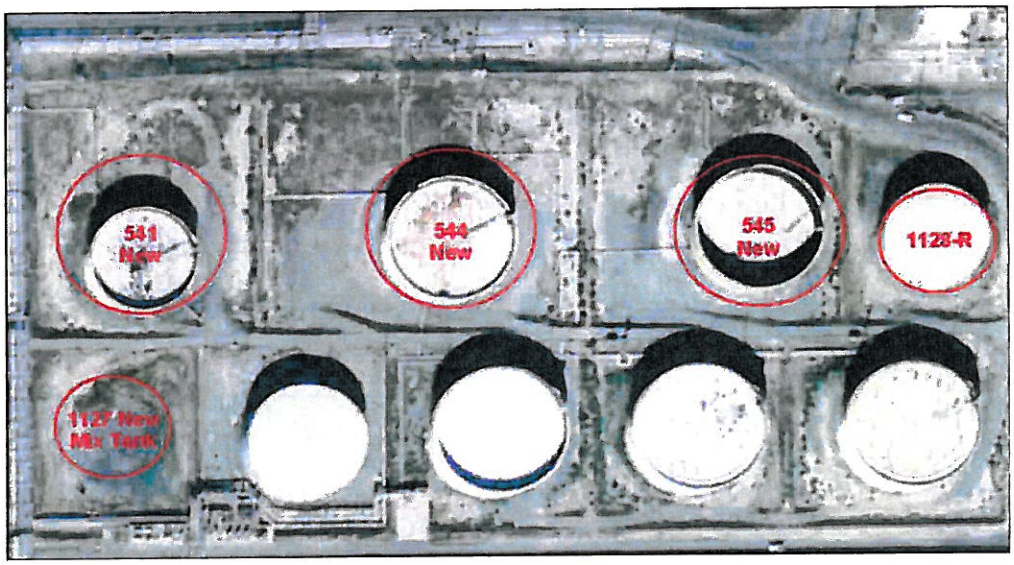


Figure 3-2 *Aerial View of Project Area*



The new crude oil storage tanks will be located generally in the same area as the tanks they will replace. The new mix tank will be located in a currently unoccupied space within the project area and a new storage tank will be constructed in the location of the current mix tank. Figure 3-2 above depicts the new tank locations superimposed on images of the existing tanks that will be demolished.

The containment berms/levees currently in place will be upgraded to increase their containment capacity to accommodate the increased volumes of the replacement tanks. This will be accomplished by increasing containment berm heights, connecting containment berms, or a combination of methods. The resultant containment capacity will allow for storage of a full release of the largest tank within the containment berm, plus the accumulated rainfall from a maximum 25-year, 24-hour storm event in compliance with federal Spill Prevention, Control, and Countermeasures requirements.

Marine Terminal

As San Joaquin Valley crude oil deliveries by pipeline diminish, Shell will require an increasing percentage of its crude oil supply to be delivered by vessels. Vessel deliveries will be handled at the existing marine terminal. When the proposed Project is fully implemented, vessel calls at the marine terminal are projected to increase above recent levels by approximately 53 vessel calls per year (or approximately one additional ship per week).

The Shell Marine Terminal is located on the southern shore of the Carquinez Strait approximately one-half mile west of the Benicia-Martinez Bridge (Interstate 680). The T-shaped marine terminal consists of a concrete wharf connected to shore by an elevated wooden approach roadway. A 40-foot-wide pile-supported pipe rack parallels the

approach roadway. The wharf is 1,950 feet long and 40 feet (average) wide. The elevated roadway is 1,900 feet long and 16 feet wide.

The wharf has four berths (the location on the wharf where ships dock): Two berths (#1 and #2) on the outer (northern) side, and two berths (#3 and #4) on the inner (southern) side. The berths are equipped with pumps, pipelines, electrical utilities and other mechanical equipment. Berths 1 and 2 can be occupied simultaneously. The northern side of the wharf normally maintains a minimum draft of minus 38 feet mean lower low water (MLLW), and has not historically required dredging. Berths #3 and #4 normally serve to load and unload barges, but currently are not in use because of accumulated silt. These berths were dredged to minus 20 feet MLLW in 1989.

There are two breasting dolphins (sturdy pilings for protecting the wharf from moored vessels) and two mooring dolphins (to attach vessel's mooring lines) connected by walkways on each side of the wharf. Oil-containment booms are located on each end of the wharf. The marine terminal is equipped with a marine vapor recovery system to capture hydrocarbon vapor emitted during loading operations.

The marine terminal handles crude oil, refined products, and feedstocks. The marine terminal serves inbound and outbound shipments. The Project would affect only inbound crude oil shipments.

Energy Consumption

Energy at the Refinery is used to provide power to transfer pumps and heating elements associated with moving and storing crude oil. The energy is in the form of electricity, natural gas, refinery fuel gas, or steam. Electricity is obtained either from Pacific Gas and Electric Company (PG&E) off the electricity grid, or from the on-site cogeneration plant that is owned and operated by Shell. Natural gas is supplied by PG&E and used to supplement fuel gas produced in the Refinery. Both natural gas and refinery fuel gas are used to fuel furnaces, boilers, and other combustion devices. Steam is produced within the Refinery by a series of boilers and by the heat recovery steam generators associated with the cogeneration plant. The additional energy demand associated with the Project is expected to be negligible when compared to current refinery usage.

Steam is used to heat the contents of storage tanks to maintain the tank contents at a temperature that will facilitate pumping into the mix tank for blending with other crude oils prior to discharge to the Crude Distillation Unit. The existing crude oil storage tanks to be replaced are equipped with steam heating coils. All of the new crude oil storage tanks will have steam heating coils to maintain the tank contents at a constant temperature to facilitate pumping. Due to the higher tank capacity the steam heating coils on the new storage tanks will create an additional steam demand. The expected increase is estimated to be minimal relative to overall refinery steam demand and the demand will be satisfied with the capacity of the existing steam boilers and cogeneration plant.

B. Construction and Decommissioning

Construction will require preparation of the Refinery through decommissioning and removal of existing tanks and associated structures, grading and excavation of soil, modifications to existing equipment and piping, construction and installation of new crude oil storage tanks, and modifications to storage tank containment areas. Decommissioning and removal of existing storage tanks and construction of new storage tanks will be conducted in phases. Shell plans to begin decommissioning and replacement of initial storage tanks in 2011. Completion of construction activities for all of the Project storage tanks is planned by 2015.

Parking and on-site services will be provided for the construction workers. The laydown area is located north of the project area. Construction employees will park in the established lot at Gate P-4 and bussed to the construction site. All temporary administrative, sanitary, and comfort services will be provided in the areas designated for these purposes on Shell property. There will be no parking, laydown, or other services off site.

During construction, material deliveries will include, but are not limited to, pipe, valves, fittings, structural steel, plates, concrete, rebar, formwork, machinery and equipment, electrical equipment, electrical conduit and cable, instrumentation, insulation, gaskets, bolts, nuts, and refractory. Construction, including planned material deliveries, is planned to occur 5 days per week.

Tanks to be removed will be drained and cleaned prior to demolition. Wastes generated by construction include crude oil tank sludge, steel from tanks and piping, wood trash, asbestos and other insulation, debris, cardboard, and refractory. Demolished equipment will be cut up and salvaged. Equipment removal and disposal will be done in compliance with all applicable regulations. Decontamination of demolished materials will occur prior to disposal and/or recycling. An asbestos and lead survey will be performed prior to the initiation of demolition and, as needed, the required permits will be obtained from the appropriate agencies.

Excavation and Grading

Excavation will be required for the foundations for the new tanks. Grading will be required to modify the existing tank berms/levees to accommodate the new tanks. Additional grading will be conducted as necessary in the laydown area to accommodate larger equipment and construction materials. It is anticipated that any fill required for site grading purposes will be obtained from on-site stockpiles. Approximately 8 acres of land at the tank farm and 2 acres of land at the laydown area will be affected by construction of the Project. The total Shell property is approximately 850 acres in size, and the estimated 10 acres used for this project is previously disturbed industrial land with a long history of storage tank and industrial use. The majority of the grading activities will occur at the tank farm area and will be completed before construction begins.

Other Construction Activities

To support the construction of the new crude oil storage tanks and mix tank, other construction activities (e.g., pile driving, use of construction cranes) may be necessary. All related construction activities will occur in the area of the existing tank farm. For example, construction cranes would potentially be used to lift and maneuver heavy construction materials into place. If needed, pile drivers would be used to drive heavy beams into the ground to support the larger tank structures.

Dust Control

The entire site where the new storage tanks and new mix tank will be constructed is located on unpaved land. The containment berms currently in place will be upgraded to increase the containment capacity to accommodate the increased volumes of the new tanks. An existing paved road that runs along the top of the containment berm that intersects the tank farm will potentially be repaved as part of the modifications to the containment berms and levees. Appropriate suppression techniques will be implemented during construction to reduce or avoid the generation of dust.

Construction Labor Force

As previously stated, the decommissioning and removal of existing storage tanks and construction of new storage tanks will be conducted in phases. Shell plans to begin decommissioning and replacement of initial storage tanks in 2011. Completion of construction activities for all the Project storage tanks is planned by 2015. The workforce is expected to consist of carpenters, riggers, electricians, welders, pipe fitters, ironworkers, painters, laborers, cement finishers, and administrative and office personnel.

Construction Traffic

Construction of the project will generate additional construction and personal vehicle trips during the peak construction period. Vehicle traffic will include employees, administrative personnel, management, materials, bus drivers, and soil deliveries. Prior to commencing construction, a traffic control plan will be submitted to the appropriate agency. Public safety will be maintained by traffic control measures at key intersections or other driveways that may be affected by construction vehicle ingress and egress.

Anticipated Environmental Impacts

It appears that the proposed project may have a significant impact on the following resources: Biological, Greenhouse Gas Emissions, Air Quality, Hazards & Hazardous Materials, Transportation/Traffic, Hydrology/Water Quality, and Noise. The EIR will analyze the impacts of the proposed project on those resources and other CEQA environmental criteria. In order to proceed with the proposed project, the applicant must obtain approval of a Land Use Permit from Contra Costa County and a permit from the Bay Area Air Quality Management District.

V. PUBLIC COMMENTS

The Contra Costa County Department of Conservation and Development is the Lead Agency for the preparation of the Environmental Impact Report for this project. All responsible agencies, interested agencies and individuals are invited to submit comments, which address environmental concerns resulting from the implementation of the proposed project.

Responses to this Notice of Preparation must be received by the Contra Costa County Community Development Division, 651 Pine Street, 4th Floor - North Wing, Martinez, California 94553, Attention: Telma Moreira, by Thursday, March 11, 2010 at 5:00 p.m. Facsimile (925) 335-1222.
Email Telma.Moreira@dcd.cccounty.us

VI. SCOPING SESSION

A Scoping Session will be held on Monday, February 22, 2010 at 3:30 p.m., in Room 107 of the McBrien Administration Building, 651 Pine Street, Martinez, California. Interested agencies and individuals may submit oral and written comments, which pertain to environmental concerns resulting from implementation of the proposed project.

VII. SUPPORTING DOCUMENTS

The Land Use Permit Application and supporting documents are available for viewing at the Contra Costa County Department of Conservation and Development. If you wish to obtain a copy of any supporting document related to this project, you may contact Telma Moreira of the Community Development Division at (925) 335-1217.

Signature: Telma B. Moreira

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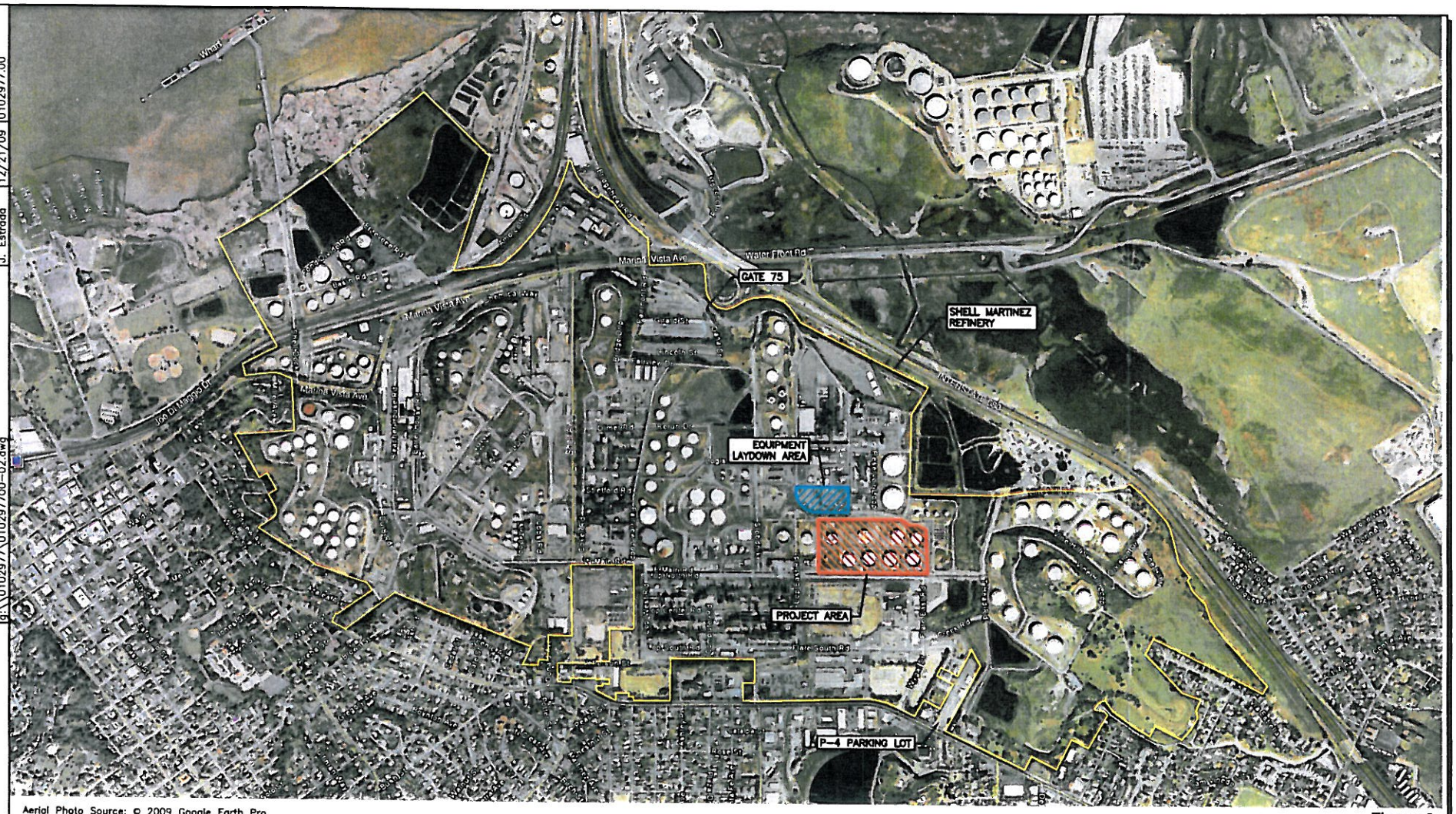
651 Pine Street, 4th Floor North Wing
Martinez, CA 94553-1229

Attachment: Site Location Map

County Clerk: 2 originals



Aerial Photo Source: © 2009 Google Earth Pro
Ver 5.0.11733.9347

N

0 1000
Approx. Scale (feet)

Figure 2
Project Location
Shell CTRP LUP Application
Shell Martinez Refinery
Martinez, California

ERM 12/09

CAD File: g:\0102977\0102977700-02.dwg
Drawn By: J. Estrada
Date: 12/21/09
Project No: 0102977.00

WILLIAM B. WALKER, M.D.
HEALTH SERVICES DIRECTOR

SHERMAN L. QUINLAN, REHS, MPH
ENVIRONMENTAL HEALTH DIRECTOR

CONTRA COSTA
HEALTH SERVICES

CONTRA COSTA
ENVIRONMENTAL HEALTH

2120 Diamond Blvd., Suite 200
Concord, California 94520
Ph (925) 692-2500
Fax (925) 692-2502
www.cocoeh.org

CONTRA COSTA
2'10 FEB 18 A 10: 29
DEPARTMENT OF CONSERVATION AND DEVELOPMENT

February 17, 2010

Telma B. Moreira
Contra Costa County
Community Development Division
651 Pine St.
4th Floor, North Wing
Martinez, CA 94553

RE: LP10-2006
Shell Oil – Crude Storage Tank Replacement Project

Dear Ms. Moreira:

The Contra Costa Environmental Health Division (CCEHD) has received an "Agency Comment Request" for the above referenced project. The following are our comments:

1. A permit from CCEHD is required for any well or soil boring prior to commencing drilling activities, including those associated with environmental investigation and cleanup, and geotechnical investigation.

2. Any abandoned wells (water, environmental, or geotechnical) must be destroyed under permit from CCEHD. If the existence of such wells are known in advance or discovered during construction or other activities, these should be clearly marked, kept secure, and destroyed pursuant to CCEHD requirements.

If I can be of further assistance, please feel free to contact me at (925) 692-2535.

Sincerely,

Joseph G. Doser
Supervising Environmental Health Specialist

cc: Les Miyashiro, Environmental Health Specialist

JGD:ssm

STATE OF CALIFORNIA

GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH

STATE CLEARINGHOUSE AND PLANNING UNIT

ARNOLD SCHWARZENEGGER
GOVERNOR

CYNTHIA BRYANT
DIRECTOR

Notice of Preparation

February 10, 2010

To: Reviewing Agencies

Re: Shell Martinez Crude Tank Replacement Project
SCH# 2010022034

Attached for your review and comment is the Notice of Preparation (NOP) for the Shell Martinez Crude Tank Replacement Project draft Environmental Impact Report (EIR).

Responsible agencies must transmit their comments on the scope and content of the NOP, focusing on specific information related to their own statutory responsibility, within 30 days of receipt of the NOP from the Lead Agency. This is a courtesy notice provided by the State Clearinghouse with a reminder for you to comment in a timely manner. We encourage other agencies to also respond to this notice and express their concerns early in the environmental review process.

Please direct your comments to:

Telma B. Moreira
Contra Costa County Conservation and Development
651 Pine Street
4th Floor, North Wing
Martinez, CA 94553

with a copy to the State Clearinghouse in the Office of Planning and Research. Please refer to the SCH number noted above in all correspondence concerning this project.

If you have any questions about the environmental document review process, please call the State Clearinghouse at (916) 445-0613.

Sincerely,

Scott Morgan
Acting Director

Attachments
cc: Lead Agency

1400 10th Street P.O. Box 3044 Sacramento, California 95812-3044
(916) 445-0613 FAX (916) 323-3018 www.opr.ca.gov

Document Details Report
State Clearinghouse Data Base

SCH# 2010022034
Project Title Shell Martinez Crude Tank Replacement Project
Lead Agency Contra Costa County

Type NOP Notice of Preparation

Description Replacement of two existing crude oil storage tanks and the existing crude oil mix tank with three new larger crude oil storage tanks, and construction of a new crude oil mix tank. The proposed project will also include refurbishment of an existing storage tank to allow it to be returned to crude oil service. Increase in the volume of crude oil shipments received at the marine terminal. Implement emission reduction projects as proposed measures to reduce project emissions to, or below, CEQA thresholds.

Lead Agency Contact

Name Telma B. Moreira
Agency Contra Costa County Conservation and Development
Phone (925) 335-1217 **Fax**
email
Address 651 Pine Street
4th Floor, North Wing
City Martinez **State** CA **Zip** 94553

Project Location

County Contra Costa
City Martinez
Region
Cross Streets Shell Avenue/Pacheco Boulevard
Lat / Long 38° 02' N / 122° 12' W
Parcel No. 378-072-016
Township **Range** **Section** **Base**

Proximity to:

Highways 680
Airports
Railways
Waterways Carquinez Straight
Schools
Land Use GP is Heavy Industry and Z is Heavy Industrial

Project Issues Aesthetic/Visual; Air Quality; Biological Resources; Noise; Toxic/Hazardous; Traffic/Circulation; Water Quality; Other Issues

---

Reviewing Agencies Resources Agency; California Energy Commission; Office of Historic Preservation; Department of Parks and Recreation; San Francisco Bay Conservation and Development Commission; Department of Water Resources; Department of Fish and Game, Region 3; Native American Heritage Commission; California Highway Patrol; Caltrans, District 4; Air Resources Board, Major Industrial Projects; Resources, Recycling and Recovery; State Water Resources Control Board, Divison of Financial Assistance; Department of Toxic Substances Control; Regional Water Quality Control Board, Region 2

Date Received 02/10/2010 **Start of Review** 02/10/2010 **End of Review** 03/11/2010

Note: Blanks in data fields result from insufficient information provided by lead agency.

NOP Distribution List

County: Contra Costa SCH# 2010088057

Resources Agency

- [x] Resources Agency
  Nadell Gayou
- [ ] Dept. of Boating & Waterways
  Mike Sotelo
- [ ] California Coastal Commission
  Elizabeth A. Fuchs
- [ ] Colorado River Board
  Gerald R. Zimmerman
- [ ] Dept. of Conservation
  Rebecca Salazar
- [x] California Energy Commission
  Eric Knight
- [ ] Cal Fire
  Allen Robertson
- [x] Office of Historic Preservation
  Wayne Donaldson
- [x] Dept of Parks & Recreation
  Environmental Stewardship Section
- [ ] Central Valley Flood Protection Board
  James Herota
- [x] S.F. Bay Conservation & Dev't. Comm.
  Steve McAdam
- [x] Dept. of Water Resources
  Resources Agency
  Nadell Gayou
- [ ] _____
  Conservancy

Fish and Game

- [ ] Depart. of Fish & Game
  Scott Flint
  Environmental Services Division
- [ ] Fish & Game Region 1
  Donald Koch
- [ ] Fish & Game Region 1E
  Laurie Harnsberger
- [ ] Fish & Game Region 2
  Jeff Drongesen
- [x] Fish & Game Region 3
  Charles Armor
- [ ] Fish & Game Region 4
  Julie Vance
- [ ] Fish & Game Region 5
  Don Chadwick
  Habitat Conservation Program
- [ ] Fish & Game Region 6
  Gabrina Gatchel
  Habitat Conservation Program
- [ ] Fish & Game Region 6 I/M
  Brad Henderson
  Inyo/Mono, Habitat Conservation Program
- [ ] Dept. of Fish & Game M
  George Isaac
  Marine Region

Other Departments

- [ ] Food & Agriculture
  Steve Shaffer
  Dept. of Food and Agriculture
- [ ] Depart. of General Services
  Public School Construction
- [ ] Dept. of General Services
  Anna Garbeff
  Environmental Services Section
- [ ] Dept. of Public Health
  Bridgette Binning
  Dept. of Health/Drinking Water

Independent Commissions,Boards

- [ ] Delta Protection Commission
  Linda Flack
- [ ] Cal EMA (Emergency Management Agency)
  Dennis Castrillo
- [ ] Governor's Office of Planning & Research
  State Clearinghouse
- [x] Native American Heritage Comm.
  Debbie Treadway
- [ ] Public Utilities Commission
  Leo Wong
- [ ] Santa Monica Bay Restoration
  Guangyu Wang
- [ ] State Lands Commission
  Marina Brand
- [ ] Tahoe Regional Planning Agency (TRPA)
  Cherry Jacques

Business, Trans & Housing

- [ ] Caltrans - Division of Aeronautics
  Sandy Hesnard
- [ ] Caltrans - Planning
  Terri Pencovic
- [x] California Highway Patrol
  Scott Loetscher
  Office of Special Projects
- [ ] Housing & Community Development
  CEQA Coordinator
  Housing Policy Division

Dept. of Transportation

- [ ] Caltrans, District 1
  Rex Jackman
- [ ] Caltrans, District 2
  Marcelino Gonzalez
- [ ] Caltrans, District 3
  Bruce de Terra
- [x] Caltrans, District 4
  Lisa Carboni
- [ ] Caltrans, District 5
  David Murray
- [ ] Caltrans, District 6
  Michael Navarro
- [ ] Caltrans, District 7
  Elmer Alvarez
- [ ] Caltrans, District 8
  Dan Kopulsky
- [ ] Caltrans, District 9
  Gayle Rosander
- [ ] Caltrans, District 10
  Tom Dumas
- [ ] Caltrans, District 11
  Jacob Armstrong
- [ ] Caltrans, District 12
  Chris Herre

Cal EPA

Air Resources Board

- [ ] Airport Projects
  Jim Lerner
  - [ ] Transportation Projects
    Douglas Ito
  - [x] Industrial Projects
    Mike Tollstrup
- [x] California Department of Resources, Recycling & Recovery
  Sue O'Leary
- [x] State Water Resources Control Board
  Regional Programs Unit
  Division of Financial Assistance
- [ ] State Water Resources Control Board
  Student Intern, 401 Water Quality Certification Unit
  Division of Water Quality
- [ ] State Water Resouces Control Board
  Steven Herrera
  Division of Water Rights
- [x] Dept. of Toxic Substances Control
  CEQA Tracking Center
- [ ] Department of Pesticide Regulation
  CEQA Coordinator

Regional Water Quality Control Board (RWQCB)

- [ ] RWQCB 1
  Cathleen Hudson
  North Coast Region (1)
- [x] RWQCB 2
  Environmental Document Coordinator
  San Francisco Bay Region (2)
- [ ] RWQCB 3
  Central Coast Region (3)
- [ ] RWQCB 4
  Teresa Rodgers
  Los Angeles Region (4)
- [ ] RWQCB 5S
  Central Valley Region (5)
  - [ ] RWQCB 5F
    Central Valley Region (5)
    Fresno Branch Office
  - [ ] RWQCB 5R
    Central Valley Region (5)
    Redding Branch Office
- [ ] RWQCB 6
  Lahontan Region (6)
  - [ ] RWQCB 6V
    Lahontan Region (6)
    Victorville Branch Office
- [ ] RWQCB 7
  Colorado River Basin Region (7)
- [ ] RWQCB 8
  Santa Ana Region (8)
- [ ] RWQCB 9
  San Diego Region (9)

- [ ] Other _____
  _____
  _____

Last Updated on 01/04/2010

CALIFORNIA HISTORICAL RESOURCES INFORMATION SYSTEM

ALAMEDA
COLUSA
CONTRA COSTA
LAKE
MARIN
MENDOCINO
MONTEREY
NAPA
SAN BENITO
SAN FRANCISCO
SAN MATEO
SANTA CLARA
SANTA CRUZ
SOLANO
SONOMA
YOLO

Northwest Information Center
Sonoma State University
1303 Maurice Avenue
Rohnert Park, California 94928-3609
Tel: 707.664.0880 • Fax: 707.664.0890
E-mail: leigh.jordan@sonoma.edu
http://www.sonoma.edu/nwic

Febuary 18, 2010

File No.: 09-1016

Telma Moreira, Project Planner
Contra Costa County
Community Development Department
651 Pine Street
4th Floor, North Wing
Martinez, CA 94553

re: LP 10-2006

Dear Ms. Moreira,

Records at this office were reviewed to determine if this project could adversely affect cultural resources. **Please note that use of the term cultural resources includes both archaeological sites and historical buildings and/or structures. The review for possible historic-era building/structures, however, was limited to references currently in our office and should not be considered comprehensive.**

Previous Studies:

_X_ Study # 1582 (Banks 1979), covering approximately 95% of the proposed project area, identified no cultural resources. Environmental data suggests that the proposed project area was a highly sensitive area for cultural resources due to its location and proximity to marshlands and water sources as well as known cultural resources (P07-000132) within the adjacent area. However, construction disturbances of the refinery over the years has greatly impacted the original landscape and caused disturbance to areas that may have contained resources. Therefore, further study forcultural resources is not recommended.

Archaeological and Native American Resources Recommendations:

_X_ The proposed project area has the possibility of containing unrecorded archaeological site(s). However, due to prior ground disturbance no further study for archaeological resources is recommended.

_X_ We recommend you contact the local Native American tribe(s) regarding traditional, cultural, and religious heritage values. For a complete listing of tribes in the vicinity of the project, please contact the Native American Heritage Commission at 916/653-4082.

Built Environment Recommendations:

_X_ The 1951 USGS Vine Hill, Calif. 7.5' quad depicts several buildings and structures in the proposed project area. Since the Office of Historic Preservation has determined that any building or structure 45 years or older may be of historical value, it is recommended that prior to commencement of project activities, a qualified professional familiarwith the architecture and history of Contra Costa County conduct a formal CEQA evaluation.

For your reference, a list of qualified professionals in California that meet the Secretary of the Interior's Standards can be found at http://www.chrisinfo.org. If archaeological resources are encountered during the project, work in the immediate vicinity of the finds should be halted until a qualified archaeologist has evaluated the situation. If you have any questions please give us a call (707) 664-0880.

Sincerely,

Kristina Montgomery

Kristina Montgomery, for
Leigh Jordan
Coordinator

cc: Shell Oil Productions U.S.
3485 Pacheco Blvd
Martinez, CA 94553

CONTRA COSTA COUNTY
DEPARTMENT OF CONSERVATION AND DEVELOPMENT
COMMUNITY DEVELOPMENT DIVISION

651 Pine Street
4th Floor, North Wing
Martinez, CA 94553-0095

RECEIVED
FEB 11 2010
Contra Costa Health
Hazardous Materials

Phone: 925-335-1210

Date 2/9/10

AGENCY COMMENT REQUEST

We request your comments regarding the attached application currently under review.

DISTRIBUTION

- X Building Inspection ___ Grading Inspection
- X HSD, Environmental Health, Concord
- X HSD, Hazardous Materials
- X P/W - Flood Control (Full Size)
- X P/W - Engineering Svcs (Full Size)
  Date Forwarded _____
- X P/W Traffic (Reduced)
- X P/W Special Districts (Reduced)
- ___ P/W—APC Floodplain Tech (2nd Floor)
- ___ Advanced Planning
- ___ Redevelopment Agency/Housing
- X Historical Resources Information System
- ___ CA Native Amer. Her. Comm.
- X CA Fish & Game, Region _____
- X US Fish & Wildlife Service
- X Fire District _____
- ___ Sanitary District _____
- X Water District _____
- X City Martinez
- X School District Martinez Unified
- ___ East Bay Regional Park District
- ___ MAC _____
- ___ DOIT - Dep. Director, Communications
- ___ CDD-GIS
- ___ LAFCO
- ___ Mineral Rights Holder:
  _____
  BCDC State Lands Commission
- Community Organizations:
  RWQCB EBRPD
  CA-DTSC

Please submit your comments as follows:

Project Planner Telma B. Moreira
Phone # (925) 335-1217

County File Number LP 10-2006

Prior To March 5, 2010

We have found the following special programs apply to this application:

- ____ Redevelopment Area
- ____ Active Fault Zone
- ____ Flood Hazard Area, Panel # _____
  If in special flood zone, route to APC Floodplain Tech
- ____ 60 dBA Noise Control
- ____ CA EPA Hazardous Waste Site
- ____ Traffic Zone _____
- ____ CEQA Exempt
  Categorical Exemption Section:

see attached additional

Please indicate the code section of recommendations that are required by law or ordinance. Please send copies of your response to the Applicant & Owner.

✓ No comments on this application ____ Our comments are attached

Comments: _____

Signature: Sue Loyd

Agency/Phone #: HSD, Hazardous Materials (925) 332-352

Date: 02/14/10

G:\Current Planning\curr-plan\APC Forms\Agency Comment Request with seal.doc

Department of Toxic Substances Control

Linda S. Adams
Secretary for
Environmental Protection

Maziar Movassaghi
Acting Director
700 Heinz Avenue
Berkeley, California 94710-2721

Arnold Schwarzenegger
Governor

February 23, 2010

Ms. Telma Moreira
Contra Costa County Conservation and Development
651 Pine Street
4th Floor, North Wing
Martinez, California 94553

SHELL MARTINEZ CRUDE TANK REPLACEMENT PROJECT, COUNTY FILE #L P/O-2006, SCH#2010022034

Dear Ms. Moreira,

Thank you for the opportunity to comment on the Notice of Preparation (NOP) for the subject project. The Department of Toxic Substances Control (DTSC) is the state agency responsible for regulating management of hazardous wastes and actions to correct release of hazardous constituents from facilities such as the Shell Refinery at which this project is proposed to take place.

Removal of tanks as described in the NOP, and supporting documents affords an opportunity to investigate for potential releases of hazardous substances and wastes which might be detected in soil and groundwater within the footprint of removed tanks. It further affords the opportunity to remove such releases as appropriate.

To the extent that such investigation and removal might be warranted, inclusion of removal activities in the project and the CEQA analysis would be prudent.

DTSC will be in contact with the project proponent to discuss regulatory issues relevant to the project. This note merely invites you to consider inclusion of these regulatory actions in scoping of the CEQA document for the project.

Printed on Recycled Paper

If you have any questions, please feel free to call me at (510) 540-3772.

Sincerely,

Daniel Murphy, P.E., Unit Chief
Brownsfields and Environmental Restoration Program

Contra Costa County **Fire Protection District**

March 4, 2010

Ms. Telma Moreira
Contra Costa County
Community Development Department
651 Pine Street, 4th Floor
Martinez, CA 94553

Subject: LP10-2006; Shell Oil Crude Tank Replacement Project
1915 Shell Avenue, Martinez
APN 378-072-016
CCCFPD Project No.: 113746-PL

Dear Ms. Moreira:

We have reviewed the land use permit application for a crude (oil) storage tank replacement project to remove and replace three (3) tanks, refurbish one (1) tank, and install one (1) new tank at the subject location. The following is required for Fire District approval in accordance with the Health and Safety Code, and the 2007 California Fire Code (CFC):

1. Flammable or combustible liquid storage tanks shall ***not*** be located on the site without obtaining approval and necessary permits from the Fire District. The installation of above-ground storage tanks for flammable and combustible liquids shall comply with Section 3404.2 and Sections 3404.2.9.1 through 3404.2.9.1.1 of the 2007 California Fire Code (CFC). (3401.4) CFC, (3404.2.9) CFC

2. The developer shall submit three (3) complete sets of above-ground flammable/combustible liquid storage tank plans and specifications of the subject project, including plans for any of the following required submittals, to the Fire District for review and approval ***prior to*** construction to ensure compliance with minimum requirements related to fire and life safety. (901.2) CFC, (108.4.1) CBC

   - Private underground fire service water mains (NFPA-24, 2007)
   - Foam fire protection systems (NFPA-11, 2005)

3. The developer shall provide an adequate and reliable water supply for fire protection as set forth in the California Fire Code. (508.1) CFC

4. Plan review and inspection fees shall be submitted at the time of plan review submittal. Checks may be made payable to "CCCFPD" (Contra Costa County Fire Protection District).

2010 Geary Road • Pleasant Hill, California 94523-4619 • Telephone (925) 941-3300 • Fax (925) 941-3309
East County • Telephone (925) 757-1303 • Fax (925) 941-3329 West County • Telephone (510) 374-7070
www.cccfpd.org

5. Submit plans to: Contra Costa County Fire Protection District
2010 Geary Road
Pleasant Hill, CA 94523

The above-referenced CCCFPD Project Number shall be required in all correspondence or communication with the Fire District.

Our preliminary review comments shall not be construed to encompass the complete project. Additional plans and specifications may be required after further review.

Please provide this office with a copy of the conditions of approval as set forth by your Planning Division.

If you have any questions regarding this matter, please contact this office at (925) 941-3300.

Sincerely,

Ted Leach
Fire Inspector

TL/

c: Contra Costa County Hazardous Materials
4333 Pacheco Boulevard
Martinez, CA 94553

Gordon Johnson
Shell Oil Products U.S.
3485 Pacheco Boulevard
Martinez, CA 94553

File: 113746.ltr

DEPARTMENT OF TRANSPORTATION
111 GRAND AVENUE
P. O. BOX 23660
OAKLAND, CA 94623-0660
PHONE (510) 622-5491
FAX (510) 286-5559
TTY 711

CONTRA COSTA
2010 MAR -4 P 2:33
DEPARTMENT OF CONSERVATION AND DEVELOPMENT

Flex your power!
Be energy efficient!

March 1, 2010

CC680560
CC-680-24.05
SCH# 2010022034

Ms. Telma B. Moreira
Contra Costa County
Department of Conservation and Development
651 Pine Street, 4th Floor, North Wing
Martinez, CA 94553

Dear Ms. Moreira:

Shell Martinez Crude Tank Replacement Project – Notice of Preparation

Thank you for including the California Department of Transportation (Department) in the early stages of the environmental review process for the Shell Martinez Crude Tank Replacement project. The following comments are based on the Notice of Preparation (NOP). As the lead agency, Contra Costa County is responsible for all project mitigation, including any needed improvements to State highways. The project's fair share contribution, financing, scheduling, implementation responsibilities and lead agency monitoring should be fully discussed for all proposed mitigation measures. This information should also be presented in the Mitigation Monitoring and Reporting Plan of the environmental document. Required roadway improvements should be completed prior to issuance of the Certificate of Occupancy. Since an encroachment permit is required for work in the state right of way (ROW), and the Department will not issue a permit until our concerns are adequately addressed, we strongly recommend that Contra Costa County work with both the applicant and the Department to ensure that our concerns are resolved during the California Environmental Quality Act (CEQA) process, and in any case prior to submittal of a permit application. Further comments will be provided during the encroachment permit process; see the end of this letter for more information regarding encroachment permits.

Traffic Impact Study (TIS)
Please include the information detailed below in the TIS to ensure that project-related impacts to State roadway facilities are thoroughly assessed. We encourage the County to coordinate preparation of the study with our office, and we would appreciate the opportunity to review the scope of work. The Department's *"Guide for the Preparation of Traffic Impact Studies"* should be reviewed prior to initiating any traffic analysis for the project; it is available at the following website: http://www.dot.ca.gov/hq/traffops/developserv/operationalsystems/reports/tisguide.pdf

The TIS should include:

1. Vicinity map, regional location map, and a site plan clearly showing project access in relation to nearby State roadways. Ingress and egress for all project components should be clearly identified. State ROW should be clearly identified.

2. The maps should also include project driveways, local roads and intersections, parking, and transit facilities.

3. Project-related trip generation, distribution, and assignment. The assumptions and methodologies used to develop this information should be detailed in the study, and should be supported with appropriate documentation.

4. Average Daily Traffic, AM and PM peak hour volumes and levels of service (LOS) on all significantly affected roadways, including crossroads and controlled intersections for existing, existing plus project, cumulative and cumulative plus project scenarios. Calculation of cumulative traffic volumes should consider all traffic-generating developments, both existing and future, that would affect study area roadways and intersections. *The analysis should clearly identify the project's contribution to area traffic and degradation to existing and cumulative levels of service. Lastly, the Department's LOS threshold, which is the transition between LOS C and D, and is explained in detail in the Guide for Traffic Studies, should be applied to all State facilities.*

5. Schematic illustration of traffic conditions including the project site and study area roadways, trip distribution percentages and volumes as well as intersection geometrics, i.e., lane configurations, for the scenarios described above.

6. The project's consistency with both the Circulation Element of the General Plan and the Contra Costa County Congestion Management Agency's Congestion Management Plan should be evaluated.

7. Mitigation should be identified for any roadway mainline section or intersection with insufficient capacity to maintain an acceptable LOS with the addition of project-related and/or cumulative traffic.

8. Special attention should be given to the following trip-reducing measures:
   - Encouraging mixed-use,
   - Maximizing density through offering bonuses and/or credits,
   - Coordinating with AC Transit and the County Connection, to increase transit use by expanding routes and emphasizing express service to regional rail stations, and by providing bus shelters with seating at any future bus pullouts,
   - Providing transit information to all future project employees and patrons, and
   - Encouraging bicycle- and pedestrian-friendly design.

Please forward three hard copies and one CD of the environmental document, along with the TIS, including Technical Appendices, and staff report to the address below as soon as they are available.

Luis Melendez
Community Planning Office, Mail Station 10D
California DOT, District 4
P.O. Box 23660
Oakland, CA 94623-0660

Encroachment Permit
Please be advised that any work or traffic control that encroaches onto the state ROW requires an encroachment permit that is issued by the Department. To apply, a completed encroachment permit application, environmental documentation, and five (5) sets of plans clearly indicating state ROW must be submitted to the address below. Traffic-related mitigation measures should be incorporated into the construction plans during the encroachment permit process. See the website link below for more information. http://www.dot.ca.gov/hq/traffops/developserv/permits/

Michael Condie, District Office Chief
Office of Permits
California DOT, District 4
P.O. Box 23660
Oakland, CA 94623-0660

Please feel free to call or email Luis Melendez of my staff at (510) 286-5606 or Luis_Melendez@dot.ca.gov with any questions regarding this letter.

Sincerely,

Lisa Carboni

LISA CARBONI
District Branch Chief
Local Development – Intergovernmental Review

c: State Clearinghouse

Contra Costa County
Public Works
Department

Julia R. Bueren, Director
Deputy Directors
R. Mitch Avalon • Brian M. Balbas
Stephen Kowalewski • Patricia McNamee

Memo

TO: Telma Moriera, Principal Planner, Department of Conservation and Development

DATE: March 3, 2010

FROM: Monish Sen, Associate Civil Engineer, Engineering Services Division

SUBJECT: **PERMIT LP 10-2006**
GENERAL COMMENTS
(Shell Oil Products U.S./Shell Avenue/Martinez/APN 378-072-016)

FILE: LP 10-02006

2010 MAR -5 AM 10:
CONTRA COSTA COUNTY
DEPARTMENT OF CONSERVATION AND DEVELOPMENT

We have reviewed the application package for the proposed Shell Crude Tank Replacement Project received by your office on February 9, 2010, along with the Notice of Preparation (NOP) of an Environmental Impact Report (EIR), and submit the following comments. These comments should be adequately addressed during the preparation of the draft EIR for the proposed project:

Background

The applicant requests a land use permit to replace three existing crude oil storage tanks with new larger tanks as well as the construction of an additional new crude oil storage tank. Also requested with this permit is the refurbishment of an existing storage tank. The proposed project is located at the Shell Martinez Refinery in the unincorporated area of Martinez. Although a portion of the subject parcel is located in the incorporated City of Martinez, the proposed tank reconstruction is located in the unincorporated County portion of the site.

General Comments

- The applicant has indicated that decommissioning, removal, and construction of crude oil tanks and associated equipment shall be conducted in phases. Decommissioning of the existing tanks is expected to start as soon as 2011, and completion of the project is expected by 2015. Construction is expected to occur five days a week, with materials and equipment deliveries expected to enter the facility at Gate 75. The applicant shall indicate how much construction related traffic is expected to be generated during peak construction activities. Additionally, the potential haul routes and the specific number of truck trips anticipated should be identified to help determine the potential impacts that the construction related traffic will have on County maintained roadways. A traffic study should address potential impacts. Any remedial work that may be necessary on County maintained roadways due to impacts from construction related traffic shall be identified, and a pavement monitoring plan may be required. In addition, to help reduce any traffic delays due to construction related traffic, a project construction schedule may be necessary.

- The applicant should indicate how storm water runoff is proposed to be collected and

conveyed to an adequate man-made storm drain system or natural watercourse. A drainage plan should be included with any future submittal.

- The applicant will be required to obtain Encroachment Permits from the County's Application and Permit Center for any work proposed within any County road rights of way.

- The applicant will be required to comply with the requirements of the Bridge/Thoroughfare Fee Ordinance for the Martinez Area of Benefit, as adopted by the Board of Supervisors. The fee shall be paid prior to issuance of a building permit.

Stormwater Management

- In compliance with of the County's Stormwater Management and Discharge Control Ordinance, any new and/or redeveloped impervious surface area proposed with this application totaling more than 10,000 square feet will require submittal of a Stormwater Control Plan (SWCP) prepared in accordance with the most recent edition of the *Stormwater C.3 Guidebook*. It is not clear how much impervious surfacing is being created/replaced with this project, although it appears to exceed the 10,000 square foot threshold. The applicant should tabulate the total impervious surfaces proposed with this project and provide this information to the Public Works Department.

MS:
G:\engsvc\Land Dev\LP\LP 10-2006\General Comments.docx

cc: G. Huisingh, Engineering Services
S. Gospodchikov, Engineering Services
J. Fahy, Transportation Engineering
J. Caldwell, Transportation Engineering
D. Swartz, County Watershed Program
Shell Oil Products, U.S.
Attn: Gordon Johnson
3485 Pacheco Boulevard
Martinez, CA 94553

Contra Costa County **Fire Protection District**

CONTRA COSTA

2010 MAR -9 P 2:27

DEPARTMENT OF CONSERVATION AND DEVELOPMENT

March 5, 2010

Ms. Telma Moreira
Contra Costa County
Community Development Department
651 Pine Street, Fourth Floor
Martinez, CA 94553

Subject: LP10-2006; Shell Oil Crude Tank Replacement Project
1915 Shell Avenue, Martinez
APN 378-072-016
CCCFPD Project No.: 113746-PL

Dear Ms. Moreira:

We have reviewed the land use permit application for a crude (oil) storage tank replacement project to remove and replace three (3) tanks, refurbish one (1) tank, and install one (1) new tank at the subject location. The following is required for Fire District approval in accordance with the Health and Safety Code and the 2007 California Fire Code (CFC):

1. Flammable or combustible liquid storage tanks shall ***not*** be located on the site without obtaining approval and necessary permits from the Fire District. The installation of aboveground storage tanks for flammable and combustible liquids shall comply with Section 3404.2 and Sections 3404.2.9.1 through 3404.2.9.1.1 of the 2007 California Fire Code (CFC). (3401.4) CFC, (3404.2.9) CFC

2. The developer shall submit three (3) complete sets of aboveground flammable/combustible liquid storage tank plans and specifications of the subject project, including plans for any of the following required submittals, to the Fire District for review and approval ***prior to*** construction to ensure compliance with minimum requirements related to fire and life safety. (901.2) CFC

   - Private underground fire service water mains (NFPA-24, 2007)
   - Foam fire protection systems (NFPA-11, 2005)

3. The developer shall provide an adequate and reliable water supply for fire protection as set forth in the California Fire Code. (508.1) CFC

4. Plan review and inspection fees shall be submitted at the time of plan review submittal. Checks may be made payable to "CCCFPD" (Contra Costa County Fire Protection District).

5. Submit plans to: Contra Costa County Fire Protection District
2010 Geary Road
Pleasant Hill, CA 94523

The above-referenced CCCFPD Project Number shall be required in all correspondence or communication with the Fire District.

Our preliminary review comments shall not be construed to encompass the complete project. Additional plans and specifications may be required after further review.

Please provide this office with a copy of the conditions of approval as set forth by your Planning Division.

If you have any questions regarding this matter, please contact this office at (925) 941-3300.

Sincerely,

Ted Leach
Fire Inspector

TL/cm

c: Contra Costa County Hazardous Materials
4333 Pacheco Boulevard
Martinez, CA 94553

Mr. Gordon Johnson
Shell Oil Products U.S.
3485 Pacheco Boulevard
Martinez, CA 94553

File: 113746.ltr

City of Martinez
525 Henrietta Street, Martinez, CA 94553-2394

CONTRA COSTA
2010 MAR 12 P 1:40
DEPARTMENT OF CONSERVATION AND DEVELOPMENT

March 11, 2010

Ms. Telma Moreira, Principal Planner
Contra Costa County
Department of Conservation and Development
651 Pine Street, 4th Floor North Wing
Martinez, California 94553-1229

NOP – EIR Proposed Shell Crude Tank Replacement Project

Dear Ms. Moreira:

Thank you for the Notice of Preparation for the EIR for the proposed Shell Crude Tank Replacement Project. The City of Martinez understands that Shell Oil Products USA has applied for a Land Use Permit to replace 3 existing crude oil storage tanks with 3 new larger storage tanks, construct one new crude oil storage tank and refurbish an existing one. The purpose of the project is to allow for the gradual replacement of San Joaquin crude that is piped to the refinery with crude that must be brought to the refinery by ship.

The City of Martinez applauds Shell Oil Products USA for its investment in infrastructure that will enhance the economic vitality and flexibility of the refinery. However, the City of Martinez would like to see 2 issues/concerns addressed in the Environmental Impact Report:

1) With more crude coming to the Shell Martinez Refinery by ship, we are concerned about the impact of increased marine activity and/or the increase in the size of marine vessels on the rate of sedimentation in the Martinez Marina. The City recommends that the EIR include an analysis of the impact this increase in marine activity will have on sedimentation in our marina. Dredging costs have increased significantly since our marina was constructed. An increase in the rate and/or amount of sedimentation in the marina will have a serious impact on the economic viability of the marina. The City of Martinez and our marina partner, Martinez Marina LP, are getting ready to completely renovate the marina and repair/expand the breakwater to reduce the current sedimentation situation. It is essential that the City understand this impact in light of the major investment that is planned for our marina and the importance of our waterfront to the community.

2) With the increase in the number of tanks, the City would also like to know if they will be visible from Interstate 680, Pacheco Blvd or other prominent locations in Martinez. If they will be visible, please include some photo simulations and/or options for screening in the EIR.

Thank you for the opportunity to provide input on the information to be provided and addressed in the EIR for this project. If you have any questions, please contact me at (925) 372-3514.

Sincerely,

Karen L. Majors
Assistant City Manager
Community and Economic Development

APPROVED AS RECOMMENDED BY STAFF (TM)

8. CLEARWIRE (Applicant) – CROWN CASTLE (Owner), County File #LP09-2082: The applicant requests approval of a land use permit to co-locate three (3) panel antennas and six (6) microwave dishes on an existing 160-foot guyed telecommunications tower. The applicant also proposes to locate one (1) equipment cabinet to serve the antennas and dishes on the ground below the guyed telecommunications tower. The existing guyed telecommunications tower is the northernmost of three (3) telecommunications facilities located on the 134-acre subject parcel. The project area is located several hundred yards up a dirt road, beyond the end of Cliff Castle Court, directly east of the Alameda and Contra Costa County boundary in the San Ramon area. (GP: AL) (A-4) (CT: 3451.98) (Parcel #211-230-015). FA

DEVELOPMENT PLAN: PUBLIC HEARING

APPROVED WITH MODIFICATIONS TO COA #6, 7 & 8 (TM)

9. CASEY BOWDEN & EMILY SU (Owner & Applicants), County File #DP09-3011: A request for approval of a Kensington Design Review development plan for a 1,056 square-foot, two-story addition to a single family residence which includes two bedrooms, two bathrooms and an attached second story deck. The subject site is located at 16 Highland Boulevard in the Kensington area. (R-6, TOV, K) (GP: SH) (CT: 3920.00) (Parcel # 572-026-003). FA

APPROVED WITH MODIFICATION TO COA #4 (TM)

10. SAYRE LAFLIN (Applicant) – YAKESUN WING (Owner), County File #DP09-3025: A request for approval of a Kensington Design Review development plan for a 643 square-foot, single-story addition to a single family residence which includes a family room, office and bathroom. The subject site is located at 276 Purdue Avenue in the Kensington area. (R-6, TOV, K) (GP: SH) (CT: 3920.00) (Parcel # 572-203-003). FA

3:30

NONE

11. PUBLIC COMMENTS:

SCOPING SESSION: PUBLIC HEARING

NO ONE PRESENT TO COMMENT (AMB)

12. SHELL OIL PRODUCTS (Applicant & Owner), County File #LP10-2006: This is a Scoping Session to accept public comments in determining the scope and content of the environmental concerns related to the proposed Shell Martinez Refinery Crude Tank Replacement Project ("the Project"). The Project would increase oil storage capacity and maintain production levels as crude oil delivered by vessel replaces pipeline San Joaquin Valley crude oil as a feedstock. The Project includes the replacement of two existing crude oil storage tanks and the existing crude oil mix tank with three new larger crude oil storage tanks, and construction of a new crude oil mix tank. The Project would also include refurbishment of an existing storage tank to allow it to be returned to crude oil service. The Project would result in an increase of storage capacity at the facility by approximately 700 thousand barrels (MBbl). The Project would not increase the crude oil throughput of the Shell Martinez Refinery or result in an increase in the production of existing products or by-products. No physical modifications will be made to the Refinery process equipment.

The Refinery is bounded by Pacheco Boulevard to the north and interstate 680 to the north, except for portions of the Refinery that border the Carquinez Strait north of Marina Vista. Approximately 20 percent of the Refinery is located within the corporate limits of the City of Martinez and the remainder within the unincorporated Contra Costa County. (H-I) (CT 3200.01) (Parcel #378-072-016). TM

LAND USE PERMIT: RESCHEDULED PUBLIC HEARING

APPROVED AS RECOMMENDED BY STAFF (AMB)

13. CHRISTYNA KOZEL (Applicant) – MICHAEL & CHRISTYNA KOZEL (Owners), County File #LP09-2067: The applicant is requesting approval of a land use permit for a home occupation to allow the administrative portion of a fashion accessory business. The subject property is located at 256 Columbia Avenue in the Kensington area. (R-6 TOV -K) (GP: SH) (CT: 3920.0) (Parcel #570-142-001) (Rescheduled from 1/25/10). SG

APPEAL: NOTIFICATION OF FINE: PUBLIC HEARING

ZONING ADMINISTRATOR WILL PROVIDE DECISION IN WRITING (TM)

14. DANIEL MAJHOR (Owner), County File #RF08-0909: This is a hearing on the appeal of the property owner of a decision of the Director of Conservation and Development to impose an administrative penalty fine for continued violation of the zoning code at the property identified as 7031 Piper Road in the Bethel Island area. (A-2/F-H) (GP: SL) (Parcel # 029-072-021). RLH

"Bhagavan Krishnaswamy"
<bkrishnaswamy@baaqmd.gov>

03/11/2010 02:03 PM

To <TMore@cd.cccounty.us>,
<Telma.Moreira@dcd.cccounty.us>
cc "Juan Ortellado" <jortellado@baaqmd.gov>
bcc

Subject BAAQMD comments relating to NOP for an EIR for Shell's CTRP (County File: #LP10-2006)

Hi Telma,
This is a follow-up to our conversation this afternoon and a message I left on your voice mail a few minutes back. The attached document contains my comments (non-GHG related) on the NOP.
<<Shell - CTRP - CEQA (NOP comments).doc>>
Please call me if you have any questions regarding the above document.
Thank You

K. R. Bhagavan
Air Quality Engineer, Engineering Division
Bay Area Air Quality Management District
939 Ellis Street
San Francisco, CA 94109
Phone: 415.749.4637
Fax: 415.749.5030
E-Mail: bkrishnaswamy@baaqmd.gov

Shell - CTRP - CEQA (NOP comments).doc

NOP for an EIR for Shell's CTRP (County File: #LP10-2006)

Project Emissions

It appears that the main sources of air emissions from Shell Martinez Refinery's (Shell) proposed Crude Tank Replacement Project (CTRP) stem from the following:
(a) Transport & combustion related emissions from vessels delivering crude oil to Shell.
(b) Emissions (fugitive/offgases) resulting from the transfer of crude oil from the vessels to storage tanks located within Shell via the four marine loading berths (BAAQMD source #'s S-2001 through S-2004).
(c) Working and Breathing loss emissions from the new crude oil storage tanks located within Shell.
For the purposes of this discussion emissions from (a) and (b) will collectively be referred to as wharf emissions, unless stated otherwise.

Request/Question 1: Assuming the CTRP only affects inbound crude oil receipts, for each of the past 3 years, what quantity (bbl/day & bbl/yr) of the total crude delivered to the Shell Martinez Refinery (Shell) is received via pipeline and and what quantity is received via ship vessels? Do all shipments received via pipeline exclusively consist of San Joaquin Valley (SJV) crude? If shipments of SJV crude via pipeline were to cease in the near future, would Shell continue to receive any crude oil via pipeline?

Request/Question 2: Are all shipments of crude oil received via vessels exclusively from ships? Are barges capable of delivering crude oil, assuming they call at the terminal? Is there a difference in the types of ships that call at Shell's terminal? If so, what is the difference? Likewise, is there a difference in the types of barges calling at the terminal? If so, what is the difference? On an average, how much of crude oil is delivered by each type of ship/barge (in bbl/delivery) and what are the maximum capacities of each?

Current District Emission Cap

In the District operating permit issued to Shell, emissions from all sources that were not part of Shell's Clean Fuels Project are capped (~limited) by permit condition 7618 (the REFEMs emissions cap). Though not explicitly listed in the above permit condition, emissions from the wharf operations are included as part of the facility baseline profile (in lbs/day). The District issued permit condition 7618 under Application 26786 to serve as a summary of the refinery's emissions at the time Application 26786 was reviewed. In other words, the cap was established to document the existing emissions and explicitly limit the emissions at that juncture to establish whether future projects would constitute a modification of the existing operation. Shell did not provide/surrender any emissions offsets to the District under Application 26786. To establish which sources under the REFEMs cap are being modified under the proposed project, transport emissions from ships, tugs, barges, etc. accounted for under Application 26786 must be documented.

Request/Question 3: Do the emission calculations that are part of the CTRP take into account transport emissions from ships when operating within the BAAQMD's jurisdiction, or within California Coastal Waters adjacent to the BAAQMD? Specifically, do the emission calculations account for the total (round-trip) number of nautical miles that each of the vessels (ships, barges, tugs, etc) travels from their point of entry (into the SF Bay from the Golden Gate Bridge onward) to their destination (Shell terminal). Because barges and

tugboats emit as much/more than ships, their transport emissions must not be ignored even if they do not travel as far as ships.

Request/Question 4: The District requests a separate listing of emissions from wharf and shipping operations under the REFEMs cap for each of the past 3 years. Tables VII and VIII in the above permit condition contain explicit emission factors (e/f's) for estimating emissions associated with the wharf operations and shipping emissions (associated with combustion of various types of fuels in the ships engine). This analysis should include documentation of the material throughput at the wharf and a summary of how many and what types of vessels were received at the terminal. The review should also include analysis of transport emissions (which is discussed in the next item) and the percentage of the total emissions cap under permit condition 7618 that consists of the wharf and ship emissions.

Downstream Impacts

Per information included in Tables 3-3 and 3-4 of the Land Use Permit Application submitted by ERM (Shell's consultant), the average inbound crude volume received by the terminal between 2007 through 2009 was 10,581 MBbl/yr and 34 vessels called at the terminal on an average i.e. 311 MBbl/vessel. Table 3-4 states that the average number of vessels calling at the terminal is expected to increase by 256% (from 34 to 87). As it currently exists, Shell's Title V permit limits the quantity of crude throughput at its crude unit (BAAQMD source # S-1420) to 178,800 BPD.

Request/Question 5:

Assuming all crude received by Shell (as proposed) is via vessels and is first stored in the new tanks that are part of the CTRP and is later processed at S-1420, would the average increase in estimated crude receipts (from 10,581 MBbl/yr to 27,057 Mbl/yr) at the wharf imply S-1420 and/or any of the processing/tankage units downstream would be debottlenecked to accommodate the proposed increase? Stated differently, is the CTRP application a part of/prelude to a larger project that would warrant future CEQA analysis and/or for which an air permit application will soon be submitted to the BAAQMD?

Request/Question 6:

The District requests an evaluation of the emission increases from sources (mostly grandfathered) operating under the REFEMs emissions cap that will be impacted by the CTRP and an analysis of whether the subject sources would be modified as a result of the proposed project. If the supporting calculations that are part of the analysis conclude that there is a net increase in emissions, the subject sources would lose their grandfathered status and would be removed from the REFEMs emissions cap i.e. the REFEMs emissions bubble would shrink for a given pollutant(s). This would be necessary because Shell did not offset any of the emissions summarized under the REFEMs emissions cap. The net effect of the above, could potentially limit Shell's ability to manage sources not impacted by the CTRP but which the REFEMs emissions cap governs, and also require Shell to provide offsets for all emission increases associated with the CTRP.

Toxic Air Contaminant Emissions/Health Risk Analysis

The BAAQMD's New Source Review of Toxic Air Contaminants (Regulation 2, Rule 5) was originally adopted in June 2005 and was recently amended & adopted in January 2010. Prior to Reg. 2-5 (1987 onwards), projects involving a source or group of sources emitting Toxic

Air Contaminants (TACs) were evaluated per the BAAQMD's Policy & Procedures for Toxics. In light of the above, it is highly unlikely that Application 26786 would have gone through a detailed Toxics review. As a result, it is equally unlikely a formal Health Risk Screening Analysis (HRSA) was ever performed under the above application. However, there is a possibility that the four marine loading berths S-2001 through S-2004 (not including the vessel emissions) would have been evaluated under the State's Toxics Hot Spots Program in the 1990's.

Request/Question 7:

In light of the above, rather than assume that the operations at the terminal (which are mostly grandfathered) have acceptable health risks, the District recommends that any air toxics modeling performed with regards to the CTRP be documented for this project, that the TAC emissions from the wharf and ship operations be supplied for each of the past 3 years, and that modeling of the TAC emission impacts from the proposed project changes be performed. For guidance on health risk analyses, please contact Mr. Scott Lutz – Manager of the District's Toxics Evaluation Section at (415) 749-4676.

Appendix B

Shell Final Crude Slate Supplement

ESA

Prepared for:
Shell Oil Products US

Shell Crude Tank Replacement Project
Detailed Project Description
Crude Oil Slate Supplement

Martinez Refinery
Martinez, California

October 2010

www.erm.com

Delivering sustainable solutions in a more competitive world.

Shell Oil Products US

Shell Crude Tank Replacement Project
Detailed Project Description
Crude Oil Slate Supplement

Martinez Refinery
Martinez, California

October 2010

Project No. 0102977

Environmental Resources Management
1277 Treat Boulevard
Suite 500
Walnut Creek, CA 94597
T: (925) 946-0455
F: (925) 946-9968

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LIST OF ACRONYMS AND ABBREVIATIONS

API	American Petroleum Institute
CDU	Crude distillation unit
CEC	California Energy Commission
coker	coker processing unit
CTRP	Crude Tank Replacement Project
DoE	Department of Energy
EIA	Energy Information Administration
EPA	Environmental Protection Agency
import	crude oil delivered to the Refinery by vessel
LPG	liquefied petroleum gas
LCFS	low carbon fuel standard
MB	thousand barrels
MBD	thousand barrels per day
NPDES	National Pollutant Discharge Elimination System
NPRA	National Petrochemical and Refiners Association
OSD	Canadian Oil Sands
ppb	parts per billion
ppm	parts per million
PADD5	West Coast Petroleum Administration for Defense Districts
Refinery	Shell Martinez Refinery
Shell	Shell Oil Products US
SJV	San Joaquin Valley
SO_2	sulfur dioxide
US	United States
WSPA	Western States Petroleum Association

1.0 DOCUMENT OVERVIEW

The Shell Oil Products US (Shell) Martinez Refinery (Refinery) currently processes crude oil received by pipeline and by marine shipments. Since the Refinery's inception, the majority of the crude oil refined at the Refinery has been domestic crude oil originating from the San Joaquin Valley (SJV) and arriving at the Refinery by pipeline. The supply of SJV crude oil is declining. The Refinery must gradually begin receiving more marine shipments of crude oil in order to replace declining SJV receipts and maintain normal operating levels to continue to produce transportation fuels for California market. The purpose of the Crude Tank Replacement Project (CTRP) is to increase the Refinery's capability to receive marine shipments of crude oil.

This document supplements the Detailed Project Description previously submitted for the CTRP. The information provided in this supplement is intended to satisfy recent information requests by Contra Costa County. This document provides information on the following:

- The continued decline of SJV crude oil and the effect of this decline on Shell's current crude oil slate;
- A description of the following crude oil characteristics: American Petroleum Institute (API) gravity, sulfur content, and metals;
- A description of the Refinery and the design characteristics for processing heavy crude oil at the facility;
- The API gravity and sulfur content of crude oil historically and currently processed at the Refinery; and
- The Design Feedstock Criteria that remains unchanged even though the sources of crude oil received by the Refinery will change as a result of the CTRP.

2.0 CRUDE OIL SUPPLY

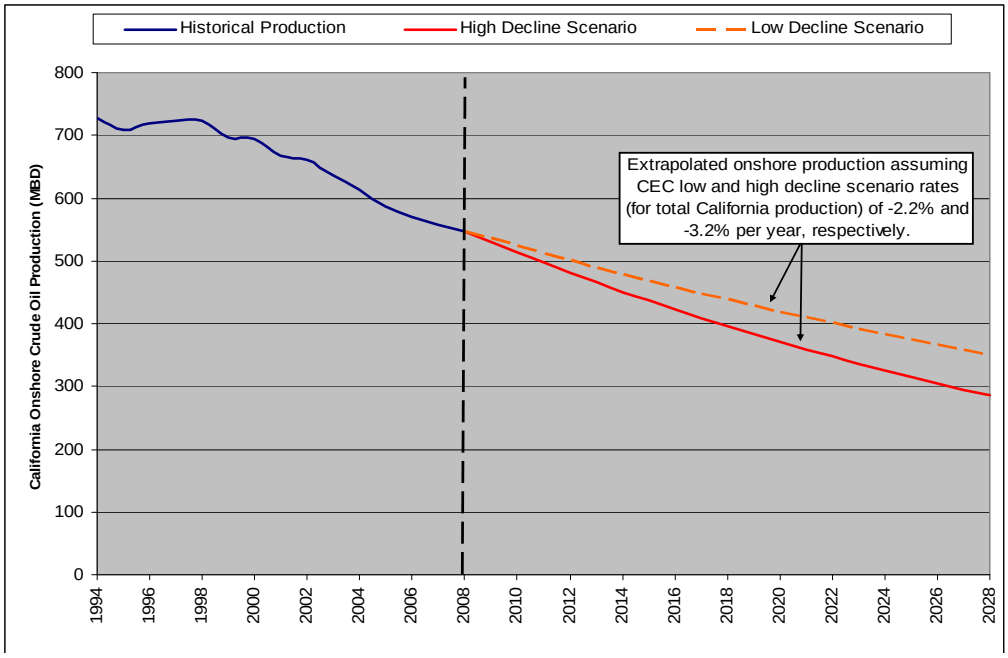
California crude oil has been in steady decline since the early 1990s. As shown in Figure 2-1, California crude oil production has declined at an average annual rate of 2.0 percent for the overall period of 1994-2008 and more steeply at 3.0 percent for the 2003-2008 period. Figure 2-1 also displays calculated future daily production rates of onshore California crude oils using California Energy Commission (CEC) estimations through 2028 under both low- and high-decline scenarios (-2.2 and -3.2 percent per year, respectively).

Because of this decline in California crude oil production, West Coast refineries are increasing the amount of crude oil received via marine shipments to supplement the loss in California crude oil supply. As shown in Figure 2-2, this trend has been ongoing and the amount of marine shipments of foreign crude oil to West Coast refineries continues to increase.

Similar to other West Coast refineries, the percentage of crude oil received at the Martinez Refinery via marine shipment compared to pipeline has increased in recent years and is projected to continue to increase. Figure 2-3 shows the relative amount of

marine shipments of crude oil compared to pipeline shipments over the last decade at the Refinery. Between 2005 and 2009, the Refinery received between 14% and 24% annually by marine shipment. Marine shipments accounted for less than 5 percent of crude oil receipts earlier in the decade.

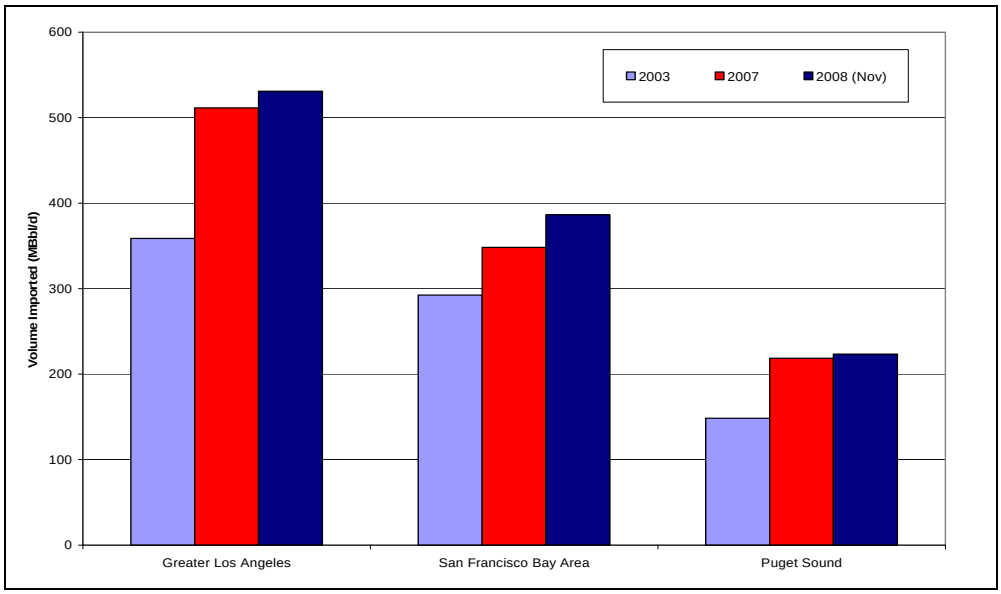
Figure 2-1 Trend of California Crude Oil Production



Note:

1. MBD = thousand barrels per day
2. Source of 1994-2008 California onshore crude oil production rates: California Department of Conservation, Division of Oil, Gas, and Geothermal Resources, 2008.
3. Source of 2008-2028 extrapolated production rates: CEC, 2009.

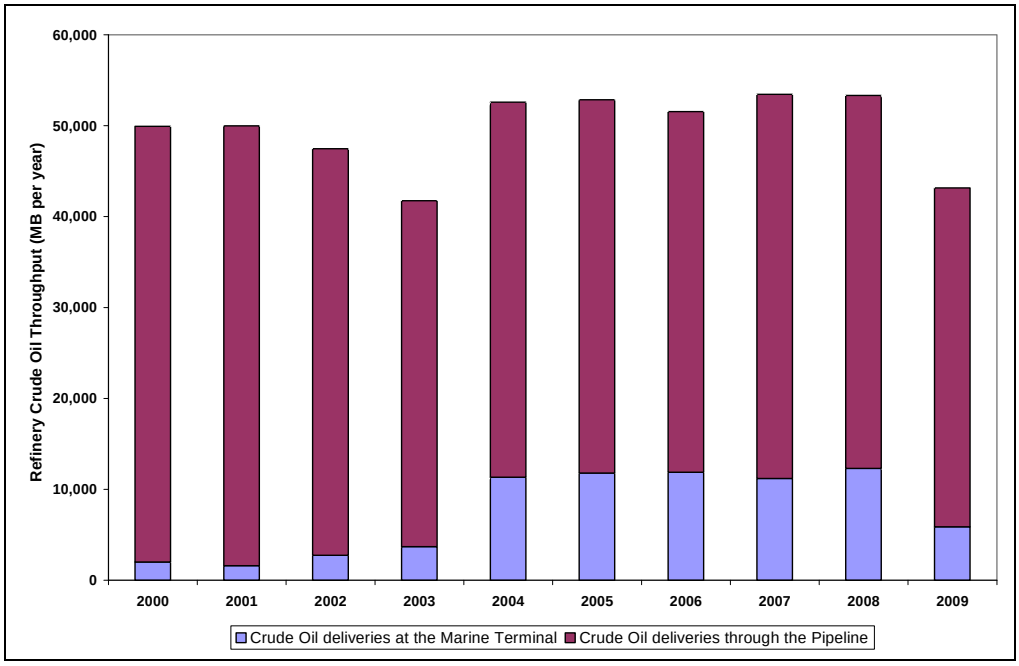
Figure 2-2 Marine Deliveries of Foreign Crude Oil to West Coast Refineries



Note:

1. Source: Western States Petroleum Association (WSPA), 2009a.

Figure 2-3 Crude Oil Deliveries to the Shell Martinez Refinery



Notes:

1. MB = thousand barrels
2. Source: Shell Martinez Refinery

3.0 CRUDE OIL CHARACTERISTICS

This section provides a brief overview of crude oil characteristics and properties such as hydrocarbon content, density, and sulfur content. It also describes the inherent design of the Refinery to process heavy crude oil. A discussion on metals is provided in Section 3.5.

Crude oil is a mixture of hydrocarbons that can be separated into classes of hydrocarbons based on their boiling points. The first step in the refining process is distillation. The distillation step involves heating the crude oil and then separating the hydrocarbons based on boiling points into the following basic components known as the distillation yield:

1. Light ends (also known as volatiles);
2. Naphtha;
3. Distillates;
4. Gas oils; and
5. Pitch (also known as Residuum).

Generally, lighter hydrocarbons are smaller molecules with low boiling points and heavier hydrocarbons are larger molecules with higher boiling points. After the initial separation by distillation, these components are sent to downstream refinery process units in order to ultimately produce finished products that meet required product specifications. Light ends are processed into liquefied petroleum gas (LPG) fuels and gasoline components and are also used within the refinery as fuel gas. Naphtha and distillate-range hydrocarbons are already in the appropriate size range for gasoline, jet fuel, and diesel. Gas oil and pitch hydrocarbons require additional process units such as the Catalytic Cracking and Coking units to break the larger hydrocarbon molecules into smaller molecules.

There are many types of crude oils in the world and there are numerous measurements used to characterize these crude oils. These include density, sulfur content, metals, and other constituents. Density (API gravity) and sulfur content are the most common crude oil qualities referenced by the refining industry.

3.1 API Gravity

The density of crude oils is a numerical measurement referred to as API gravity. The density of crude oil and API gravity are inversely related. Hence, heavier, denser crude oils have lower API gravities and lighter, less dense crude oils have higher API gravities. Crude oil can be classified by API gravity as follows (CEC 2006):

- **Heavy Crude Oil:** Crude oils with API gravity of 18 degrees or less are characterized as heavy. The oil is viscous and resistant to flow, and tends to have a lower proportion of volatile components and a higher proportion of pitch. Approximately half of the California crude oils have an average API gravity of 18 degrees or less.
- **Intermediate (or Medium) Crude Oil:** Crude oils with an API gravity greater than 18 and less than 36 degrees are referred to as intermediate. Approximately half of California crude oil has an average API gravity between 18 and 36 degrees.
- **Light Crude Oil:** Crude oils with an API gravity of 36 degrees or greater. Light crude oil produces a higher percentage of lighter products. There is no appreciable volume of California crude oils in the light crude oil API gravity range.

These precise API breakpoint values are not applied universally; other petroleum industry sources use varying breakpoints for heavy and light crude oils.

Heavy crude oils with low API gravities have higher percentages of heavier components such as gas oils and pitch. Lighter crude oils with higher API gravities have higher percentages of lighter components such as light ends and naphtha.

The crude oils originating from the SJV fields processed at the Refinery have API gravities ranging from 12 to 30 and thus are characterized as heavy to intermediate crude oils. These fields have been producing crude oil with consistent API gravity for the past 3 years and up to the past 10 years, and are not expected to change in the future.

3.1.1 Design of Refineries for Heavy and Light Crude Oils

Just as there are many types of crude oils with different physical characteristics such as API gravity, there are many types of crude oil refineries. Each refinery is designed to process a certain range of density, or API gravity, of crude oil.

Refinery equipment includes process units, furnaces, hydrogen plants, and sulfur plants. Based on the capacity and types of this equipment at a refinery, each refinery is designed to process a general API gravity range of crude oils. Refineries cannot readily change the basic type of crude oils they process and to do so would require significant capital improvements, including the addition of new process units and other equipment. For instance, at the Crude Distillation Unit (CDU), the size of the piping and equipment of this unit is based on the expected distillation yields of the crude oil processed. Correspondingly, the relative sizing of process units downstream of the CDU is also proportional to the distillation yield or processing capacity required. Significantly changing the distillation yield (i.e. API gravity) would require major changes in the piping and equipment downstream in the downstream units.

A refinery that processes light, high API gravity density crude oil is shown in Figure 3-1 as "Refinery A." The light ends, naphtha, and distillate upgrading process units (shaded blue) are relatively larger than the gas oil and pitch process units. The larger-sized process units are required because lighter crude oils have higher relative amounts of light ends, naphtha, and distillates compared to gas oils and pitch.

In contrast and as shown in Figure 3-2 as "Refinery B," a refinery that processes heavier, denser crude oils will have relatively larger gas oil and pitch process units (shaded green) and smaller light ends, naphtha, and distillate process units. Refineries such as Refinery B designed for processing heavy crude oil cannot process comparable amounts of light crude oils based on the size of these light ends, naphtha, and distillate process units. For example, the diameter of the piping that routes naphtha is much smaller than the diameter of the piping for the same stream in Figure 3-1. The same sizing is true for each of the distillation hydrocarbon streams.

Figure 3-1 Generic Example of a Light Crude Oil Refinery – "Refinery A"

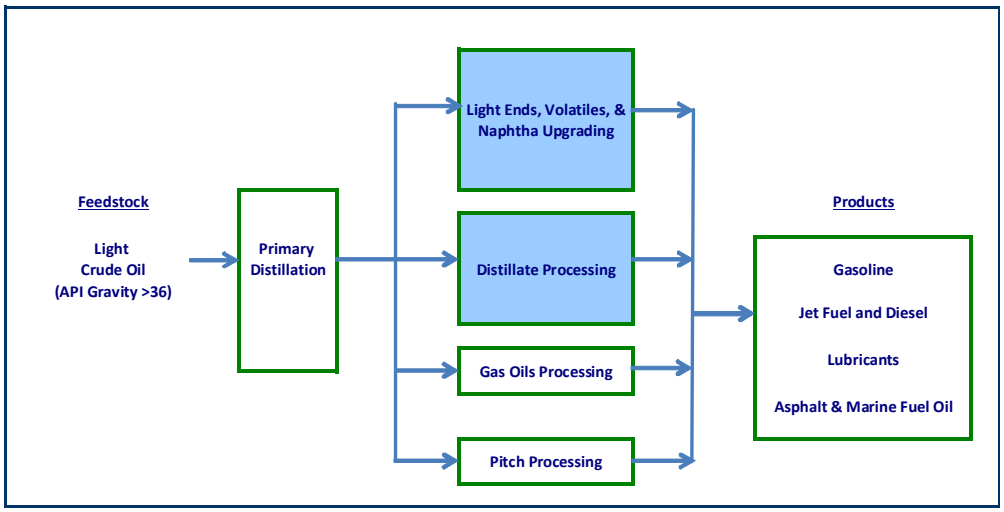
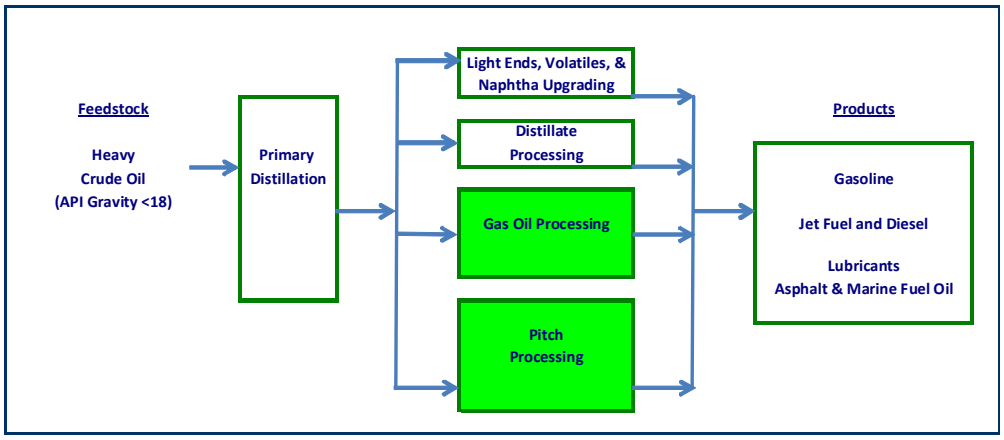


Figure 3-2 Generic Example of a Heavy Crude Oil Refinery – "Refinery B"



Although refineries can process a range of API gravity crude oils, the specific equipment and process unit sizing corresponds to an amount of processing capacity for the intermediate streams and products for which it is designed. In other words, a heavy crude oil refinery can process light crude oil, but not at the refinery's full processing capacity – only to the extent that maximizes the utilization of the light ends, naphtha, and distillates processing units, while the gas oil and pitch process units are under-utilized. This scenario is not an optimum economical situation for a refinery. Similarly, a light crude oil refinery can only process heavy crude oil to the maximum extent that the sizing of its gas oil and pitch capacity would allow, while under-utilizing the light ends, naphtha, and distillate processing units.

3.1.2 Heavy Crude Oil Processing Capacity of the Shell Martinez Refinery

The Refinery is designed to process heavy to intermediate crude oil and is characteristic of Refinery B in Figure 3-2. One of the distinguishing characteristics of a heavy crude oil refinery is the presence of a petroleum coke processing unit (coker). A coker converts the heavy fraction (pitch) of crude oil to intermediate products such as naphtha, distillates,

and gas oils as well as producing carbon (a solid byproduct). The Refinery has two cokers in operation.

Over half of California's crude oil is heavy crude oil originating from the San Joaquin valley (CEC 2006). The Refinery receives both heavy and intermediate SJV crude oil via pipeline, with the majority of the historical pipeline supply being heavy crude oil from fields that have been characterized with API gravity of 12-14 degrees. This heavy crude oil is normally mixed with lighter SJV crude oil before being distributed via pipeline to the Refinery.

Since the majority of crude oil historically purchased by Shell is at the very low (heavy) end of the API gravity range, and the supply of SJV heavy crude oil is declining (CEC 2006), it is anticipated that the future crude oil API gravity will not be lower post project than what has been refined historically. There simply are not many crude oils available for purchase with API gravity lower than the SJV heavy crude oil that the CTRP is designed to replace.

3.2 Sulfur Content

Crude oils are characterized as "sweet" or "sour" crude oils based on their sulfur content. Sweet crude oil typically has a sulfur content of 0.5 percent or less, and sour crude oil typically has a sulfur content of 2.5 percent or more. Crude oil with sulfur content that falls in between is sometimes called "intermediate sweet" or "intermediate sour." SJV crude oils processed at the Refinery have sulfur content ranging from 0.75 to 1.6 percent. The SJV fields have been producing crude oil with consistent API gravity and sulfur content, representative for the past 3 years and up to the past 10 years, and are expected to have similar characteristics in the future.

The Refinery has sufficient hydrotreating and sulfur removal capacity for the current crude oil sulfur content to meet product specifications and to comply with sulfur emissions limits. The CTRP will not change these processes.

3.3 Crude Oil Types Refined at the Shell Martinez Refinery

Shell's purchase of crude oil is driven by availability, economics, market demand, and refinery design. In general, refineries can purchase crude oil from a variety of sources including domestic sources and sources delivered to the Refinery by vessel (imports). Figures 3-3a and b show crude oil types from various sources received and refined in the western United States (US), as characterized by their API gravity and sulfur content (US Department of Energy [DoE], Energy Information Administration [EIA]).

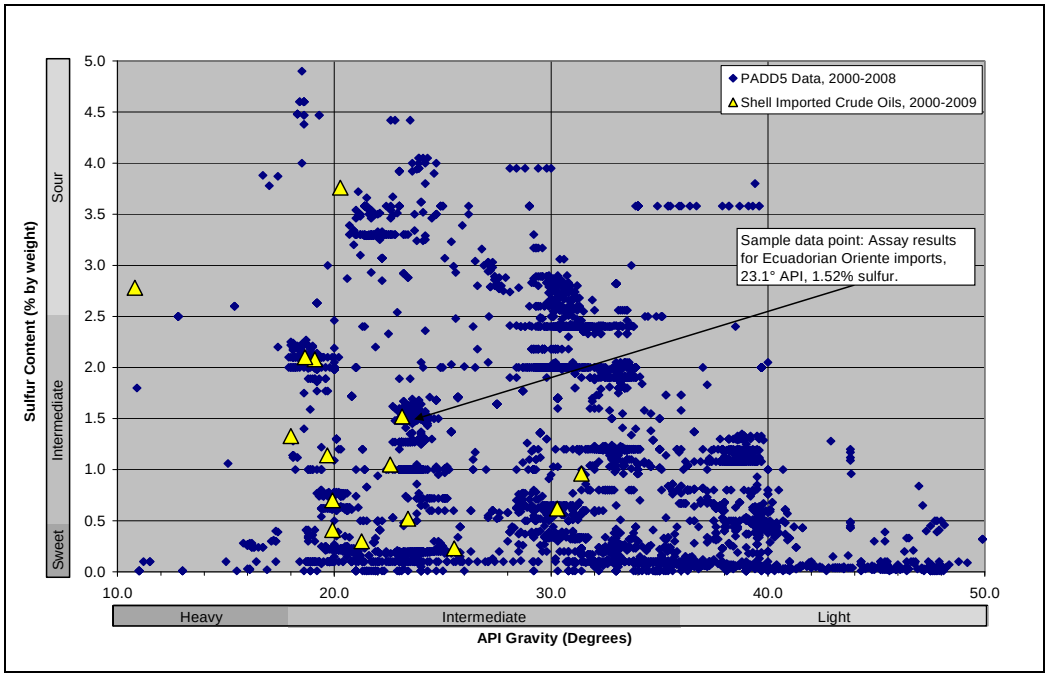
The US DoE EIA collects monthly data on crude oil imports to each of the five Petroleum Administration for Defense Districts (PADD). These data include sulfur content and API gravity. The Refinery's data are included in the PADD5 district, which includes Alaska, Arizona, California, Hawaii, Nevada, Oregon, and Washington. PADD5 sulfur content and API gravity data are compiled on a monthly basis every other year.

3.3.1 Imported Crude Oil

Figure 3-3a is a plot of the per-shipment sulfur content versus API gravity for all marine deliveries to PADD5 states for years 2000 through 2008. This plot is representative of the wide range of crude oil types available for import to the Refinery and includes Shell data for marine shipments received at the Refinery from 2000 through 2009. As an example,

the plot highlights the point included for the average measured composition of the Ecuadorian *Oriente* stream, 1.52 percent sulfur by weight, 23.1 degrees API gravity. Over the past 10 years (and also within the past 3 years), the majority (66 percent) of imported crude oil refined at the Refinery has originated from Ecuador.

Figure 3-3a Sulfur Content and API Gravity for PADD5 Imports and Shell Marine Terminal Imports



Crude oil derived from Canadian oil sands (OSD) has been the subject of considerable public and regulatory attention. The CTRP involves replacing domestic crude oil with imported crude oil, and OSD is one of the many imported crude oil types available on the market. The Refinery has limited capability to process OSD crude oils and these limitations are not changed by the CTRP. Because of these limitations, availability, and economics, the Refinery has only received five OSD marine shipments in the last 7 years.

In addition, the California Air Resources Board (CARB) has implemented a Low Carbon Fuel Standard (LCFS) that will require transportation fuel providers in California to reduce the carbon intensity (C.I.) of transportation fuels provided starting in 2011 compared to the 2006 baseline year. The C.I. is a measure of all of the carbon emitted in the production, refining, transportation, and use of the fuel. The C.I. is expressed as the amount of greenhouse gases emitted per amount of energy provided by the fuel in units of grams carbon dioxide equivalents (CO2e) per mega joule (MJ) of energy (gCO2e/MJ). One of the variables that affect the C.I. is the methodology used to produce the crude oil from a well. In general, the more difficult the oil is to extract, the more energy is required and hence a higher C.I. results. As summarized below in Table 3-1, the CARB Staff Report: "Initial Statement of Reasons (ISOR), dated March 5, 2009 (CARB, 2009) reports CARB's calculated C.I. values for California and foreign/import crude oils. The C.I. value for the imported crude oils is the volume-weighted average of the crude oils imported to California during the 2006 baseline year.

Table 3-1 Carbon Intensity Values for California and Foreign/Import Crude Oils

Source	Grade	Recovery Methodology	Carbon Intensity (gCO_2e/MJ)
California	Heavy	Thermal Enhanced Oil Recovery	18.89
	Medium	Gas Injection	12.86
	Light to Medium	Water Flood	5.68
	Light	Primary	4.31
Imported	Light	Primary	4.65

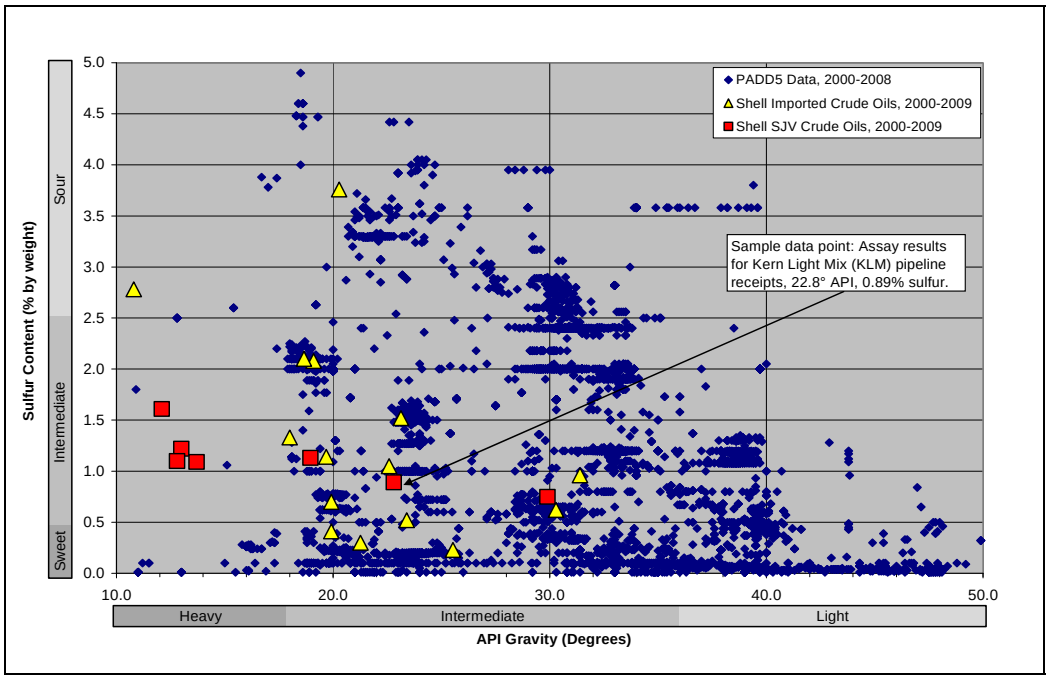
Source: CARB, 2009, Appendix C, Tables C12-1 and C12-6

The purpose of the CTRP is to allow Shell to continue to supply local markets with gasoline, diesel and jet fuel, and other products by greater receipt of imported crude oil by vessel to offset the continuing decline of SJV crude oils. The SJV heavy crude oil that the Refinery currently processes has a higher C.I. than the average C.I. of crude oils imported into California. Accordingly, the imported crude oil that will be processed following the CTRP will most likely have a lower C.I. than the crude oil that it is replacing. This trend is demonstrated by a continued decline in C.I. in average crude oil processed in California from 1982 to 2008. The CARB ISOR attributes this decline in C.I. to the increase in imports of lighter crude oils from overseas into California and the corresponding decrease in the production of heavier crude oils in California (CARB, 2009). While the standard and screening methodologies for the CARB LCFS are still under development, it is possible if not likely that OSD will be deemed to have high C.I. that will make OSD processing much less attractive and will deter the import of appreciable volumes of OSD crude oils.

3.3.2 Domestic Crude Oil

Figure 3-3b overlays onto Figure 3-3a points representing the API gravities and sulfur levels of SJV crude oils received by pipeline at the Refinery, based on Shell data. As an example, the plot highlights one crude oil included in the average measured composition of the California crude oil, Kern Light Mix, 0.89 percent sulfur by weight, 22.8 degrees API gravity.

Figure 3-3b Sulfur Content and API Gravity for PADD5 Imports and Shell Marine Terminal Imports, plus SJV Pipeline Deliveries to Shell



3.4 Annual Average Design Feedstock Criteria/Baseline

The various domestic and imported crude oils that are purchased are blended in a mix tank to meet a "design feedstock criteria" (including API gravity and sulfur content) prior to being supplied to the CDU for distillation and refining. Individual crude oil types purchased by the Refinery are often outside of the range of design feedstock criteria, but must be blended with other crude oils to meet those criteria prior to processing in the Refinery. This design feedstock criteria represents the crude oil baseline for the CTRP.

The annual average design feedstock criteria for the Refinery for the last ten years between 2000-2009 as well as for the last three-years are shown in Figure 3-4 as an overlay to Figures 3-3a and 3-3b and range up to 1.7 percent sulfur and API gravity of between 13 and 26 degrees. Factors that contribute to this design feedstock criteria that require the Refinery to operate within its ranges include sulfur processing capacity, limits on sulfur dioxide (SO_2) emissions in air quality permits, metallurgical constraints and, as discussed in Section 3.1, the Refinery's process unit sizing and configuration for the API gravity of the crude oil it is designed to process.

As previously illustrated in Figure 2-3, over the past 5 years, Shell has imported 20 percent of its crude oil via marine vessels, with the remainder being SJV crude oil received by pipeline. Within the past 3 years, the imported crude oil has come from 7 different countries and, over the past 10 years, from 11 different countries. All of the imported and domestic crude oils received at the Refinery have met or have been blended to meet the design feedstock criteria.

The Refinery monitors SO_2 emissions on a daily basis to ensure compliance with its Bay Area Air Quality Management District Title V air permit emissions limits. The two primary SO_2 facility emissions limits included in the Title V permit are a result of the Martinez Manufacturing Complex Modernization Project and the Clean Fuels Project.

Each of these projects was the subject of separate Environmental Impact Reports. As demonstrated in Figure 3-5, based on monthly values for the ten-year period from 2000 through 2009, changes of sulfur content in crude oil between approximately 0.7 up to 1.5% have shown no correlation to facility SO_2 emissions.

Figure 3-4 Shell Martinez Refinery Crude Oil API Gravity and Sulfur Blended Design Feedstock Criteria

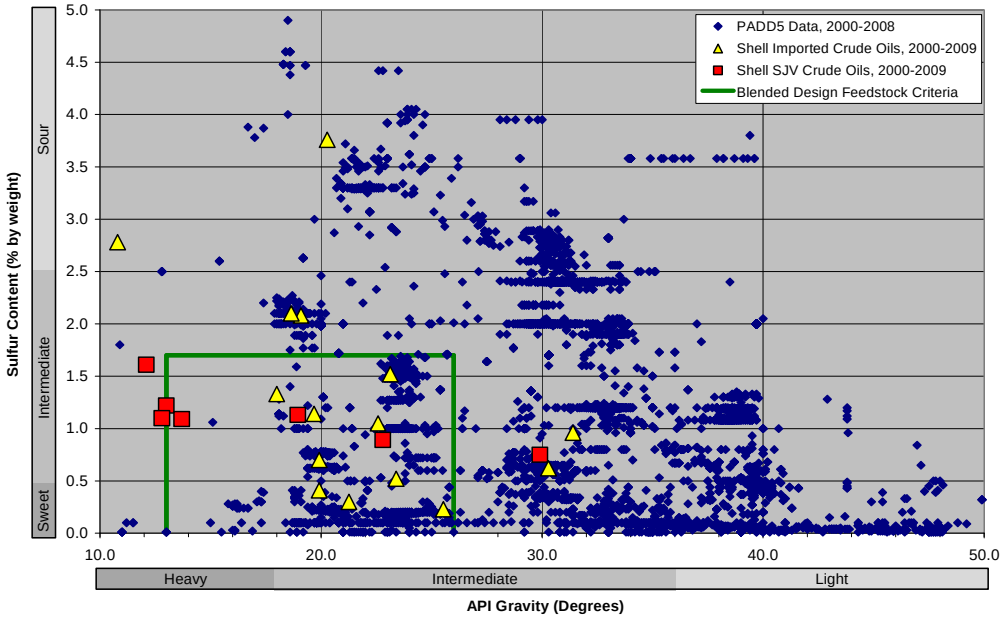
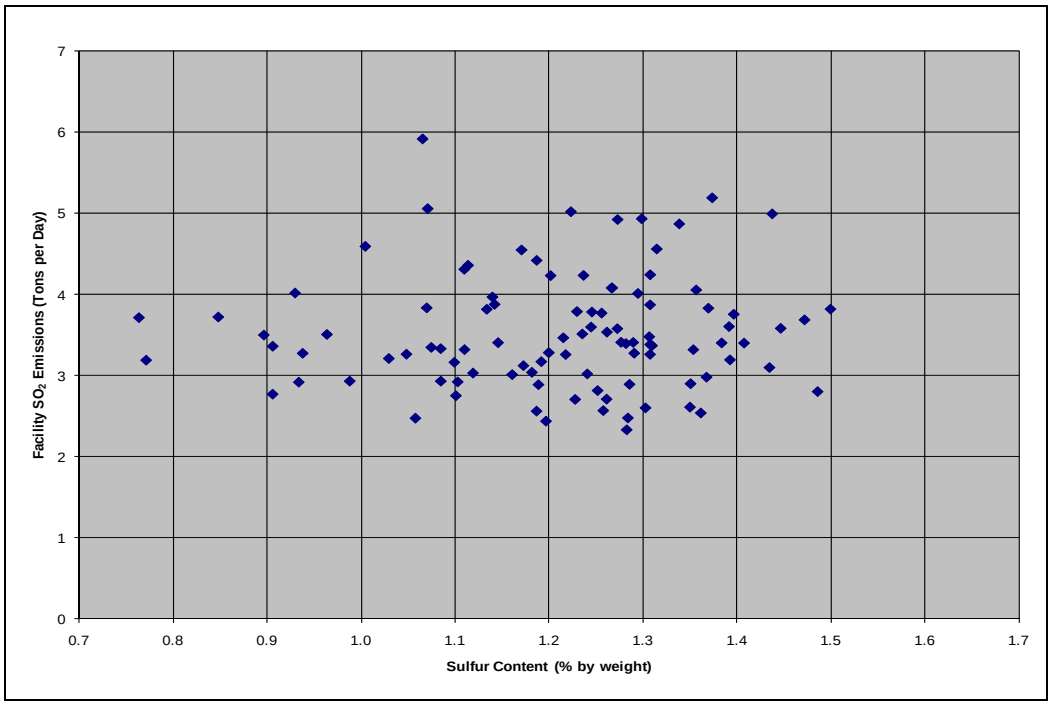


Figure 3-5 Comparison of Facility SO_2 Emissions and Crude Oil Sulfur Content (%)



3.5 Metals and Other Constituents

In addition to sulfur and density, crude oil is a mixture of many constituents that can vary greatly depending upon the crude oil's source and method by which the crude oil was extracted and produced. The chemical composition of a single type of crude oil from a given production field can vary by location in the field and even vary over time. Therefore, it is difficult to correlate the presence and concentration of metals in any single crude oil delivery with the other typically measured characteristics such as API gravity or sulfur content. The presence of metals is, in most cases, independent of these crude oil characteristics.

Refineries conduct routine testing on crude oils to evaluate the properties and constituents to ensure that the crude oil is suitable to be refined by the facility. A listing of properties known as a crude oil assay is developed based on analytical measurement of crude oil composition for certain components, including sulfur, API gravity, viscosity, vapor pressure, pour point, boiling point range, and some trace metals. Trace metals such as nickel and vanadium occur naturally in the organic matter that generates crude oils, and are often measured as part of crude oil assays because high levels can deactivate catalysts. Other metals, such as mercury and selenium have been subject to environmental concern, but are not generally analyzed as part of regular crude oil assays. However, some recent quantification of these trace metals in crude oils is available and can provide some indication of the range of amounts of these metals that might be present in the crude oils refined at the Refinery.

The Refinery will continue to review crude oil assay measurements to ensure that the properties and characteristics of the crude oil received and processed at the Refinery will adhere to design feedstock criteria and any applicable regulatory requirements.

3.5.1 Mercury

Mercury is a trace component present in all types of fossil fuels, including natural gas, gas condensates, crude oil, coal, and asphalt. Crude oil contains both dissolved and suspended mercury compounds. Samples must be carefully handled and prepared in order to obtain representative measurement of mercury levels of both the dissolved and suspended fractions. Mercury concentration levels in crude oil are very low, and are frequently below current analytical method detection levels. Therefore special sampling, handling, and analytical procedures are necessary to measure mercury levels, making it a non-routine determination that is not part of regular refinery crude oil assays.

Historical data on mercury levels in crude oil are not well documented and contain uncertainties in analytical and sampling methods. However, because of improvements in mercury sampling and analytical methods and research, some recent information on mercury levels in crude oil is available (Mark S. Wilhelm et al. 2007).

The US Environmental Protection Agency (EPA), in cooperation with the API and the National Petrochemical and Refiners Association (NPRA), initiated a project in 2003 to determine the mercury content of crude oil processed in the US. The focus of the project was to determine the mean concentration and the range of concentrations of mercury (total) in US-processed crude oil in a statistical fashion. The EPA/API/NPRA project has played a key role in the development of sampling and analysis methods for determination of mercury concentrations in crude oil.

During the course of the study, 170 separate crude oil streams were sampled repetitively to obtain 328 individual samples. Samples were retrieved immediately upstream of refinery tank farms. The arithmetic mean and median of 170 oil streams were 7.3 and 1.3 parts per billion (ppb) in total mercury, respectively. The total mercury concentration of oil processed in the US in 2004, expressed as a volume weighted mean, was calculated to be 3.5 ±0.6 ppb. The range of measured concentrations extended from below the analytical detection limit (0.5 ppb) to approximately 600 ppb. Published results from this study effort list the average mercury concentration of crude oil produced in California (sampled as part of this study primarily in 2004) as 11.3 ppb (Mark S. Wilhelm et al. 2007).

In addition, Shell participated in a study undertaken by WSPA to quantify the amount of mercury in crude oils processed in the San Francisco Bay Area (WSPA 2009b). The 9-month sampling period was from October 2007 through June 2008. Representative samples were obtained at the inlet to each crude unit at each refinery and represented the mix of crude oils being processed at that time. This study reported the average mercury concentrations found in the crude oil processed at the five Bay Area refineries ranged from 1.5 to 14.7 ppb. Good agreement was found with other recent and independent studies of mercury concentrations in the crude oil refined in North America (Mark S. Wilhelm et al. 2007).

The WSPA study concluded that most of the mercury entering the refineries in crude oil (which was determined to be 224 kilograms per year for all five sites combined) exits as waste material that is removed offsite, not released to the environment. The study also concludes that refineries contribute minimal mercury to the Bay, either by direct discharge or by aerial deposition to the Bay or the San Francisco Bay Area watershed.

The Refinery must meet its mercury effluent discharge limits per its National Pollutant Discharge Elimination System (NPDES) permit.

3.5.2 Selenium

Crude oils display a wide variety of selenium composition, depending on the source of the crude oil. In general, selenium content correlates to the sulfur content of crude oil, with higher sulfur and selenium occurring together. California SJV crude oil, however, is significantly higher in selenium than most other crude oil with comparable sulfur content. The California SJV crude oil delivered to the Refinery via pipeline has selenium content that ranges from 0.45 to 0.74 parts per million (ppm). By comparison, data available to Shell shows that crude oil imported to the Refinery ranges from less than 0.03 to 0.26 ppm.

Selenium enters the Refinery in crude oil and predominantly partitions to the effluent streams during the refining process. This effluent is treated for removal of selenium in the Refinery's biotreaters and in a selenium precipitation unit prior to discharge. The Refinery must meet its selenium effluent discharge limits per its NPDES permit.

The Refinery is capable of refining crude oil that includes California crude oil with high levels of selenium, while being required to meet some of the most stringent selenium discharge requirements in the country. The CTRP will not change the Refinery selenium treatment capacity. The imported crude oil that will be processed following the CTRP will most likely have less selenium than the high selenium crude oil that it is replacing.

3.5.3 Vanadium and Nickel

Vanadium and nickel compounds are present in crude oil. They occur naturally, as a function of crude oil source geologies. It has been well established that nickel and vanadium interfere with the catalytic cracking process. Nickel and vanadium compounds decompose under cracking conditions, resulting in the deposition of vanadium and nickel oxides on cracking catalyst. When cracking catalyst is regenerated, inert forms of each metal remaining on the catalyst reduce regeneration efficiency.

For these reasons, vanadium and nickel concentrations within purchased crude oils are monitored. Concentrations of vanadium and nickel in crude oils imported at the Refinery vary greatly. Amounts of vanadium in the assays of crude oil receipts range from 2-400 ppm. Similarly, amounts of nickel in the assays of crude oil receipts range from 5-116 ppm. The SJV crude oils have varying levels of these compounds as well, ranging from 32-110 ppm for vanadium and 39-92 ppm for nickel.

The concentration of metals such as vanadium and nickel in crude oil assays will continue to be reviewed so that levels in the crude oil mixture, as refined, will not cause process unit operational or catalyst deactivation issues. This will remain unchanged by the CTRP.

The Refinery must also continue to meet its nickel and vanadium effluent discharge limits per its NPDES permit.

4.0 CRUDE OIL SLATE CHANGE SUMMARY

As the future SJV crude oil supply continues to decline, the Refinery will need to obtain an increasing percentage of imported crude oil by vessel deliveries instead of by pipeline. There are no crude oils other than SJV available to the Refinery by pipeline. The CTRP proposes to increase crude oil storage capacity in order to maintain current production

levels of transportation fuels for the California market as crude oil delivered by vessel replaces SJV crude oil as a feedstock. The range of sulfur content and API gravity in the increased shipments of imported crude oil in the future may be as wide as, or even wider than, that of shipments historically received by the Refinery. However, the imports will need to either meet the design feedstock criteria shown in Figure 3-4 as purchased, or be blended with other crude oil types to meet the design feedstock criteria before being refined.

Shell expects to gradually replace its existing supply of SJV crude oil with imported crude oil. The CTRP will not increase the crude oil throughput of the Refinery, or result in an increase in the production of existing products or byproducts. The only physical modifications involved in the CTRP relate to new or replaced crude oil storage tanks and energy efficiency projects. There are no process equipment changes included in the project that in any way change the design feedstock criteria, which will remain the same before and after the CTRP.

5.0 REFERENCES

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Appendix C
Oil Spill Modeling Study

ESA

Oil Spill Analysis
Shell Crude Tank Replacement Project (CTRP) EIR
Martinez, CA

1. Introduction

The following Technical Memorandum describes analysis performed for Alameda County in support of the Crude Tank Replacement Project (CTRP) EIR, Shell Oil Facility, Martinez, California. Coast & Harbor Engineering, Inc.'s (CHE) Scope of Work included spill analysis using the NOAA Trajectory Analysis Planner II (TAPII) software. The Shell Martinez Terminal is located in the Carquinez Straight, immediately west of the Benicia-Martinez Bridge, as shown in Figure 1.

Figure 1. Shell Martinez Terminal project site location

2. Spill Evaluation

CHE performed analysis of potential spills at the Shell Martinez Terminal and in transit to assist the project team in evaluation of potential environmental impacts. CHE did not perform modeling of spill propagation; rather, CHE utilized statistical data summarizing spill modeling results already included within the NOAA Trajectory Analysis Planner II (TAPII) software (NOAA, 2000). The software consists of a database of spill modeling results for various materials, time periods, volumes and physical conditions. The TAPII system database is generated using a large set of individual spill trajectory modeling runs performed with NOAA's "On-Scene Spill Model (OSSM)." Each run consists of a randomly-chosen start time with its corresponding wind/tide/current conditions and a spill location of interest, then spill trajectories are calculated with subsequent calculation of spill volumes that accumulate within each segmented shoreline impact area (called "shoreline zones") over a 5-day simulation period (Barker, 2009).

The results obtained from the TAPII system on the Shell Martinez Terminal EIR include probabilities of spill volumes within the shoreline zones resulting from a spill of a certain material and volume at the terminal and also at one in-transit location at the Carquinez Bridge.

2.1. Modeling Scenarios and Approach

Spill scenarios were developed by the project team prior to the analysis using United States Coast Guard (USCG) spill response spill volume planning protocols and following consultation with Shell personnel (Gordon Johnson, Shell, personal communication, 2011). Two locations were selected for the origin of modeled accidental oil spills that included the Shell Martinez Terminal (MT) and Carquinez Bridge. Table 1 shows the spill analysis scenarios, consisting of different spill locations, times of year that the spill would occur and spill volumes.

Table 1. Spill Analysis Scenarios

Scenario	Location	Season	Volume (bbl)	Type of Spill
1	Shell Martinez Terminal	Summer	1,680	Reasonable Worst Case MT Spill
2	Shell Martinez Terminal	Winter	1,680	Reasonable Worst Case MT Spill
3	Shell Martinez Terminal	Summer	168	Maximum Most Probable MT Spill
4	Shell Martinez Terminal	Winter	168	Maximum Most Probable MT Spill
5	Shell Martinez Terminal	Summer	50	Average Most Probable MT Spill
6	Shell Martinez Terminal	Winter	50	Average Most Probable MT Spill
7	Carquinez Bridge	Summer	20,000	Reasonable Worst Case Tanker Spill
8	Carquinez Bridge	Winter	20,000	Reasonable Worst Case Tanker Spill

Winter and summer time periods differ presumably due to larger tidal ranges and river flows during the winter; however, insufficient detail regarding the simulations used to develop the TAPII database was available from NOAA to confirm these assumptions. Results generally indicate wider spread of higher probabilities of material during the winter. The results from the TAPII modeling system consist of probabilities that a certain number of barrels of spill material will be present within each shoreline zone. Shoreline zones are pre-defined within the TAPII system (185 different zones), and consist of areas approximately 8,200 ft long (on average), that extend approximately 1,650 ft offshore (on average).

Spill transport was evaluated at multiple times during a five-day simulation period (nine times were available, from six hours to five days after each spill), and the maximum probabilities of spill volumes exceeding a critical threshold value (level of concern) in each shoreline zone were determined. The TAPII system assumes that spill materials do not mix, but are all present on the surface as a sheen.

The approach to material volume calculation within each shoreline zone was coordinated and approved by the project team prior to final spill analysis. The level of concern in each shoreline zone, defined in TAPII as the volume of material present in each shoreline zone, was determined based on the shoreline zone area (8,200 by 1,650 ft) and reported thickness of crude oil sheen from Metcalf and Eddy (2003). Metcalf and Eddy (2003) provide oil sheen thickness information for different appearance criteria ranging from “barely visible” to “colors are much darker”. Metcalf and Eddy (2003) report that crude oil sheen thickness for a “silvery sheen” (herein chosen as the level of concern for oil spill impact analysis) is such that 50 gallons are typically present in one square nautical mile. Based on this reported sheen thickness, a volume of 0.6 barrels per shoreline zone was determined to be the

level of concern upon which probabilities of impact were calculated in the TAPII system.

2.2. Modeling Results

The TAPII database was used to analyze the scenarios described in Section 2.1 and the results were analyzed in coordination with the project team. Appendix A shows plan view plots of the TAPII results of the maximum probabilities of spill volumes present in each shoreline zone on a rectified satellite image of San Francisco Bay, San Pablo Bay, and Suisun Bay for each modeling scenario. Sections 2.2.1 to 2.2.8 describe the results of the maximum probabilities of spill volumes along the shorelines of San Francisco Bay, San Pablo Bay, and Suisun Bay for each modeling scenario.

2.2.1. Scenario 1

Scenario 1 consists of 1,680 barrels of crude oil spill at the Shell Martinez Terminal (Reasonable Worst Case MT Spill) during summer. Results indicate that probabilities of exceeding the levels of concern range from 75 to 100 percent along the shorelines west of the terminal past the Carquinez Bridge and east of the terminal to Chipps Island and Mallard Island. Probabilities of exceedance up to 40 percent can be found in San Pablo Bay to Point San Pablo and Point San Pedro. Probabilities of exceedance up to 15 percent can be found to Tiburon. Probabilities of exceedance drop to values less than 5 percent south of Tiburon.

2.2.2. Scenario 2

Scenario 2 consists of 1,680 barrels of crude oil spill at the Shell Martinez Terminal (Reasonable Worst Case MT Spill) during winter. Results indicate that probabilities of exceeding the levels of concern range from 75 to 100 percent along the shorelines west of the terminal past the Carquinez Bridge and east of the terminal to Chipps Island and Mallard Island. Probabilities of exceedance of up to 50-60 percent can be found in San Pablo Bay to Point San Pablo and Point San Pedro. Probabilities of exceedance up to 25 percent can be found to the Golden Gate. Probabilities of exceedance drop to values less than 5 percent south of Alameda.

2.2.3. Scenario 3

Scenario 3 consists of 168 barrels of crude oil spill at the Shell Martinez Terminal (Maximum Most Probable MT Spill) during summer. Results indicate that probabilities of exceeding the levels of concern range from 75 to 100 percent along the shorelines west of the terminal past the Carquinez Bridge (north shoreline) and east of the terminal to Seal Islands/Roe Island. Probabilities of exceedance up to 50 percent can be found along the shorelines east of the terminal to Chipps Island and Mallard Island. Probabilities of exceedance drop to values less than 5 percent outside Suisun Bay.

2.2.4. Scenario 4

Scenario 4 consists of 168 barrels of crude oil spill at the Shell Martinez Terminal (Maximum Most Probable MT Spill) during winter. Results indicate that probabilities of exceeding the levels of concern range from 75 to 100 percent along the shoreline west of the terminal past the Carquinez Bridge (north shoreline) and east of the terminal to Seal Islands/Roe Island. Probabilities of exceedance up to 40 percent can be found along the shoreline east of the terminal to Chipps Island and Mallard Island. Probabilities of exceedance of up to 30 percent can be found in San Pablo Bay to Point San Pedro. Probabilities of exceedance drop to values less than 10-15 percent south of San Pablo Bay with peaks at Tiburon and Angel Island. Probabilities of exceedance drop to values less than 5 percent south of Angel Island.

2.2.5. Scenario 5

Scenario 5 consists of 50 barrels of crude oil spill at the Terminal (Average Most Probable MT Spill) during summer. Results indicate that probabilities of exceeding the levels of concern range from 75 to 100 percent west of the terminal to Port Costa/Crockett along the south shoreline and up to approximately one mile east of the Carquinez Bridge along the northern shoreline. Probabilities of exceedance range from 75 to 100 percent for approximately 2.2 miles east of the terminal along the south shoreline. Probabilities of exceedance up to 50 percent can be found along the shoreline west of the terminal past the Carquinez Bridge (north shoreline) and east of the terminal to the shoreline area north of Port Chicago. Probabilities of exceedance up to 30 percent can be found along the shoreline east of the terminal to Chipps Island and Mallard Island. Probabilities of exceedance drop to values less than 5 percent outside Suisun Bay.

2.2.6. Scenario 6

Scenario 6 consists of 50 barrels of crude oil spill at the Shell Martinez Terminal (Average Most Probable MT Spill) during winter. Results indicate that probabilities of exceeding the levels of concern range from 75 to 100 percent west of the terminal all the way to Port Costa/Crockett along the south shoreline and past the Carquinez Bridge along the north shoreline. Probabilities of exceedance range from 75 to 100 percent for approximately 3.2 miles along the south shoreline east of the terminal. Probabilities of exceedance up to 50 percent can be found along the south shoreline west of the terminal past the Carquinez Bridge, and east of the terminal to the shoreline area north of Port Chicago. Probabilities of exceedance up to 20 percent can be found along the shoreline east of the terminal to Chipps Island and Mallard Island. Probabilities of exceedance drop to values less than 5 percent outside San Pablo Bay.

2.2.7. Scenario 7

Scenario 7 consists of 20,000 barrels of crude oil spill at Carquinez Bridge (Reasonable Worst Case Tanker Spill) during summer. Results indicate that probabilities of exceeding the levels of concern range from 75 to 100 percent along the shoreline west of the Carquinez Bridge into San Pablo Bay and east of the Carquinez Bridge to the shoreline area north of Port Chicago. Probabilities of

exceedance up to 40-50 percent can be found in San Pablo Bay to the Richmond-San Rafael Bridge and east of the Carquinez Bridge to Chipps Island and Mallard Island. Probabilities of exceedance of up to 30 percent can be found at Richmond, and up to 20 percent can be found to the Golden Gate and to Alameda. Probabilities of exceedance drop to values less than 5 percent south of Alameda.

2.2.8. Scenario 8

Scenario 8 consists of 20,000 barrels of crude oil spill at Carquinez Bridge (Reasonable Worst Case Tanker Spill) during winter. Results indicate that probabilities of exceeding the levels of concern range from 75 to 100 percent along the shoreline west of the Carquinez Bridge, into San Pablo Bay to Point San Pablo and Point San Pedro, and east of the Carquinez Bridge to the shoreline area north of Port Chicago. Probabilities of exceedance of up to 50 percent can be found at Richmond, to the Golden Gate and to Treasure Island. Probabilities of exceedance up to 30 percent can be found along the shoreline east of the terminal to Chipps Island and Mallard Island. Probabilities of exceedance drop to values less than 5 percent south of Hunters Point.

3. Conclusion

Oil spill dispersion predictions were provided using the NOAA TAPII system in support of environmental impact analysis for the Shell Martinez Crude Tank Replacement Project (CTRP) EIR, Martinez, California. Oil spill analysis results in the form of probabilities of spills exceeding levels of concern were provided to the project team for environmental analysis.

4. References

Barker, C. 2009. The NOAA Trajectory Analysis Planner: TAP II. Downloaded from NOAA website.

Johnson, G. 2011. Personal Communication with Gordon Johnson, Shell.

Metcalf & Eddy. 2003. Wastewater Engineering, Treatment and Reuse. 4th ed. New York: McGraw-Hill, 98.

National Oceanic and Atmospheric Administration (NOAA). January 2000. TAPII 1.1 User Manual, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, Office of Response and Restoration.

APPENDIX A

Plan Views of Maximum Probabilities of Spill Volumes above Level of Concern in Each Shoreline Zone

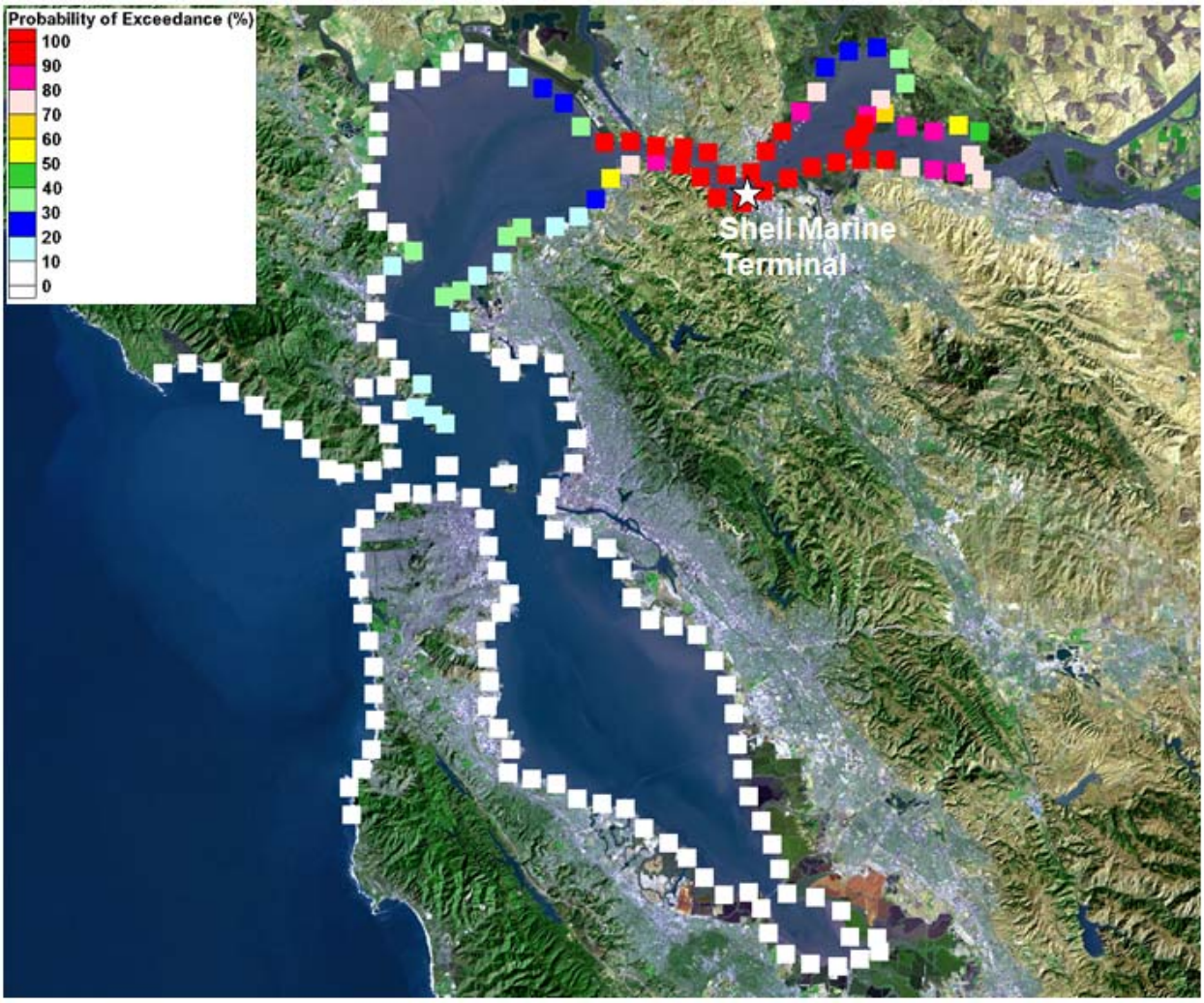


Figure A1. Scenario 1, Reasonable Worst Case MT Spill, 1,680 Barrels, Shell Martinez Terminal, Summer

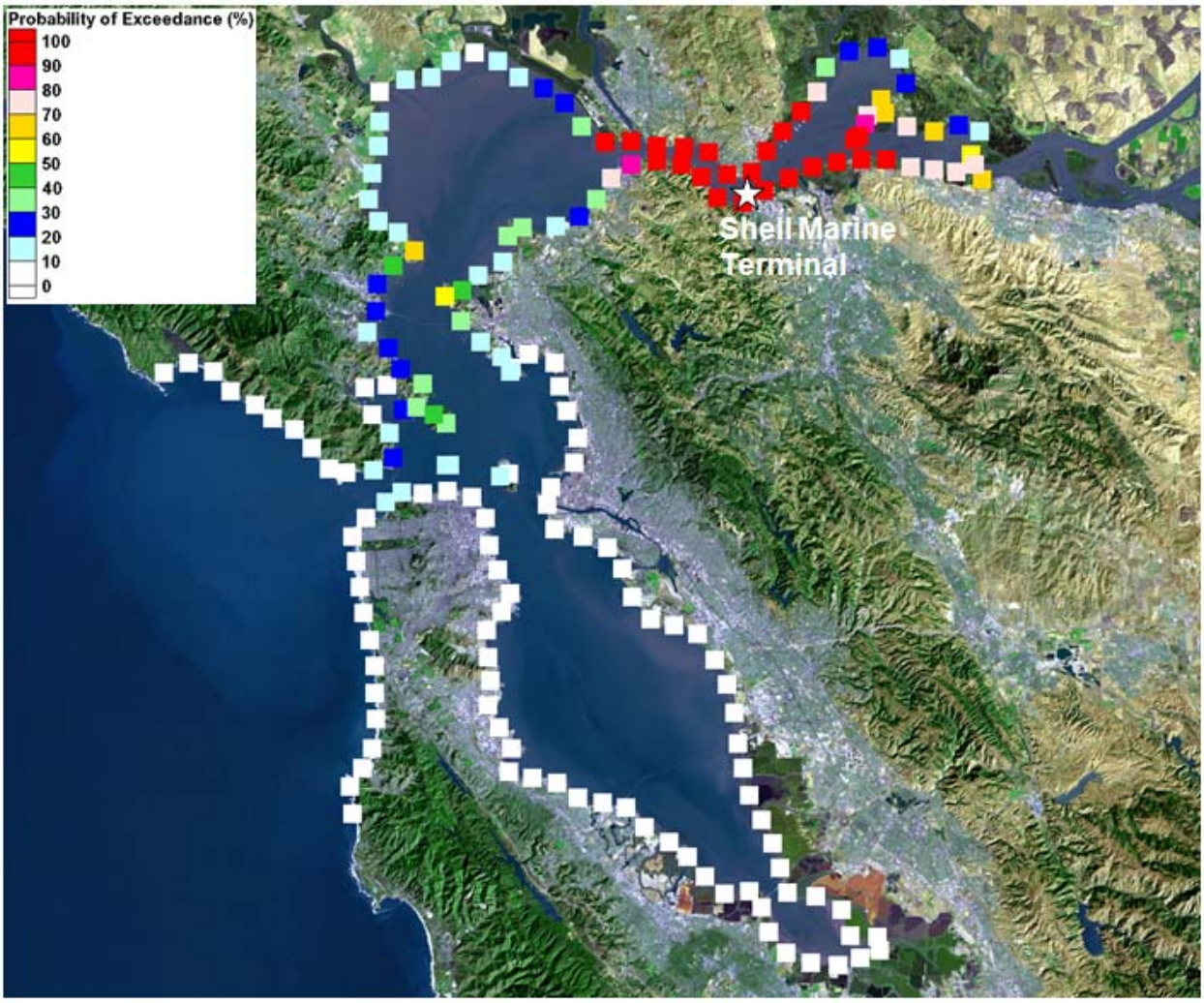


Figure A2. Scenario 2, Reasonable Worst Case MT Spill, 1,680 Barrels, Shell Martinez Terminal, Winter

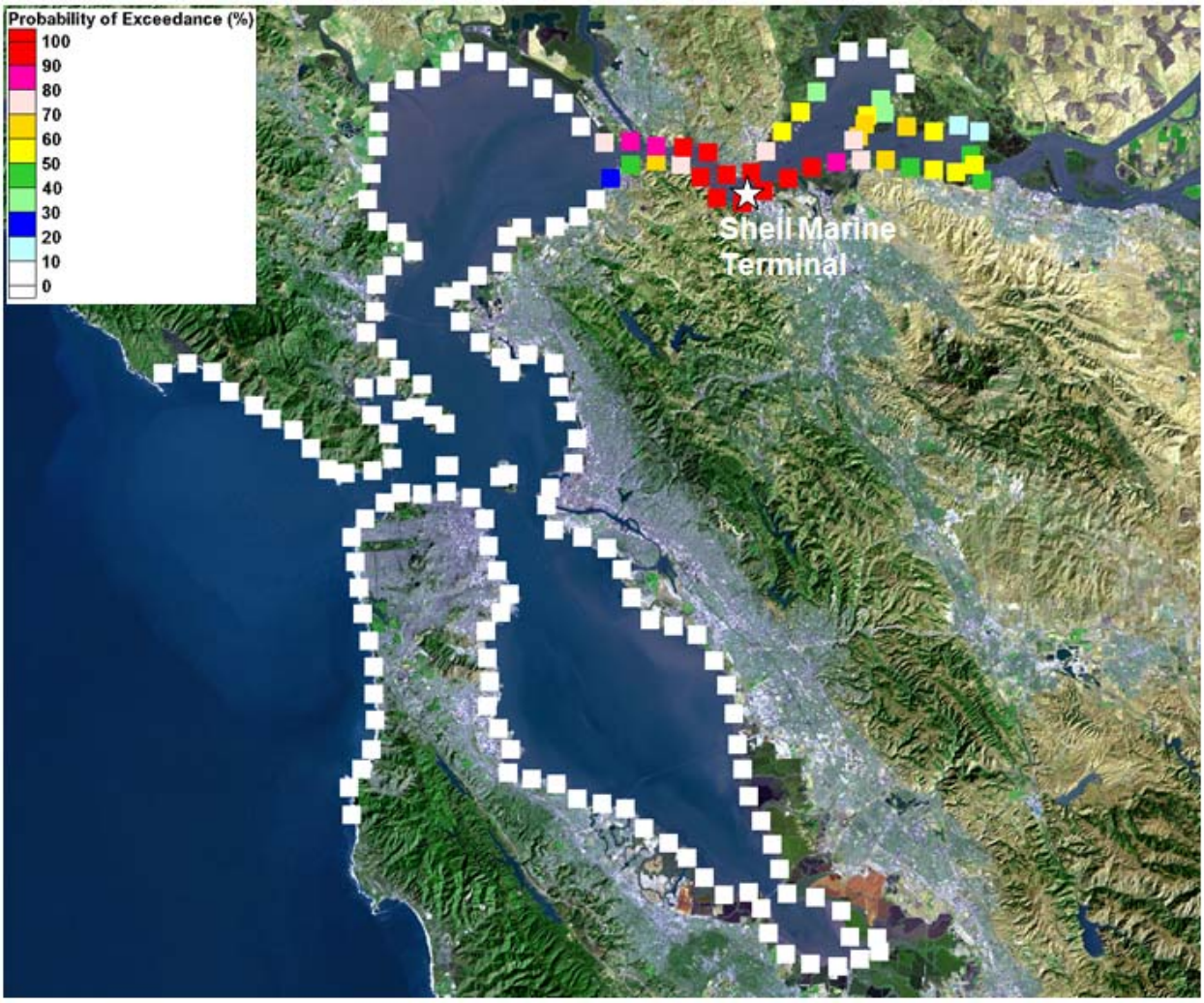


Figure A3. Scenario 3, Maximum Most Probable MT Spill, 168 Barrels, Shell Martinez Terminal, Summer

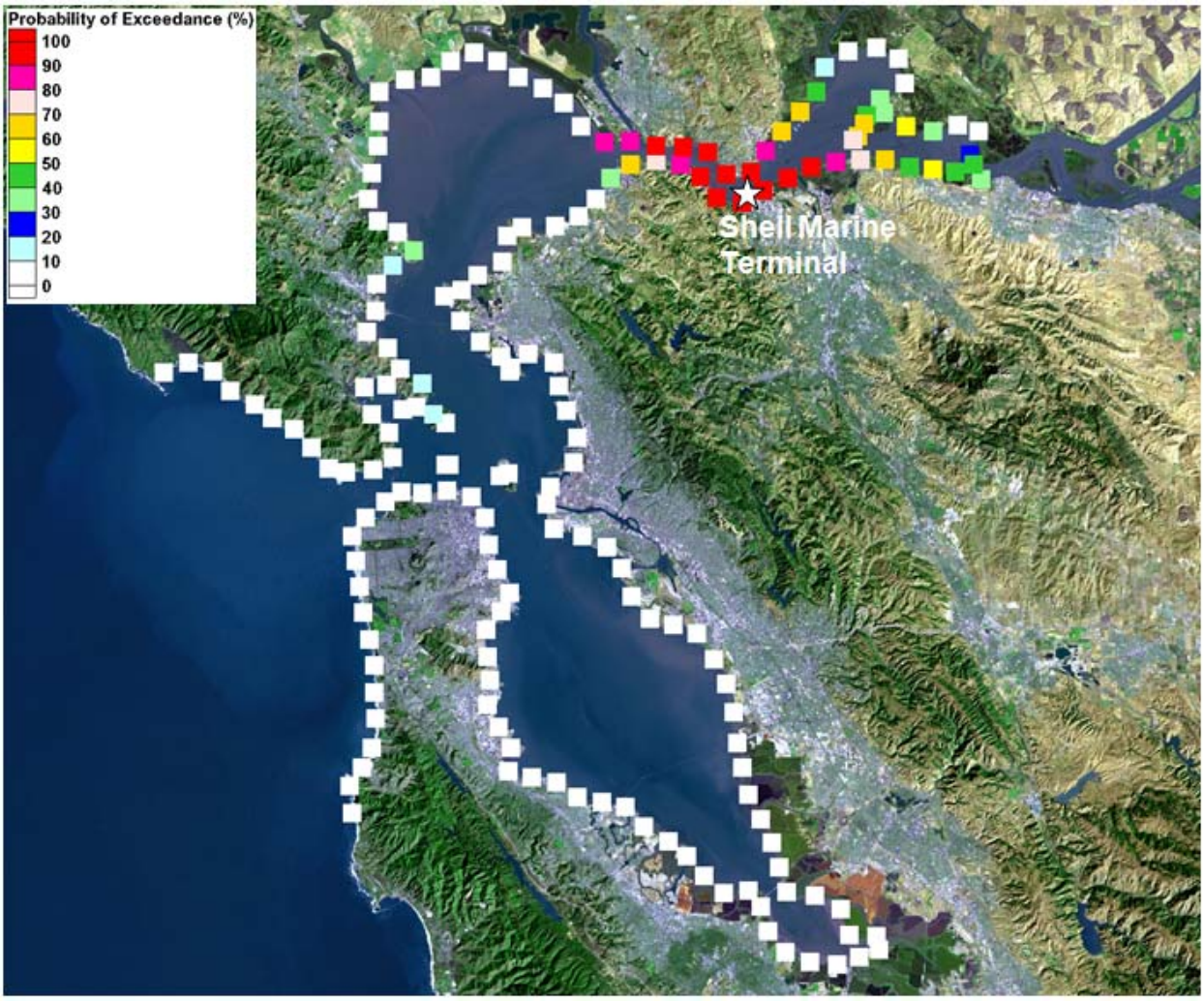


Figure A4. Scenario 4, Maximum Most Probable MT Spill, 168 Barrels, Shell Martinez Terminal, Winter

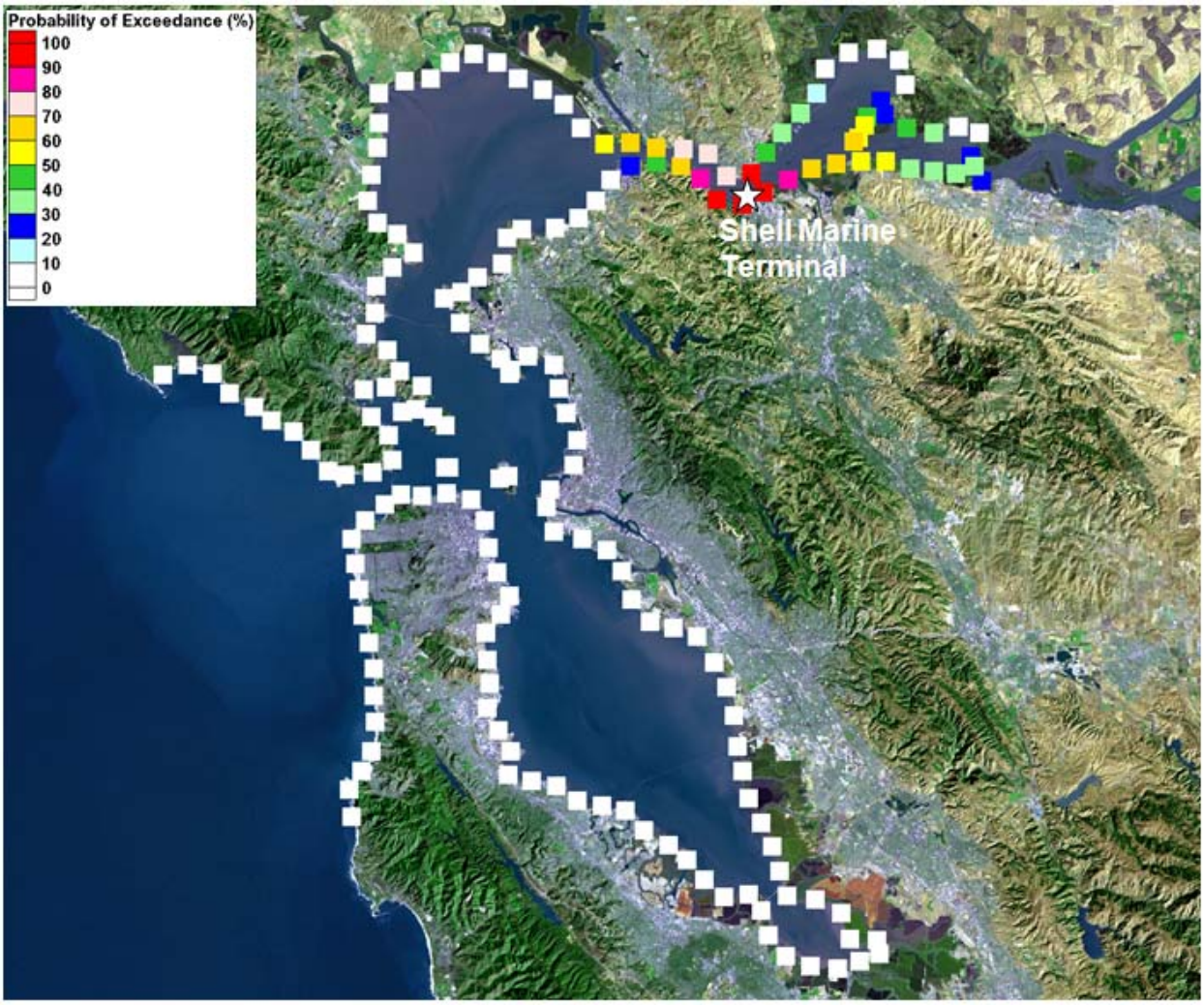


Figure A5. Scenario 5, Average Most Probable MT Spill, 50 Barrels, Shell Martinez Terminal, Summer

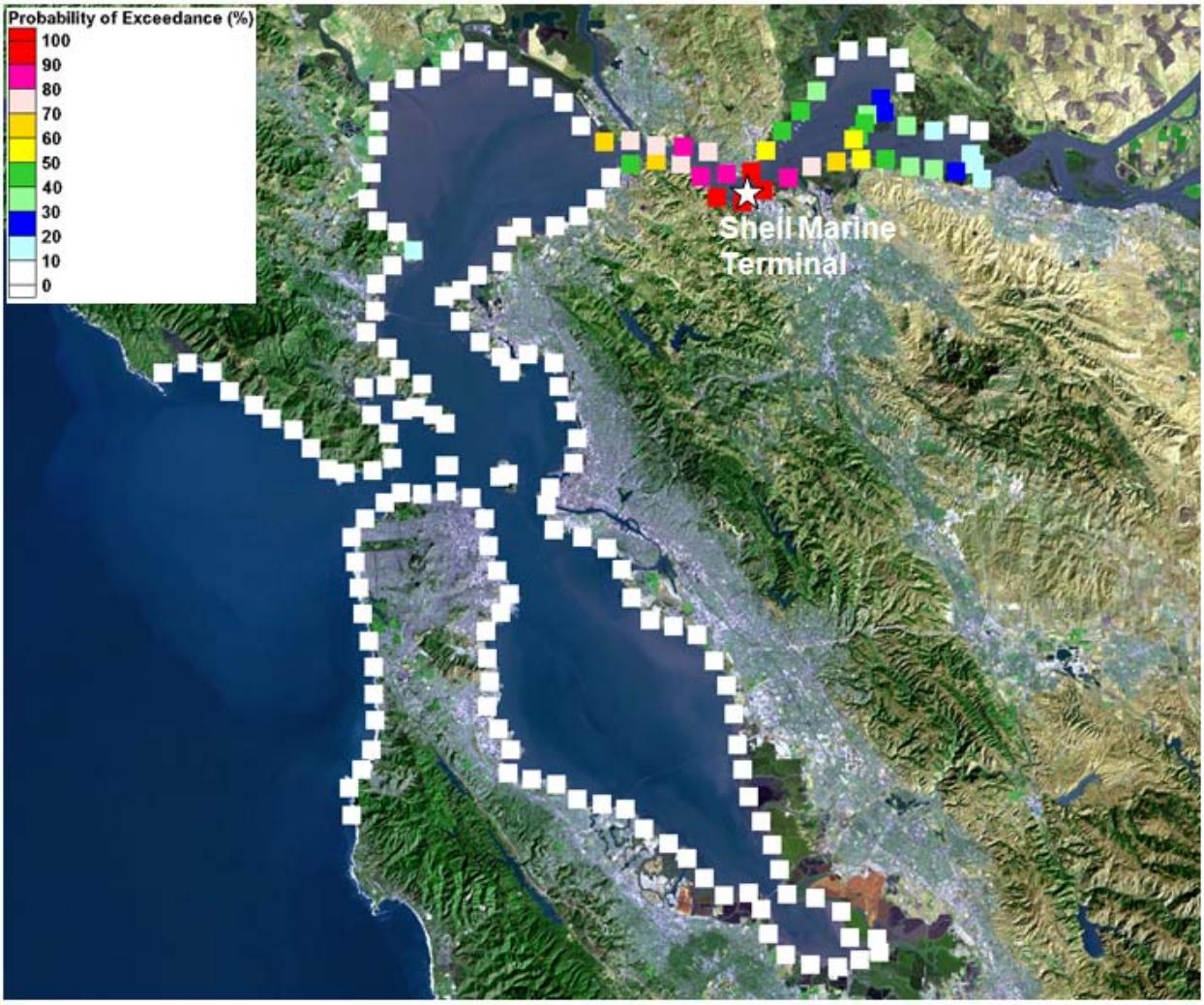


Figure A6. Scenario 6, Average Most Probable MT Spill, 50 Barrels, Shell Martinez Terminal, Winter

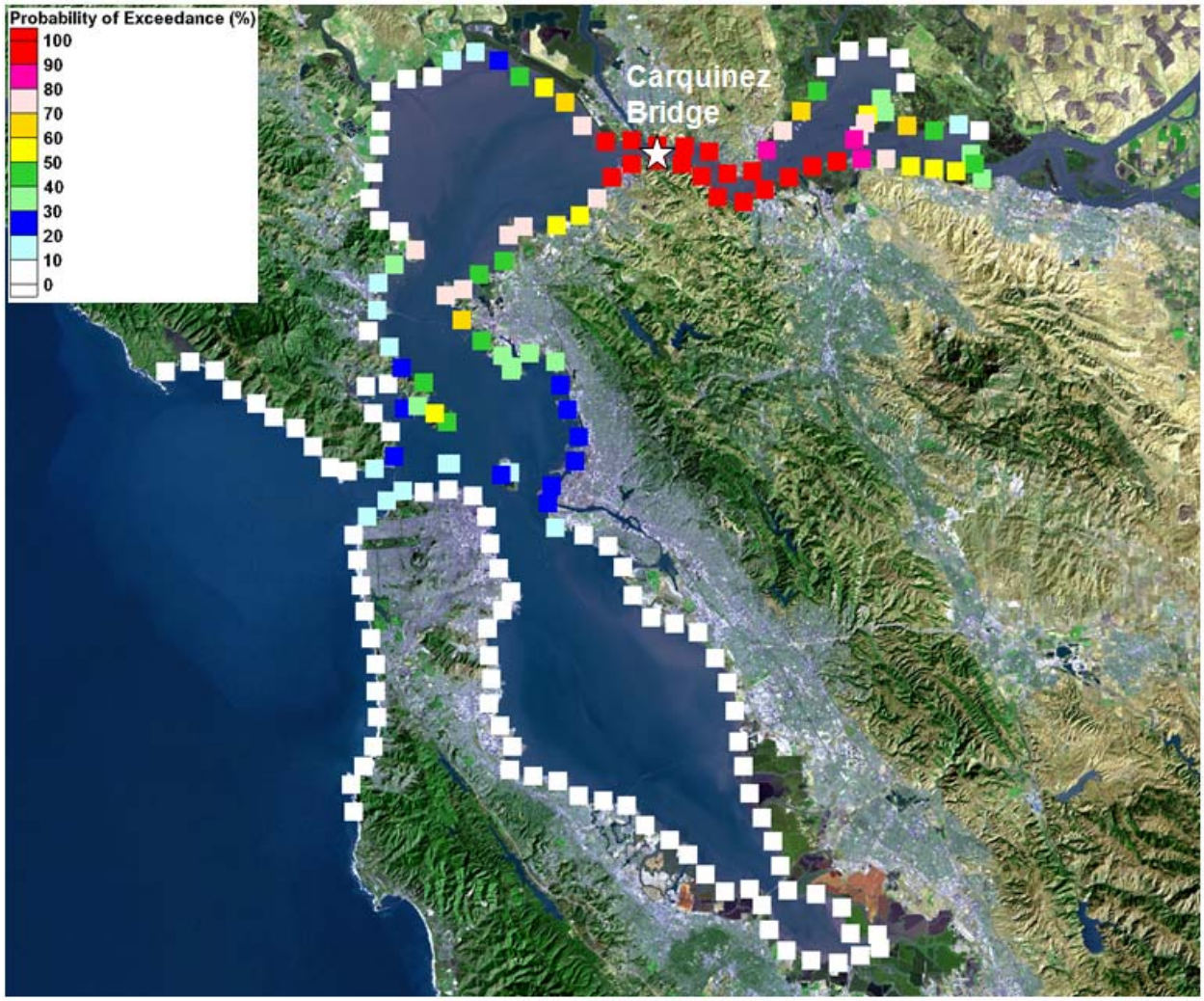


Figure A7. Scenario 7, Reasonable Worst Case Tanker Spill, 20,000 Barrels, Carquinez Bridge, Summer

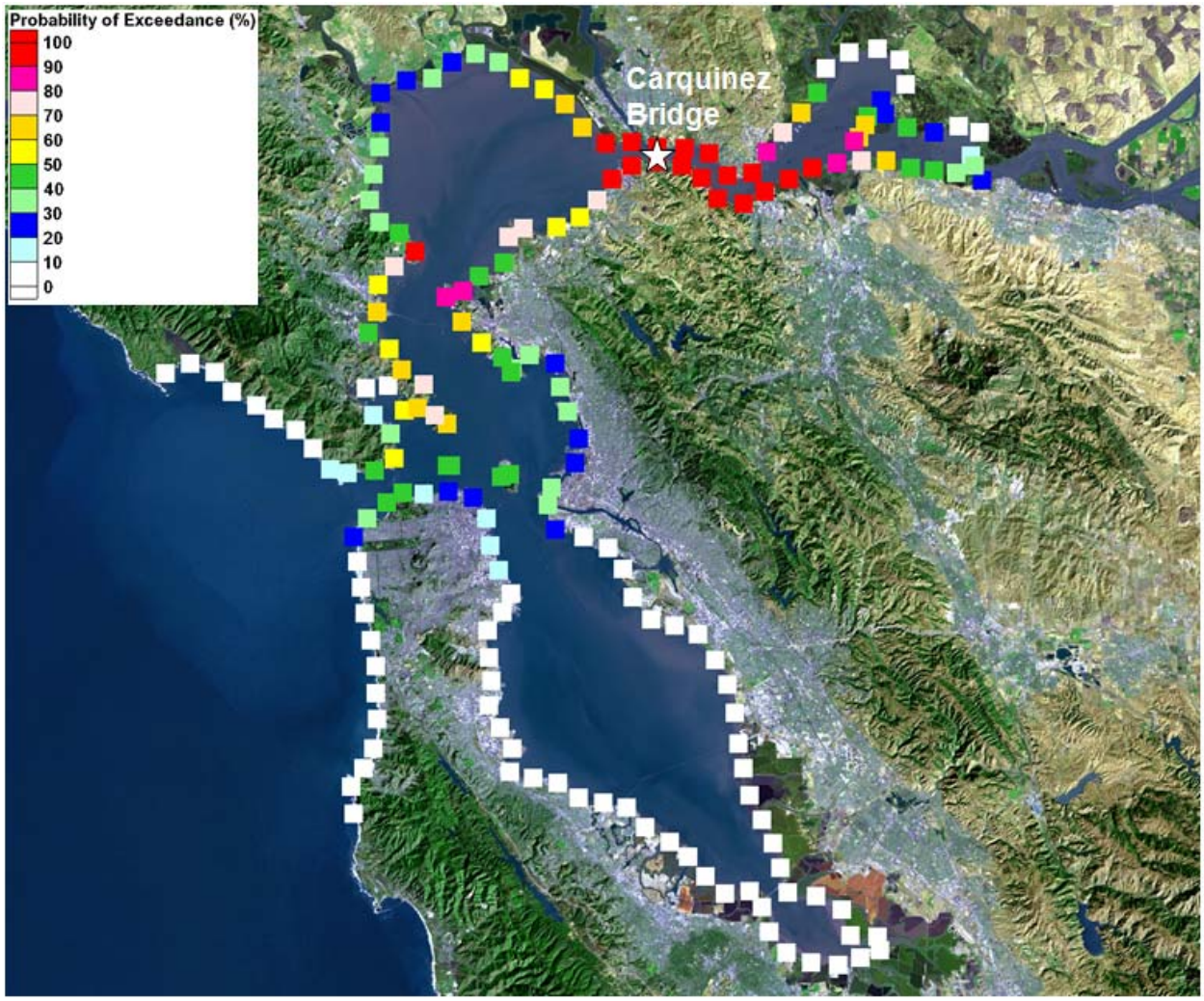


Figure A8. Scenario 8, Reasonable Worst Case Tanker Spill, 20,000 Barrels, Carquinez Bridge, Winter

Appendix D

Biological Resources Information

ESA

TABLE D.1-1
IDENTIFICATION OF POTENTIAL AREAS OF IMPACT AND SENSITIVE BIOTA FROM CRUDE OIL SPILLS

Spill Model		NOAA ESRI Map #	Habitats Effected		NOAA Identified Species of Concern	Special Status Species
No.	Scenario		50-80% Probability of Spill Impact	>80% Probability of Spill Impact		
1	Summer, 1,680 Barrels, Reasonable Worst Case Scenario MT Spill, Shell Martinez Terminal	SF-8	Sheltered tidal flats, mixed with fine to medium sand beaches and riprap		Shore birds, Wading birds, dabbling ducks, Western gull, Black-tail bay shrimp, California Bay shrimp, Dungeness crab, Double-crested cormorant, gulls, Western gull, Mason's lilaeopsis	Salt marsh harvest mouse, Suisun ornate shrew
				Tidal Marsh, muted tidal marsh, managed marshes, and diked marshes	Shore birds, Wading birds, dabbling ducks, Western gull, California Black rail, California Clapper rail, Double-crested cormorant, Salt marsh harvest mouse, Suisun ornate shrew, eelgrass	California Black rail, California Clapper rail
				Channel	Black-tail bay shrimp, California Bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon	Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt
		SF-9		Mixed sand and gravel beaches with rip rap	Shore birds, Wading birds, canvas backs, dabbling ducks, diving ducks, Western grebe, Western gull, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white croaker, white sturgeon, Dungeness crab, Delta Tule pea, Soft bird's-beak	Chinook Salmon, Delta Smelt, Longfin smelt, Green sturgeon
				Exposed Rocky Shore	Western gull, Shore birds, Wading birds, canvas backs, dabbling ducks, diving ducks, Western grebe, Western gull	
				Sheltered Tidal flat, tidal marshes	Soft bird's-beak, California Black rail, California Clapper rail, Suisun marsh aster, Suisun song sparrow	Soft bird's-beak, California Black rail, California Clapper rail
				Channel	Canvas backs, ruddy ducks, diving ducks, California Bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon, white croaker	Chinook Salmon, Delta Smelt, Longfin smelt, Green sturgeon
		SF-10		Tidal marshes, managed marshes, muted tidal marshes, sheltered tidal flats	Gulls, shorebirds, wading birds, Canvasbacks, diving ducks, ruddy ducks, California clapper rail, Salt marsh common yellowthroat, Suisun song sparrow, California black rail, Delta tule pea, California bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white croaker, white sturgeon, Peregrine falcon, Western gull, salt-marsh harvest mouse, harbor seal	California Black rail, Chinook Salmon, Delta Smelt, Longfin smelt, Peregrine falcon, Green sturgeon, salt-marsh harvest mouse
		SF-11	Salt and Brackish water Marshes, Tidal marshes, diked marshes, muted tidal marshes, managed marshes, sheltered tidal flats		California Black rail, California Least turn, shorebirds, wading birds, double-crested cormorant, Suisun song sparrow, Great blue heron, Great egret, Sacramento splittail, soft bird's beak, Delta tule pea, Suisun marsh aster, Antioch dunes evening primrose, Delta Mudwort, western pond turtle, salt-marsh harvest mouse, and northern river otter.	California Black rail, California least turn, soft bird's beak, Antioch dunes evening primrose, salt-marsh harvest mouse
			Channel		California Bay shrimp, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon, white croaker	Chinook Salmon

TABLE D.1-1 (Continued)
IDENTIFICATION OF POTENTIAL AREAS OF IMPACT AND SENSITIVE BIOTA FROM CRUDE OIL SPILLS

Spill Model		NOAA ESRI Map #	Habitats Effected		NOAA Identified Species of Concern	Special Status Species
No.	Scenario		50-80% Probability of Spill Impact	>80% Probability of Spill Impact		
2	Winter, 1,680 barrels, Reasonable Worst Case Scenario MT Spill, Shell Martinez Terminal	SF-14	Fine to medium sandy beaches with slopes, and exposed rocky shore		California halibut, Shore birds, Wading birds, canvasbacks, diving ducks, Ruddy duck, gulls, Western gull, Double-crested cormorant, California Brown Pelican, western grebe, black oystercatcher, dabbling ducks, eelgrass, blacktail bay shrimp, California bay shrimp, Dungeness crab	California Brown Pelican
		SF-8	Sheltered tidal flats, mixed with fine to medium sand beaches and riprap		Shore birds, Wading birds, dabbling ducks, Western gull, Black-tail bay shrimp, California Bay shrimp, Dungeness crab, Double-crested cormorant, gulls, Western gull, Mason's lilaeopsis	Salt marsh harvest mouse, Suisun ornate shrew
				Tidal Marsh, muted tidal marsh, managed marshes, and diked marshes	Shore birds, Wading birds, dabbling ducks, Western gull, California Black rail, California Clapper rail, Double-crested cormorant, Salt marsh harvest mouse, Suisun ornate shrew, eelgrass	California Black rail, California Clapper rail
				Channel	Black-tail bay shrimp, California Bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon	Chinook Salmon, Delta Smelt
		SF-9	Mixed sand and gravel beaches		Shore birds, Wading birds, canvas backs, dabbling ducks, diving ducks, Western grebe, Western gull, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white croaker, white sturgeon, Dungeness crab	Chinook Salmon, Delta Smelt, Longfin smelt, Green sturgeon
				Rocky intertidal	Delta Tule pea, Western gull, Shore birds, Wading birds, canvas backs, dabbling ducks, diving ducks, Western grebe, Western gull	
			Tidal Marshes		Soft bird's-beak, Mason's lilaeopsis, California Black rail, California Clapper rail	Soft bird's-beak, California Black rail, California Clapper rail
				Channel	Canvas backs, ruddy ducks, diving ducks, California Bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon, white croaker	Chinook Salmon, Delta Smelt, Longfin smelt, Green sturgeon
		SF-10		Tidal marshes, managed marshes, muted tidal marshes, sheltered tidal flats	Gulls, shorebirds, wading birds, Canvasbacks, diving ducks, ruddy ducks, California clapper rail, Salt marsh common yellowthroat, Suisun song sparrow, California black rail, Delta tule pea, California bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white croaker, white sturgeon, Peregrine falcon, Western gull, salt-marsh harvest mouse, harbor seal	California Black rail, Chinook Salmon, Delta Smelt, Longfin smelt, Peregrine falcon, Green sturgeon, salt-marsh harvest mouse
		SF-11	Salt and Brackish water Marshes, Tidal marshes, diked marshes, muted tidal marshes, managed marshes, sheltered tidal flats		California Black rail, California Least turn, shorebirds, wading birds, double-crested cormorant, Suisun song sparrow, Great blue heron, Great egret, Sacramento splittail, soft bird's beak, Delta tule pea, Suisun marsh aster, Antioch dunes evening primrose, Delta Mudwort, western pond turtle, salt-marsh harvest mouse, and northern river otter.	California Black rail, California least turn, soft bird's beak, Antioch dunes evening primrose, salt-marsh harvest mouse
			Channel		California Bay shrimp, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon, white croaker	Chinook Salmon

TABLE D.1-1 (Continued)
IDENTIFICATION OF POTENTIAL AREAS OF IMPACT AND SENSITIVE BIOTA FROM CRUDE OIL SPILLS

Spill Model		NOAA ESRI Map #	Habitats Effected		NOAA Identified Species of Concern	Special Status Species
No.	Scenario		50-80% Probability of Spill Impact	>80% Probability of Spill Impact		
3	Summer, 168 barrels, Maximum Most Probable MT Spill, Shell Martinez Terminal	SF-8	Sheltered tidal flats, mixed with fine to medium sand beaches and riprap		Shore birds, Wading birds, dabbling ducks, Western gull, Black-tail bay shrimp, California Bay shrimp, Dungeness crab, Double-crested cormorant, gulls, Western gull, Mason's lilaeopsis	Salt marsh harvest mouse, Suisun ornate shrew
				Tidal Marsh, muted tidal marsh, managed marshes, and diked marshes	Shore birds, Wading birds, dabbling ducks, Western gull, California Black rail, California Clapper rail, Double-crested cormorant, Salt marsh harvest mouse, Suisun ornate shrew, eelgrass	California Black rail, California Clapper rail
				Channel	Black-tail bay shrimp, California Bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon	Chinook Salmon, Delta Smelt
		SF-9		Mixed sand and gravel beaches	Shore birds, Wading birds, canvas backs, dabbling ducks, diving ducks, Western grebe, Western gull, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white croaker, white sturgeon, Dungeness crab	Chinook Salmon, Delta Smelt, Longfin smelt, Green sturgeon
				Rocky intertidal	Delta Tule pea, Western gull, Shore birds, Wading birds, canvas backs, dabbling ducks, diving ducks, Western grebe, Western gull	
				Tidal Marshes	Soft bird's-beak, Mason's lilaeopsis, California Black rail, California Clapper rail	Soft bird's-beak, California Black rail, California Clapper rail
				Channel	Canvas backs, ruddy ducks, diving ducks, California Bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon, white croaker	Chinook Salmon, Delta Smelt, Longfin smelt, Green sturgeon
		SF-10		Tidal marshes, managed marshes, muted tidal marshes, sheltered tidal flats	Gulls, shorebirds, wading birds, Canvasbacks, diving ducks, ruddy ducks, California clapper rail, Salt marsh common yellowthroat, Suisun song sparrow, California black rail, Delta tule pea, California bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white croaker, white sturgeon, Peregrine falcon, Western gull, salt-marsh harvest mouse, harbor seal	California Black rail, Chinook Salmon, Delta Smelt, Longfin smelt, Peregrine falcon, Green sturgeon, salt-marsh harvest mouse
		SF-11	Salt and Brackish water Marshes, Tidal marshes, diked marshes, muted tidal marshes, managed marshes, sheltered tidal flats		California Black rail, California Least turn, shorebirds, wading birds, double-crested cormorant, Suisun song sparrow, Great blue heron, Great egret, Sacramento splittail, soft bird's beak, Delta tule pea, Suisun marsh aster, Antioch dunes evening primrose, Delta Mudwort, western pond turtle, salt-marsh harvest mouse, and northern river otter.	California Black rail, California least turn, soft bird's beak, Antioch dunes evening primrose, salt-marsh harvest mouse
			Channel		California Bay shrimp, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon, white croaker	Chinook Salmon

TABLE D.1-1 (Continued)
IDENTIFICATION OF POTENTIAL AREAS OF IMPACT AND SENSITIVE BIOTA FROM CRUDE OIL SPILLS

Spill Model		NOAA ESRI Map #	Habitats Effected		NOAA Identified Species of Concern	Special Status Species
No.	Scenario		50-80% Probability of Spill Impact	>80% Probability of Spill Impact		
4	Winter, 168 barrels, Maximum Most Probable MT Spill, Shell Martinez Terminal	SF-8	Sheltered tidal flats, mixed with fine to medium sand beaches and riprap		Shore birds, Wading birds, dabbling ducks, Western gull, Black-tail bay shrimp, California Bay shrimp, Dungeness crab, Double-crested cormorant, gulls, Western gull, Mason's lilaeopsis	Salt marsh harvest mouse, Suisun ornate shrew
				Tidal Marsh, muted tidal marsh, managed marshes, and diked marshes	Shore birds, Wading birds, dabbling ducks, Western gull, California Black rail, California Clapper rail, Double-crested cormorant, Salt marsh harvest mouse, Suisun ornate shrew, eelgrass	California Black rail, California Clapper rail
				Channel	Black-tail bay shrimp, California Bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon	Chinook Salmon, Delta Smelt
		SF-9		Mixed sand and gravel beaches	Shore birds, Wading birds, canvas backs, dabbling ducks, diving ducks, Western grebe, Western gull, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white croaker, white sturgeon, Dungeness crab	Chinook Salmon, Delta Smelt, Longfin smelt, Green sturgeon
				Rocky intertidal	Delta Tule pea, Western gull, Shore birds, Wading birds, canvas backs, dabbling ducks, diving ducks, Western grebe, Western gull	
				Tidal Marshes	Soft bird's-beak, Mason's lilaeopsis, California Black rail, California Clapper rail	Soft bird's-beak, California Black rail, California Clapper rail
				Channel	Canvas backs, ruddy ducks, diving ducks, California Bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon, white croaker	Chinook Salmon, Delta Smelt, Longfin smelt, Green sturgeon
		SF-10		Tidal marshes, managed marshes, muted tidal marshes, sheltered tidal flats	Gulls, shorebirds, wading birds, Canvasbacks, diving ducks, ruddy ducks, California clapper rail, Salt marsh common yellowthroat, Suisun song sparrow, California black rail, Delta tule pea, California bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white croaker, white sturgeon, Peregrine falcon, Western gull, salt-marsh harvest mouse, harbor seal	California Black rail, Chinook Salmon, Delta Smelt, Longfin smelt, Peregrine falcon, Green sturgeon, salt-marsh harvest mouse
		SF-11	Salt and Brackish water Marshes, Tidal marshes, diked marshes, muted tidal marshes, managed marshes, sheltered tidal flats		California Black rail, California Least turn, shorebirds, wading birds, double-crested cormorant, Suisun song sparrow, Great blue heron, Great egret, Sacramento splittail, soft bird's beak, Delta tule pea, Suisun marsh aster, Antioch dunes evening primrose, Delta Mudwort, western pond turtle, salt-marsh harvest mouse, and northern river otter.	California Black rail, California least turn, soft bird's beak, Antioch dunes evening primrose, salt-marsh harvest mouse
			Channel		California Bay shrimp, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon, white croaker	Chinook Salmon

TABLE D.1-1 (Continued)
IDENTIFICATION OF POTENTIAL AREAS OF IMPACT AND SENSITIVE BIOTA FROM CRUDE OIL SPILLS

Spill Model		NOAA ESRI Map #	Habitats Effected		NOAA Identified Species of Concern	Special Status Species
No.	Scenario		50-80% Probability of Spill Impact	>80% Probability of Spill Impact		
5	Summer, 50 barrels, Average Most Probable MT Spill, Shell Martinez Terminal	SF-8	Sheltered tidal flats, mixed with fine to medium sand beaches and riprap		Shore birds, Wading birds, dabbling ducks, Western gull, Black-tail bay shrimp, California Bay shrimp, Dungeness crab, Double-crested cormorant, gulls, Western gull, Mason's lilaeopsis	Salt marsh harvest mouse, Suisun ornate shrew
			Tidal Marsh, muted tidal marsh, managed marshes, and diked marshes		Shore birds, Wading birds, dabbling ducks, Western gull, California Black rail, California Clapper rail, Double-crested cormorant, Salt marsh harvest mouse, Suisun ornate shrew, eelgrass	California Black rail, California Clapper rail
			Channel		Black-tail bay shrimp, California Bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon	Chinook Salmon, Delta Smelt
		SF-9	Mixed sand and gravel beaches		Shore birds, Wading birds, canvas backs, dabbling ducks, diving ducks, Western grebe, Western gull, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white croaker, white sturgeon, Dungeness crab	Chinook Salmon, Delta Smelt, Longfin smelt, Green sturgeon
			Rocky intertidal		Delta Tule pea, Western gull, Shore birds, Wading birds, canvas backs, dabbling ducks, diving ducks, Western grebe, Western gull	
			Tidal Marshes		Soft bird's-beak, Mason's lilaeopsis, California Black rail, California Clapper rail	Soft bird's-beak, California Black rail, California Clapper rail
			Channel		Canvas backs, ruddy ducks, diving ducks, California Bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon, white croaker	Chinook Salmon, Delta Smelt, Longfin smelt, Green sturgeon
		SF-10	Tidal marshes, managed marshes, muted tidal marshes, sheltered tidal flats		Gulls, shorebirds, wading birds, Canvasbacks, diving ducks, ruddy ducks, California clapper rail, Salt marsh common yellowthroat, Suisun song sparrow, California black rail, Delta tule pea, California bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white croaker, white sturgeon, Peregrine falcon, Western gull, salt-marsh harvest mouse, harbor seal	California Black rail, Chinook Salmon, Delta Smelt, Longfin smelt, Peregrine falcon, Green sturgeon, salt-marsh harvest mouse
6	Winter, 50 barrels, Average Most Probable MT Spill, Shell Martinez Terminal	SF-8	Sheltered tidal flats, mixed with fine to medium sand beaches and riprap		Shore birds, Wading birds, dabbling ducks, Western gull, Black-tail bay shrimp, California Bay shrimp, Dungeness crab, Double-crested cormorant, gulls, Western gull, Mason's lilaeopsis	Salt marsh harvest mouse, Suisun ornate shrew
			Tidal Marsh, muted tidal marsh, managed marshes, and diked marshes		Shore birds, Wading birds, dabbling ducks, Western gull, California Black rail, California Clapper rail, Double-crested cormorant, Salt marsh harvest mouse, Suisun ornate shrew, eelgrass,	California Black rail, California Clapper rail
			Channel		Black-tail bay shrimp, California Bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon	Chinook Salmon, Delta Smelt
		SF-9	Mixed sand and gravel beaches		Shore birds, Wading birds, canvas backs, dabbling ducks, diving ducks, Western grebe, Western gull, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white croaker, white sturgeon, Dungeness crab	Chinook Salmon, Delta Smelt, Longfin smelt, Green sturgeon

TABLE D.1-1 (Continued)
IDENTIFICATION OF POTENTIAL AREAS OF IMPACT AND SENSITIVE BIOTA FROM CRUDE OIL SPILLS

Spill Model		NOAA ESRI Map #	Habitats Effected		NOAA Identified Species of Concern	Special Status Species
No.	Scenario		50-80% Probability of Spill Impact	>80% Probability of Spill Impact		
			Rocky intertidal		Delta Tule pea, Western gull, Shore birds, Wading birds, canvas backs, dabbling ducks, diving ducks, Western grebe, Western gull	
			Tidal Marshes		Soft bird's-beak, Mason's lilaeopsis, California Black rail, California Clapper rail	Soft bird's-beak, California Black rail, California Clapper rail
			Channel		Canvas backs, ruddy ducks, diving ducks, California Bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon, white croaker	Chinook Salmon, Delta Smelt, Longfin smelt, Green sturgeon
		SF-10	Tidal marshes, managed marshes, muted tidal marshes, sheltered tidal flats		Gulls, shorebirds, wading birds, Canvasbacks, diving ducks, ruddy ducks, California clapper rail, Salt marsh common yellowthroat, Suisun song sparrow, California black rail, Delta tule pea, California bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white croaker, white sturgeon, Peregrine falcon, Western gull, salt-marsh harvest mouse, harbor seal	California Black rail, Chinook Salmon, Delta Smelt, Longfin smelt, Peregrine falcon, Green sturgeon, salt-marsh harvest mouse
7	Summer, 20,000 barrels, Carquinez Bridge, Shell Martinez Terminal	SF-14	Exposed solid man-made structures and rip rap		Eelgrass, Western gull, shorebirds, wading birds, Dabbling ducks, shorebirds, wading birds, Black oyster catcher, California Brown Pelican, Double-crested cormorant, gulls, common mure	California Brown Pelican,
			Sheltered tidal flats mixed with tidal marshes and managed marshes		Eelgrass, Dabbling ducks, shorebirds, wading birds, Black oyster catcher, California Brown Pelican, Double-crested cormorant, gulls, Western gull, Western Grebe, American shad, California Halibut, Chinook Salmon, rainbow trout, Green sturgeon, stripped bass, white sturgeon, Bat ray, English sole, leopard shark, Black-tail Bay shrimp, California Bay shrimp, Dungeness crab, Harbor seal, salt-marsh harvest mouse, saltmarsh wandering shrew, San Pablo vole	California Brown Pelican, Chinook Salmon, Green sturgeon, rainbow trout, salt-marsh harvest mouse,
			Mixed sand and gravel beaches and exposed rocky shore		Eelgrass, Dabbling ducks, shorebirds, wading birds, California Brown Pelican, Western gull	California Brown Pelican,
		SF-16	Exposed rocky shore, mixed with coarse grained beaches and rip rap		California halibut, Pacific herring, American shad, bat ray, brown rockfish, Chinook salmon, leopard shark, stripped bass, white croaker, shorebirds, wading birds, Western gull, Harbor seal, Eelgrass, Black-tail bay shrimp, California Bay shrimp, Dungeness crab	Chinook salmon
		SF-8		Sheltered tidal flats, mixed with fine to medium sand beaches and riprap	Shore birds, Wading birds, dabbling ducks, Western gull, Black-tail bay shrimp, California Bay shrimp, Dungeness crab, Double-crested cormorant, gulls, Western gull, Mason's lilaeopsis	Salt marsh harvest mouse, Suisun ornate shrew
				Tidal Marsh, muted tidal marsh, managed marshes, and diked marshes	Shore birds, Wading birds, dabbling ducks, Western gull, California Black rail, California Clapper rail, Double-crested cormorant, Salt marsh harvest mouse, Suisun ornate shrew, eelgrass	California Black rail, California Clapper rail
				Channel	Black-tail bay shrimp, California Bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon	Chinook Salmon, Delta Smelt

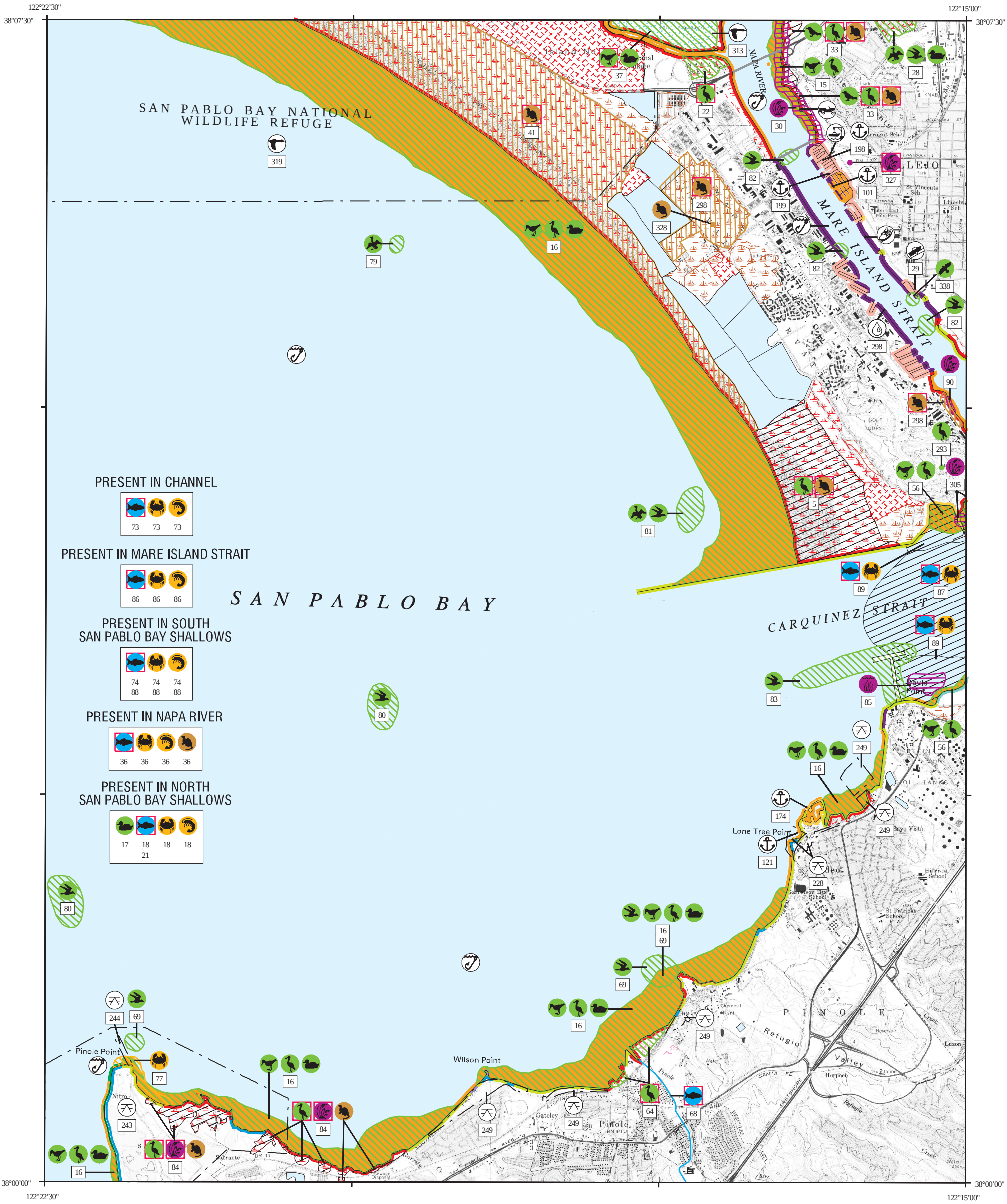
TABLE D.1-1 (Continued)
IDENTIFICATION OF POTENTIAL AREAS OF IMPACT AND SENSITIVE BIOTA FROM CRUDE OIL SPILLS

Spill Model		NOAA ESRI Map #	Habitats Effected		NOAA Identified Species of Concern	Special Status Species
No.	Scenario		50-80% Probability of Spill Impact	>80% Probability of Spill Impact		
		SF-9		Mixed sand and gravel beaches	Shore birds, Wading birds, canvas backs, dabbling ducks, diving ducks, Western grebe, Western gull, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white croaker, white sturgeon, Dungeness crab	Chinook Salmon, Delta Smelt, Longfin smelt, Green sturgeon
				Rocky intertidal	Delta Tule pea, Western gull, Shore birds, Wading birds, canvas backs, dabbling ducks, diving ducks, Western grebe, Western gull	
				Tidal Marshes	Soft bird's-beak, Mason's lilaeopsis, California Black rail, California Clapper rail	Soft bird's-beak, California Black rail, California Clapper rail
				Channel	Canvas backs, ruddy ducks, diving ducks, California Bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon, white croaker	Chinook Salmon, Delta Smelt, Longfin smelt, Green sturgeon
		SF-10		Tidal marshes, managed marshes, muted tidal marshes, sheltered tidal flats	Gulls, shorebirds, wading birds, Canvasbacks, diving ducks, ruddy ducks, California clapper rail, Salt marsh common yellowthroat, Suisun song sparrow, California black rail, Delta tule pea, California bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white croaker, white sturgeon, Peregrine falcon, Western gull, salt-marsh harvest mouse, harbor seal	California Black rail, Chinook Salmon, Delta Smelt, Longfin smelt, Peregrine falcon, Green sturgeon, salt-marsh harvest mouse
		SF-11	Salt and Brackish water Marshes, Tidal marshes, diked marshes, muted tidal marshes, managed marshes, sheltered tidal flats		California Black rail, California Least turn, shorebirds, wading birds, double-crested cormorant, Suisun song sparrow, Great blue heron, Great egret, Sacramento splittail, soft bird's beak, Delta tule pea, Suisun marsh aster, Antioch dunes evening primrose, Delta Mudwort, western pond turtle, salt-marsh harvest mouse, and northern river otter.	California Black rail, California least turn, soft bird's beak, Antioch dunes evening primrose, salt-marsh harvest mouse
			Channel		California Bay shrimp, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon, white croaker	Chinook Salmon
8	Winter, 20,000 barrels, Carquinez Bridge, Shell Martinez Terminal	SF-14		Exposed solid man-made structures and rip rap	Eelgrass, Western gull, shorebirds, wading birds, Dabbling ducks, shorebirds, wading birds, Black oyster catcher, California Brown Pelican, Double-crested cormorant, gulls, common mure	California Brown Pelican
			Sheltered tidal flats mixed with tidal marshes and managed marshes		Eelgrass, Point Reyes bird's beak, dabbling ducks, shorebirds, wading birds, Black oyster catcher, California Brown Pelican, California Clapper rail, Double-crested cormorant, gulls, Western gull, Western Grebe, black-crowned night-heron, Great blue heron, Great egret, snowy egret, canvasback, diving ducks, American shad, California Halibut, Chinook Salmon, rainbow trout, Green sturgeon, stripped bass, white sturgeon, Bat ray, English sole, leopard shark, Black-tail Bay shrimp, California Bay shrimp, Dungeness crab, Harbor seal, salt-marsh harvest mouse, saltmarsh wandering shrew, San Pablo vole	California Brown Pelican, California Clapper rail, Chinook Salmon, Green sturgeon, rainbow trout, salt-marsh harvest mouse,
			Mixed sand and gravel beaches and exposed rocky shore		Eelgrass, Dabbling ducks, shorebirds, wading birds, California Brown Pelican, Western gull, Pacific herring	California Brown Pelican, Pacific herring

TABLE D.1-1 (Continued)
IDENTIFICATION OF POTENTIAL AREAS OF IMPACT AND SENSITIVE BIOTA FROM CRUDE OIL SPILLS

Spill Model		NOAA ESRI Map #	Habitats Effected		NOAA Identified Species of Concern	Special Status Species
No.	Scenario		50-80% Probability of Spill Impact	>80% Probability of Spill Impact		
		SF-16	Exposed rocky shore, mixed with fine to medium grained beaches		California halibut, Pacific herring, American shad, bat ray, brown rockfish, Chinook salmon, leopard shark, stripped bass, white croaker, shorebirds, wading birds, pelagic cormorant, pigeon guillemot, Western gull, Peregrine falcon, Harbor seal, Eelgrass, Black-tail bay shrimp, California Bay shrimp, Dungeness crab	Chinook salmon, Pacific herring, Peregrine falcon
		SF-8	Sheltered tidal flats, mixed with fine to medium sand beaches and riprap		Shorebirds, Wading birds, dabbling ducks, Western gull, Black-tail bay shrimp, California Bay shrimp, Dungeness crab, pacific rock crab, red rock crab, Double-crested cormorant, gulls, California Black rail, California Clapper rail, Western gull, Mason's lilaeopsis	Salt marsh harvest mouse, Suisun ornate shrew, California Black rail, California Clapper rail
			Tidal Marsh, muted tidal marsh, managed marshes, and diked marshes		Shorebirds, Wading birds, dabbling ducks, Western gull, California Black rail, California Clapper rail, Double-crested cormorant, Salt marsh harvest mouse, Suisun ornate shrew, San Pablo vole, eelgrass, Ambiguous Indian paintbrush, soft bird's-beak Yellowray goldfields	California Black rail, California Clapper rail, Salt marsh harvest mouse
			Channel		Black-tail bay shrimp, California Bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon	Chinook Salmon, Delta Smelt
		SF-9		Mixed sand and gravel beaches	Shore birds, Wading birds, canvas backs, dabbling ducks, diving ducks, Western grebe, Western gull, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white croaker, white sturgeon, Dungeness crab	Chinook Salmon, Delta Smelt, Longfin smelt, Green sturgeon
				Rocky intertidal	Delta Tule pea, Western gull, Shore birds, Wading birds, canvas backs, dabbling ducks, diving ducks, Western grebe, Western gull	
				Tidal Marshes	Soft bird's-beak, Mason's lilaeopsis, California Black rail, California Clapper rail	Soft bird's-beak, California Black rail, California Clapper rail
				Channel	Canvas backs, ruddy ducks, diving ducks, California Bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white sturgeon, white croaker	Chinook Salmon, Delta Smelt, Longfin smelt, Green sturgeon
		SF-10		Tidal marshes, managed marshes, muted tidal marshes, sheltered tidal flats	Gulls, shorebirds, wading birds, Canvasbacks, diving ducks, ruddy ducks, California clapper rail, Salt marsh common yellowthroat, Suisun song sparrow, California black rail, Delta tule pea, California bay shrimp, Dungeness crab, American shad, Chinook Salmon, Delta Smelt, Green sturgeon, Longfin smelt, stripped bass, white croaker, white sturgeon, Peregrine falcon, Western gull, salt-marsh harvest mouse, harbor seal	California Black rail, Chinook Salmon, Delta Smelt, Longfin smelt, Peregrine falcon, Green sturgeon, salt-marsh harvest mouse

ENVIRONMENTAL SENSITIVITY INDEX MAP



SHORELINE HABITATS

- 1A EXPOSED ROCKY SHORES
- 1B EXPOSED, SOLID MAN – MADE STRUCTURES
- 2A EXPOSED WAVE – CUT PLATFORMS IN BEDROCK
- 3A FINE – TO MEDIUM – GRAINED SAND BEACHES
- 3B SCARPS AND STEEP SLOPES IN SAND
- 4 COARSE – GRAINED SAND BEACHES
- 5 MIXED SAND AND GRAVEL BEACHES
- 6A GRAVEL BEACHES
- 6B RIPRAP
- 7 EXPOSED TIDAL FLATS
- 8A SHELTERED ROCKY SHORES
- 8B SHELTERED, SOLID MAN – MADE STRUCTURES
- 8C SHELTERED RIPRAP
- 9A SHELTERED TIDAL FLATS
- 9B VEGETATED LOW RIVERINE BANKS
- 10A SALT – AND BRACKISH – WATER MARSHES
- TIDAL MARSHES
- MUTED TIDAL MARSHES
- MANAGED MARSHES
- DIKED MARSHES
- SALT PONDS

N W E S

SCALE 1:45000

1 .5 0 1 KILOMETER

1 .5 0 1 MILE

Not For Navigation

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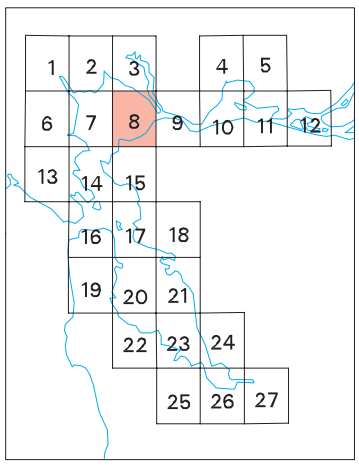


MARE ISLAND, CA. (1980) SF-8

SAN FRANCISCO BAY – ESIMAP 8

BIOLOGICAL RESOURCES:

BIRD:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Nesting	Laying	Hatching	Fledging
5	California black rail	S	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
	California clapper rail	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUL	-	-	-
15	Shorebirds			HIGH	X	X	X	X	X		X	X	X	X	X	X	-	-	-	-
	Wading birds			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
16	Dabbling ducks			HIGH	X	X	X	X					X	X	X	X	-	-	-	-
	Shorebirds			HIGH	X	X	X	X	X		X	X	X	X	X	X	-	-	-	-
	Wading birds			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
17	Canvasback			MEDIUM	X	X	X	X						X	X	X	-	-	-	-
	Diving ducks			HIGH	X	X	X	X						X	X	X	-	-	-	-
	Ruddy duck			MEDIUM	X	X	X	X					X	X	X	X	-	-	-	-
22	California clapper rail	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUL	-	-	-
28	American coot			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
	American white pelican			HIGH				X	X	X	X	X	X				-	-	-	-
	Canvasback			HIGH	X	X	X	X						X	X	X	-	-	-	-
	Diving ducks			HIGH	X	X	X	X						X	X	X	-	-	-	-
	Forster's tern			20			X	X	X	X	X	X					APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
	Gulls			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
	Terns			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
	Western grebe			HIGH	X	X	X	X	X					X	X	X	-	-	-	-
33	California black rail	S	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
	California clapper rail	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUL	-	-	-
	Saltmarsh common yellowthroat			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
37	American avocet			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	MAR-SEP	MAR-JUN	MAY-JUL	JUL-SEP
	American coot			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
	Black-necked stilt			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	MAR-SEP	MAR-JUN	MAY-JUL	JUL-SEP
	Canvasback			HIGH	X	X	X	X						X	X	X	-	-	-	-
	Dabbling ducks			HIGH	X	X	X	X					X	X	X	X	-	-	-	-
	Diving ducks			HIGH	X	X	X	X						X	X	X	-	-	-	-
	Northern pintail			HIGH	X	X	X					X	X	X	X	X	-	-	-	-
	Red-necked (Northern) phalarope			LOW						X	X	X					-	-	-	-
	Ruddy duck			HIGH	X	X	X	X					X	X	X	X	-	-	-	-
	Shorebirds			HIGH	X	X	X	X	X		X	X	X	X	X	X	-	-	-	-
	Western snowy plover	F	T	LOW		X	X	X	X	X	X	X	X				-	-	-	-
56	Shorebirds			LOW	X	X	X	X	X		X	X	X	X	X	X	-	-	-	-
	Wading birds			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
64	California black rail	S	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
69	Western gull			1	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
79	Double-crested cormorant			20	X	X	X	X	X	X	X	X	X	X	X	X	MAR-AUG	MAR-MAY	MAR-JUN	MAY-AUG
80	Western gull			3	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
81	Double-crested cormorant			4	X	X	X	X	X	X	X	X	X	X	X	X	MAR-AUG	MAR-MAY	MAR-JUN	MAY-AUG
	Western gull			1	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
82	Western gull			10	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
83	Western gull			11	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
84	California black rail	S	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
	California clapper rail	S/F	E/E	LOW	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUL	-	-	-
293	Great blue heron				X	X	X	X	X	X	X	X	X	X	X	X	JAN-AUG	-	-	-
338	Osprey			PRESENT	X	X								X	X	X	-	-	-	-

FISH:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
18	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	SEP-NOV
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
21	English sole			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	DEC-APR	JAN-DEC	-
	Starry flounder			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	FEB-DEC	JAN-DEC	JAN-DEC
36	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon			LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Delta smelt	S/F	T/T	RARE	X	X	X	X	X	X				X	X	X	JAN-MAY	JAN-MAY	JAN-JUL	MAR-JUL	OCT-JUN
	Rainbow trout (steelhead)	F	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	FEB-JUN	JUL-FEB
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
68	Rainbow trout (steelhead)	F	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	FEB-JUN	JUL-FEB
73	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUL-NOV
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	OCT-MAR
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	FEB-AUG
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	NOV-MAY
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	SEP-NOV
	White croaker			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	SEP-MAR	JAN-DEC	-
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
74	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	California halibut			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	OCT-MAR	JAN-DEC	JAN-DEC
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	SEP-NOV
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
86	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon			LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Delta smelt	S/F	T/T	RARE	X	X	X	X	X	X				X	X	X	JAN-MAY	JAN-MAY	JAN-JUL	MAR-JUL	OCT-JUN
	Rainbow trout (steelhead)	F	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	FEB-JUN	JUL-FEB
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
87	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUL-NOV
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	OCT-MAR
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	FEB-AUG
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	NOV-MAY
	Delta smelt	S/F	T/T	RARE	X	X		X	X	X	X	X	X	X	X	X	-	-	APR-JUN	APR-AUG	AUG-FEB
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Longfin smelt			HIGH	X	X	X	X									-	JAN-MAR	JAN-APR	APR-APR	-
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUN-AUG
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
88	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	English sole			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	DEC-APR	JAN-DEC	-
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	SEP-NOV
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
89	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Delta smelt	S/F	T/T	RARE	X	X		X	X	X	X	X	X	X	X	X	-	-	APR-JUN	APR-AUG	AUG-FEB
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Longfin smelt			HIGH	X	X	X	X									-	JAN-MAR	JAN-APR	APR-APR	-
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUN-AUG
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC

SAN FRANCISCO BAY – ESIMAP 8 (continued)

BIOLOGICAL RESOURCES (continued):

HABITAT/PLANT:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D
30	Mason's lilaeopsis			POTENTIAL	X	X	X	X	X	X	X	X	X	X	X	X
84	Ambiguous indian paintbrush			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
	Soft bird's-beak	F	E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
	Yellowray goldfields			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
85	Eelgrass				X	X	X	X	X	X	X	X	X	X	X	X
90	Mason's lilaeopsis			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
305	Mason's lilaeopsis			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
327	Soft bird's-beak	F	E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X

INVERTEBRATE:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
18	Blacktail bay shrimp			MEDIUM	X	X	X	X	X	X	X	X	X	X	X		-	-	MAR-SEP	MAR-OCT	JAN-NOV
	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV
	Dungeness crab			HIGH				X	X	X	X	X	X	X	X	X	-	-	-	APR-DEC	-
36	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV
	Dungeness crab			HIGH				X	X	X	X	X	X	X	X	X	-	-	-	APR-DEC	-
73	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X			JAN-MAR	JAN-SEP	MAR-SEP	-	JAN-NOV
	Dungeness crab			HIGH	X	X		X	X	X				X	X		-	-	-	APR-JUN NOV-FEB	-
74	Blacktail bay shrimp			MEDIUM	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV
	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV
	Dungeness crab			HIGH				X	X	X	X	X	X	X	X	X	-	-	-	APR-DEC	-
77	Pacific rock crab			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Red rock crab			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
86	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV
	Dungeness crab			HIGH				X	X	X	X	X	X	X	X	X	-	-	-	APR-DEC	-
87	Dungeness crab			HIGH	X	X		X	X	X				X	X		-	-	-	APR-JUN NOV-FEB	-
88	Blacktail bay shrimp			MEDIUM	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV
	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV
	Dungeness crab			HIGH				X	X	X	X	X	X	X	X	X	-	-	-	APR-DEC	-
89	Dungeness crab			HIGH				X	X	X	X	X	X	X	X	X	-	-	-	APR-DEC	-

TERRESTRIAL MAMMAL:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D
5	Salt-marsh harvest mouse	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
33	Salt-marsh harvest mouse	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
36	Northern river otter			HIGH	X	X	X	X	X	X	X	X	X	X	X	X
41	Salt-marsh harvest mouse	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
	Suisun ornate shrew			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
84	San Pablo vole			LOW	X	X	X	X	X	X	X	X	X	X	X	X
298	Salt-marsh harvest mouse	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
328	Suisun ornate shrew			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X

HUMAN USE RESOURCES:

BOAT RAMP:

HUN#	Name
29	BOAT RAMP

MARINA:

HUN#	Name
101	CURTOLA PARKWAY RAMP
121	JOSEPHS FISHING RESORT
174	RODEO MARINA
198	VALLEJO MUNICIPAL MARINA
199	VALLEJO YACHT CLUB

STATE/REGIONAL PARK:

HUN#	Name	Owner	Contact	Phone
228	LEONA HEIGHTS OPEN SPACE REGIONAL PRES.	EBRP	DISPATCH	510-881-1833
243	POINT PINOLE REGIONAL SHORELINE	EBRP	DISPATCH	510-881-1833
244	POINT PINOLE STATE FISHING PIER		EBRP DISPATCH	510-881-1833
249	SAN PABLO BAY REGIONAL SHORELINE	EBRP	DISPATCH	510-881-1833

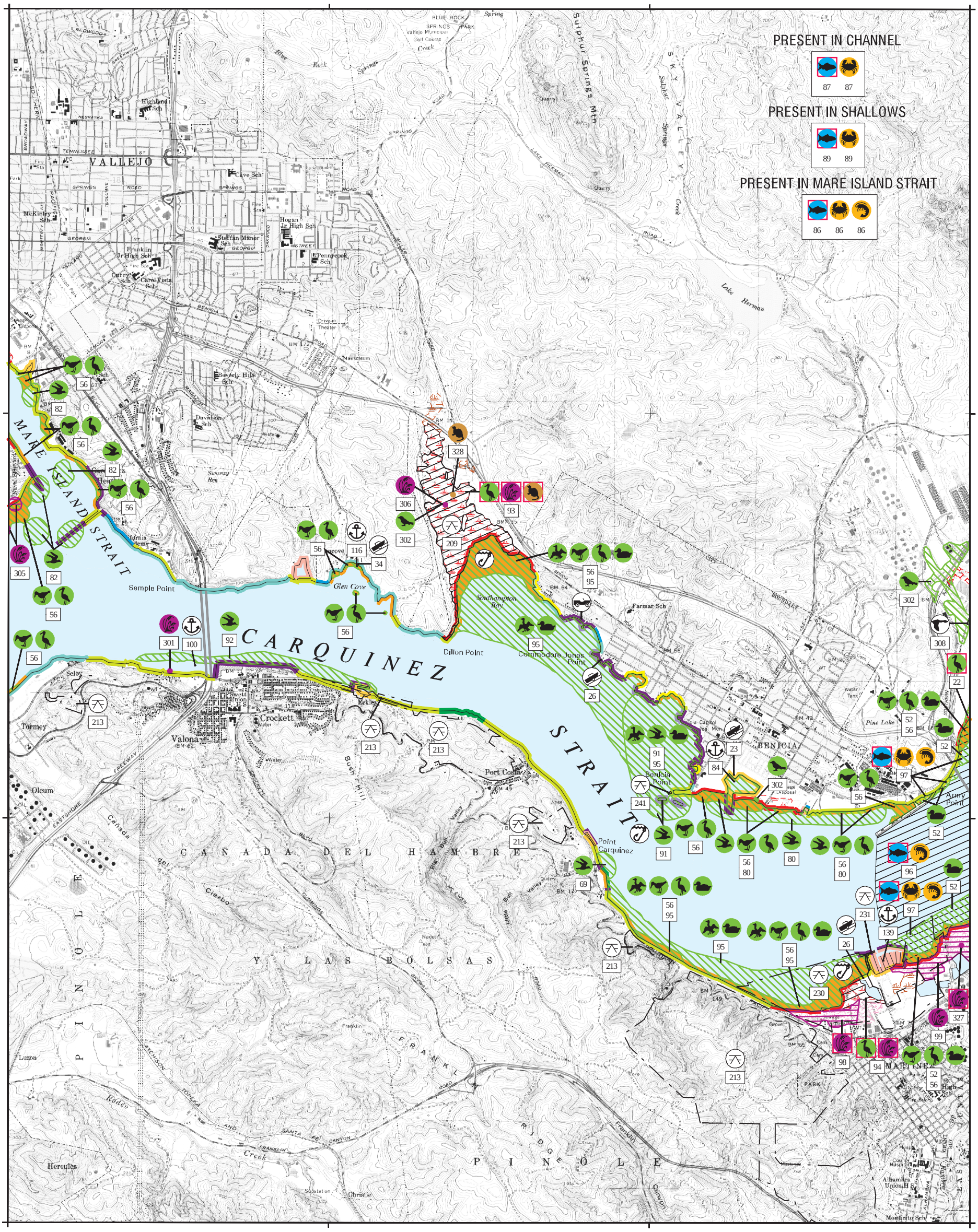
WATER_INTAKE:

HUN#	Name	Owner	Contact	Phone
298	MARE ISLAND POWER PLANT	NAVAL SHIPYARD		

WILDLIFE REFUGE/MGMT AREA:

HUN#	Name	Owner	Contact	Phone
313	NAPA-SONOMA MARSHES STATE WILDLIFE AREA	CDFG	REGIONAL OFFICE	707-944-5500
319	SAN PABLO BAY NATIONAL WILDLIFE REFUGE	USFWS	REFUGE MANAGER	510-792-0222

ENVIRONMENTAL SENSITIVITY INDEX MAP



SHORELINE HABITATS

- 1A EXPOSED ROCKY SHORES
- 1B EXPOSED, SOLID MAN – MADE STRUCTURES
- 2A EXPOSED WAVE – CUT PLATFORMS IN BEDROCK
- 3A FINE – TO MEDIUM – GRAINED SAND BEACHES
- 3B SCARPS AND STEEP SLOPES IN SAND
- 4 COARSE – GRAINED SAND BEACHES
- 5 MIXED SAND AND GRAVEL BEACHES
- 6A GRAVEL BEACHES
- 6B RIPRAP
- 7 EXPOSED TIDAL FLATS
- 8A SHELTERED ROCKY SHORES
- 8B SHELTERED, SOLID MAN – MADE STRUCTURES
- 8C SHELTERED RIPRAP
- 9A SHELTERED TIDAL FLATS
- 9B VEGETATED LOW RIVERINE BANKS
- 10A SALT – AND BRACKISH – WATER MARSHES
- TIDAL MARSHES
- MUTED TIDAL MARSHES
- MANAGED MARSHES
- DIKED MARSHES
- SALT PONDS

N W E S

SCALE 1:45000

1 .5 0 1 KILOMETER

1 .5 0 1 MILE

Not For Navigation

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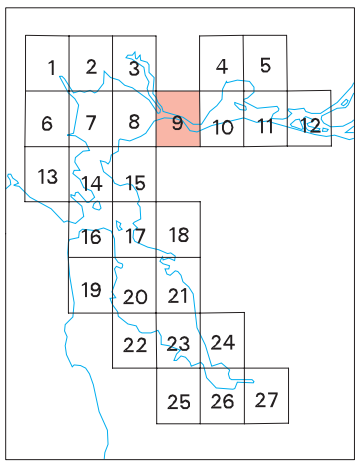


BENICIA, CA. (1980) SF-9

SAN FRANCISCO BAY – ESIMAP 9

BIOLOGICAL RESOURCES:

BIRD:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Nesting	Laying	Hatching	Fledging
22	California clapper rail	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUL	-	-	-
52	Canvasback			MEDIUM	X	X	X	X						X	X	X	-	-	-	-
	Diving ducks			HIGH	X	X	X	X						X	X	X	-	-	-	-
	Ruddy duck			LOW	X	X	X	X					X	X	X	X	-	-	-	-
56	Shorebirds			LOW	X	X	X	X	X		X	X	X	X	X	X	-	-	-	-
	Wading birds			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
69	Western gull			1	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
80	Western gull			3	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
82	Western gull			10	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
91	Western gull			5	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
92	Western gull			2	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
93	California black rail	S	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
	California clapper rail	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUL	-	-	-
94	California clapper rail	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUL	-	-	-
95	Canvasback			HIGH	X	X	X	X						X	X	X	-	-	-	-
	Dabbling ducks			HIGH	X	X	X	X					X	X	X	X	-	-	-	-
	Diving ducks			HIGH	X	X	X	X						X	X	X	-	-	-	-
	Western grebe			HIGH	X	X	X	X	X					X	X	X	-	-	-	-
302	Suisun song sparrow			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	FEB-JUN	-	-	-

FISH:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
86	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon			LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Delta smelt	S/F	T/T	RARE	X	X	X	X	X	X	X			X	X	X	JAN-MAY	JAN-MAY	JAN-JUL	MAR-JUL	OCT-JUN
	Rainbow trout (steelhead)	F	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	FEB-JUN	JUL-FEB
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
87	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUL-NOV
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	OCT-MAR
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	FEB-AUG
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	NOV-MAY
	Delta smelt	S/F	T/T	RARE	X	X		X	X	X	X	X	X	X	X	X	-	-	APR-JUN	APR-AUG	AUG-FEB
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Longfin smelt			HIGH	X	X	X	X									-	JAN-MAR	JAN-APR	APR-APR	-
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUN-AUG
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
96	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUL-NOV
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	OCT-MAR
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	FEB-AUG
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	NOV-MAY
	Delta smelt	S/F	T/T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	APR-JUN	APR-AUG	JAN-DEC
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Longfin smelt			HIGH	X	X	X	X									-	JAN-MAR	JAN-APR	APR-APR	-
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	APR-MAY	APR-JUN	JAN-DEC	SEP-MAY
	White croaker			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	SEP-MAR	JAN-DEC	-
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
97	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUL-NOV
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	OCT-MAR
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	FEB-AUG
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	NOV-MAY
	Delta smelt	S/F	T/T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	APR-JUN	APR-AUG	JAN-DEC
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Longfin smelt			HIGH	X	X	X	X									-	JAN-MAR	JAN-APR	APR-APR	-
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	APR-MAY	APR-JUN	JAN-DEC	SEP-MAY
	White croaker			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	SEP-MAR	JAN-DEC	-
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC

HABITAT/PLANT:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D
93	Soft bird's-beak	F	E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
94	Soft bird's-beak	F	E	LOW	X	X	X	X	X	X	X	X	X	X	X	X
98	Soft bird's-beak	F	E	LOW	X	X	X	X	X	X	X	X	X	X	X	X
99	Delta tule pea			LOW	X	X	X	X	X	X	X	X	X	X	X	X
301	Delta tule pea			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
305	Mason's lilaeopsis			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
306	Suisun marsh aster			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
327	Soft bird's-beak	F	E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X

INVERTEBRATE:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
86	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV
	Dungeness crab			HIGH				X	X	X	X	X	X	X	X		-	-	-	APR-DEC	-
87	Dungeness crab			HIGH	X	X		X	X	X				X	X		-	-	-	APR-JUN NOV-FEB	-
89	Dungeness crab			HIGH				X	X	X	X	X	X	X	X	X	-	-	-	APR-DEC	-
96	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X	X		JAN-MAR	JAN-SEP	MAR-SEP	-	JAN-NOV
97	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X	X		-	-	MAR-SEP	MAR-OCT	JAN-NOV
	Dungeness crab			HIGH				X	X	X	X	X	X	X	X	X	-	-	-	APR-DEC	-

TERRESTRIAL MAMMAL:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D
93	Salt-marsh harvest mouse	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
328	Suisun ornate shrew			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X

HUMAN USE RESOURCES:

BOAT RAMP:

HUN#	Name
23	BENICIA MARINA BOAT RAMP
26	BOAT RAMP
34	GLEN COVE WATERFRONT PARK AND MARINA

MARINA:

HUN#	Name
84	BENECIA MARINA
100	CROCKETT MARINE SERVICE
116	GLEN COVE MARINA
139	MARTINEZ MARINA

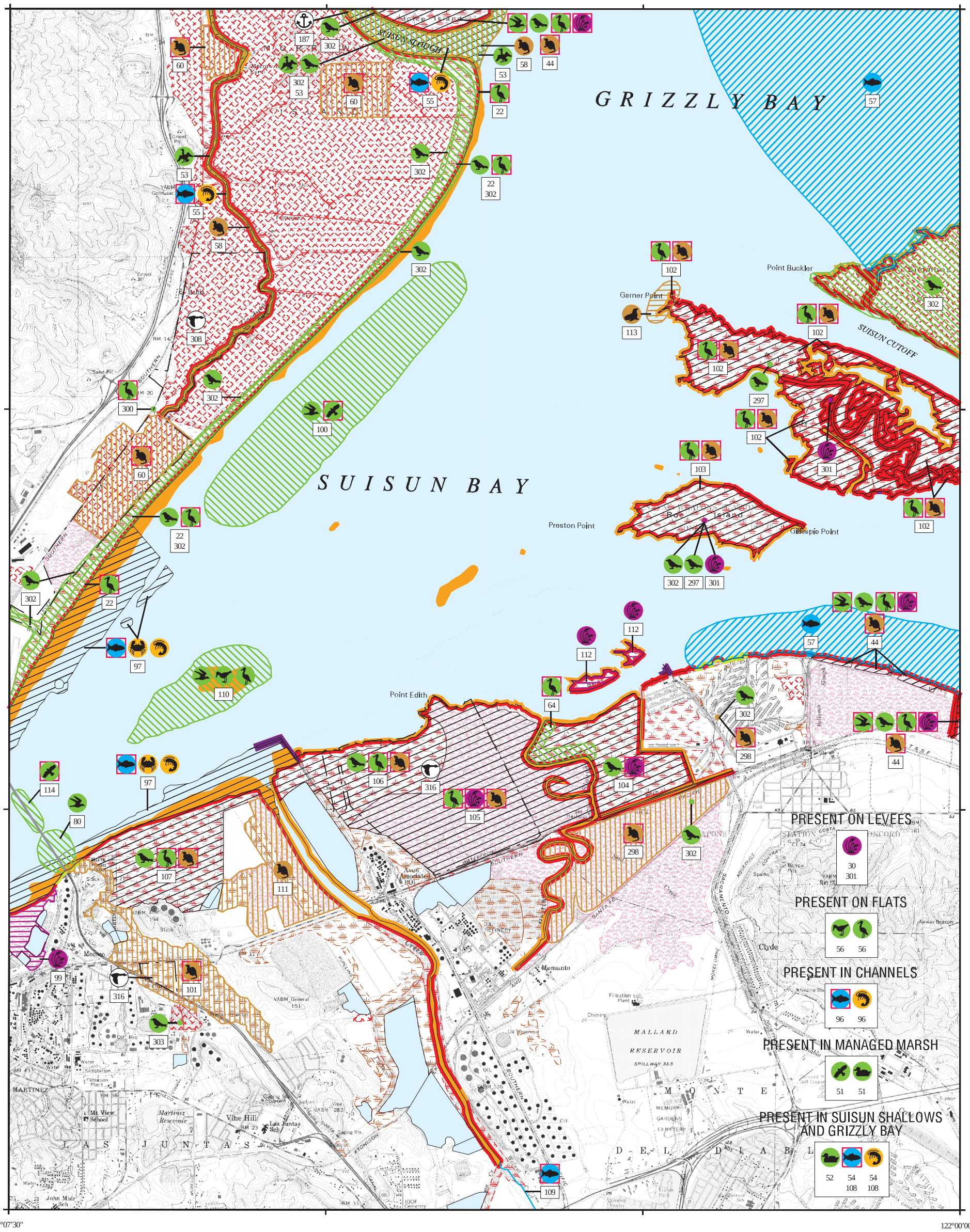
STATE/REGIONAL PARK:

HUN#	Name	Owner	Contact	Phone
209	BENICIA STATE RECREATION AREA	CDPR	DISPATCH	916-988-7322
213	CARQUINEZ STRAIT REGIONAL SHORELINE	EBRP	DISPATCH	510-881-1833
230	MARTINEZ REGIONAL SHORELINE	EBRP	DISPATCH	510-881-1833
231	MARTINEZ STATE FISHING PIER			
241	POINT BENICIA STATE FISHING PIER			

WILDLIFE REFUGE/MGMT AREA:

HUN#	Name	Owner	Contact	Phone
308	GRIZZLY ISLAND STATE WILDLIFE AREA	CDFG	MANAGER	707-425-3828

ENVIRONMENTAL SENSITIVITY INDEX MAP



SHORELINE HABITATS

- 1A EXPOSED ROCKY SHORES
- 1B EXPOSED, SOLID MAN – MADE STRUCTURES
- 2A EXPOSED WAVE – CUT PLATFORMS IN BEDROCK
- 3A FINE – TO MEDIUM – GRAINED SAND BEACHES
- 3B SCARPS AND STEEP SLOPES IN SAND
- 4 COARSE – GRAINED SAND BEACHES
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- MUTED TIDAL MARSHES
- MANAGED MARSHES
- DIKED MARSHES
- SALT PONDS

SCALE 1:45000

1 .5 0 1 KILOMETER

1 .5 0 1 MILE

Not For Navigation

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Office of Response and Restoration
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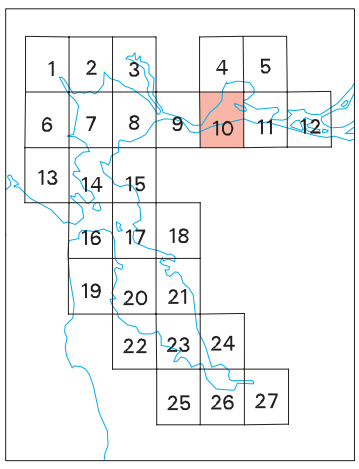


VINE HILL, CA. (1980) SF-10

SAN FRANCISCO BAY – ESIMAP 10

BIOLOGICAL RESOURCES:

BIRD:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Nesting	Laying	Hatching	Fledging
22	California clapper rail	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUL	-	-	-
44	California black rail	S	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
	California least tern	S/F	E/E	LOW				X	X	X	X	X	X				MAY-AUG	MAY-JUN	JUN-JUL	JUN-AUG
	Suisun song sparrow			LOW	X	X	X	X	X	X	X	X	X	X	X	X	FEB-JUN	-	-	-
51	Canada goose			2000	X	X	X	X					X	X	X	X	-	-	-	-
	Canvasback			MEDIUM	X	X	X	X						X	X	X	-	-	-	-
	Dabbling ducks			HIGH	X	X	X	X					X	X	X	X	-	-	-	-
	Greater white-fronted goose			1000	X	X	X	X					X	X	X	X	-	-	-	-
	Northern pintail			HIGH	X	X	X					X	X	X	X	X	-	-	-	-
	Ruddy duck			MEDIUM	X	X	X	X					X	X	X	X	-	-	-	-
	Short-eared owl			PRESENT			X	X	X	X	X	X	X	X	X		MAR-JUL	-	-	-
	Snow goose			200	X	X	X	X						X	X	X	-	-	-	-
	Tundra (whistling) swan			200	X	X	X							X	X	X	-	-	-	-
52	Canvasback			MEDIUM	X	X	X	X						X	X	X	-	-	-	-
	Diving ducks			HIGH	X	X	X	X						X	X	X	-	-	-	-
	Ruddy duck			LOW	X	X	X	X					X	X	X	X	-	-	-	-
53	Clark's grebe			HIGH	X	X	X	X	X					X	X	X	-	-	-	-
	Western grebe			HIGH	X	X	X	X	X					X	X	X	-	-	-	-
56	Shorebirds			LOW	X	X	X	X	X		X	X	X	X	X	X	-	-	-	-
	Wading birds			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
64	California black rail	S	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
80	Western gull			3	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
100	Peregrine falcon	S/F	E/E	LOW	X	X									X	X	-	-	-	-
	Western gull				X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
102	California black rail	S	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
	California clapper rail	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUL	-	-	-
103	California black rail	S	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
104	Suisun song sparrow			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	FEB-JUN	-	-	-
105	California clapper rail	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUL	-	-	-
106	California black rail	S	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
	California clapper rail	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUL	-	-	-
	Saltmarsh common yellowthroat			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
	Suisun song sparrow			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	FEB-JUN	-	-	-
107	California black rail	S	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
	Saltmarsh common yellowthroat			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
110	Gulls			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
	Shorebirds			HIGH	X	X	X	X	X		X	X	X	X	X	X	-	-	-	-
	Wading birds			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
114	Peregrine falcon	S/F	E/E				X	X	X	X	X	X					-	-	-	-
297	Saltmarsh common yellowthroat			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
300	California black rail	S	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
302	Suisun song sparrow			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	FEB-JUN	-	-	-
303	Tricolored blackbird			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-

FISH:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
54	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Delta smelt	S/F	T/T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	APR-JUN	APR-AUG	JAN-DEC
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Starry flounder			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	FEB-DEC	JAN-DEC	JAN-DEC
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	APR-MAY	APR-JUN	JAN-DEC	SEP-MAY
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
55	Delta smelt	S/F	T/T	LOW	X	X	X	X	X	X	X	X	X				JAN-JUN	JAN-JUN	JAN-JUL	APR-SEP	JAN-JUL
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	APR-MAY	APR-JUN	JAN-DEC	-
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
57	Sacramento splittail			HIGH						X	X	X	X	X	X		-	-	-	JUN-NOV	JUN-NOV
96	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUL-NOV
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	OCT-MAR
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	FEB-AUG
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	NOV-MAY
	Delta smelt	S/F	T/T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	APR-JUN	APR-AUG	JAN-DEC
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Longfin smelt			HIGH	X	X	X	X									-	JAN-MAR	JAN-APR	APR-APR	-
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	APR-MAY	APR-JUN	JAN-DEC	SEP-MAY
	White croaker			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	SEP-MAR	JAN-DEC	-
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
97	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUL-NOV
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	OCT-MAR
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	FEB-AUG
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	NOV-MAY
	Delta smelt	S/F	T/T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	APR-JUN	APR-AUG	JAN-DEC
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Longfin smelt			HIGH	X	X	X	X									-	JAN-MAR	JAN-APR	APR-APR	-
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	APR-MAY	APR-JUN	JAN-DEC	SEP-MAY
	White croaker			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	SEP-MAR	JAN-DEC	-
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
108	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUL-NOV
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	OCT-MAR
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	FEB-AUG
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	NOV-MAY
	Delta smelt	S/F	T/T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	APR-JUN	APR-AUG	JAN-DEC
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Longfin smelt			HIGH	X	X	X	X									-	JAN-MAR	JAN-APR	APR-APR	-
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	APR-MAY	APR-JUN	JAN-DEC	SEP-MAY
	White croaker			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	SEP-MAR	JAN-DEC	-
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
109	Chinook salmon			LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Rainbow trout (steelhead)	F	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	FEB-JUN	JUL-FEB

HABITAT/PLANT:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D
30	Mason's lilaeopsis			POTENTIAL	X	X	X	X	X	X	X	X	X	X	X	X
44	Soft bird's-beak	F	E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
99	Delta tule pea			LOW	X	X	X	X	X	X	X	X	X	X	X	X
104	Soft bird's-beak	F	E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
105	Soft bird's-beak	F	E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
112	Delta tule pea			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X
301	Delta tule pea			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X

INVERTEBRATE:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
54	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV
55	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV
96	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X			JAN-MAR	JAN-SEP	MAR-SEP	-	JAN-NOV
97	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV
	Dungeness crab			HIGH				X	X	X	X	X	X	X	X		-	-	-	APR-DEC	-
108	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV

MARINE MAMMAL:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Mating	Calving	Pupping	Molting
113	Harbor seal			21	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-

SAN FRANCISCO BAY – ESIMAP 10 (continued)

BIOLOGICAL RESOURCES (continued):

TERRESTRIAL MAMMAL:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D
44	Salt-marsh harvest mouse	S/F	E/E	LOW	X	X	X	X	X	X	X	X	X	X	X	X
58	Northern river otter			HIGH	X	X	X	X	X	X	X	X	X	X	X	X
60	Salt-marsh harvest mouse	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
101	Salt-marsh harvest mouse	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
	Saltmarsh wandering shrew			LOW	X	X	X	X	X	X	X	X	X	X	X	X
102	Salt-marsh harvest mouse	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
103	Salt-marsh harvest mouse	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
105	Salt-marsh harvest mouse	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
106	Salt-marsh harvest mouse	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
107	Salt-marsh harvest mouse	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
	Saltmarsh wandering shrew			LOW	X	X	X	X	X	X	X	X	X	X	X	X
111	Saltmarsh wandering shrew			LOW	X	X	X	X	X	X	X	X	X	X	X	X
298	Salt-marsh harvest mouse	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X

HUMAN USE RESOURCES:

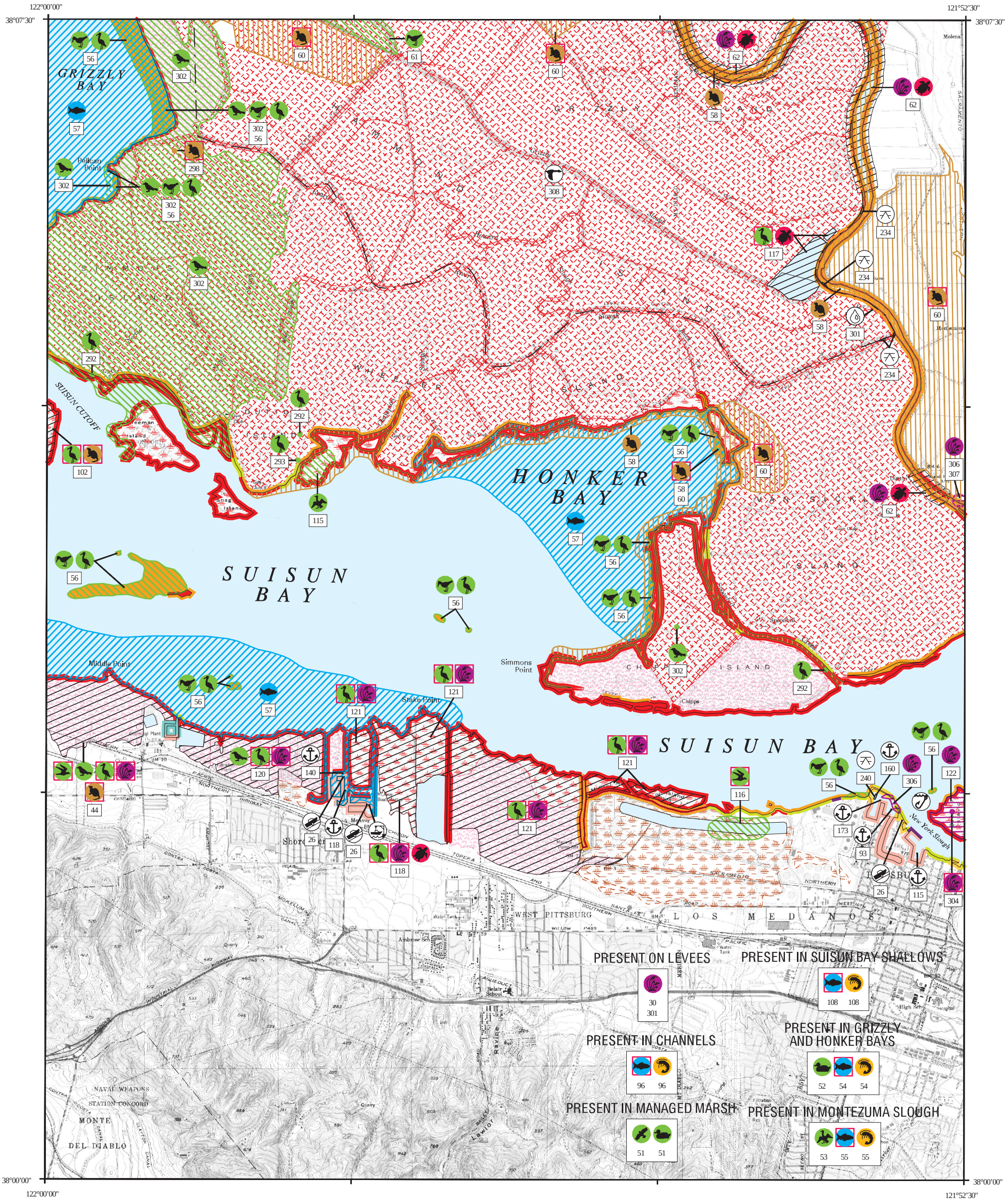
MARINA:

HUN#	Name
187	SOLANO YACHT CLUB

WILDLIFE REFUGE/MGMT AREA:

HUN#	Name	Owner	Contact	Phone
308	GRIZZLY ISLAND STATE WILDLIFE AREA	CDFG	MANAGER	707-425-3828
316	POINT EDITH STATE WILDLIFE AREA	CDFG	REGIONAL OFFICE	707-944-5500

ENVIRONMENTAL SENSITIVITY INDEX MAP



SHORELINE HABITATS

- 1A EXPOSED ROCKY SHORES
  1B EXPOSED, SOLID MAN – MADE STRUCTURES
- 2A EXPOSED WAVE – CUT PLATFORMS IN BEDROCK
- 3A FINE – TO MEDIUM – GRAINED SAND BEACHES
  3B SCARPS AND STEEP SLOPES IN SAND
- 4 COARSE – GRAINED SAND BEACHES
- 5 MIXED SAND AND GRAVEL BEACHES
- 6A GRAVEL BEACHES
- 6B RIPRAP
- 7 EXPOSED TIDAL FLATS
- 8A SHELTERED ROCKY SHORES
- 8B SHELTERED, SOLID MAN – MADE STRUCTURES
- 8C SHELTERED RIPRAP
- 9A SHELTERED TIDAL FLATS
  9B VEGETATED LOW RIVERINE BANKS
- 10A SALT – AND BRACKISH – WATER MARSHES
- TIDAL MARSHES
- MUTED TIDAL MARSHES
- MANAGED MARSHES
- DIKED MARSHES
- SALT PONDS

N W E S

SCALE 1:45000

1 .5 0 1 KILOMETER

1 .5 0 1 MILE

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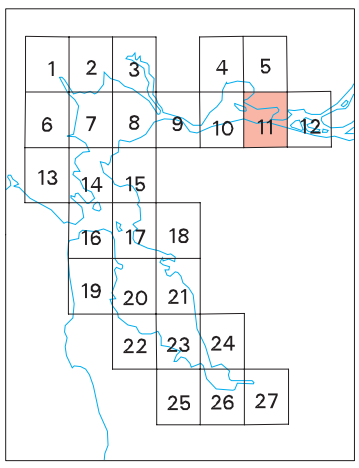
Hazardous Materials Response Division



HONKER BAY, CA. (1980) SF-11

SAN FRANCISCO BAY – ESIMAP 11

BIOLOGICAL RESOURCES:

BIRD:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Nesting	Laying	Hatching	Fledging
44	California black rail	S	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
	California least tern	S/F	E/E	LOW				X	X	X	X	X	X				MAY-AUG	MAY-JUN	JUN-JUL	JUN-AUG
	Suisun song sparrow			LOW	X	X	X	X	X	X	X	X	X	X	X	X	FEB-JUN	-	-	-
52	Canvasback			MEDIUM	X	X	X	X						X	X	X	-	-	-	-
	Diving ducks			HIGH	X	X	X	X						X	X	X	-	-	-	-
	Ruddy duck			LOW	X	X	X	X					X	X	X	X	-	-	-	-
53	Clark's grebe			HIGH	X	X	X	X	X					X	X	X	-	-	-	-
	Western grebe			HIGH	X	X	X	X	X					X	X	X	-	-	-	-
56	Shorebirds			LOW	X	X	X	X	X		X	X	X	X	X	X	-	-	-	-
	Wading birds			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
61	Shorebirds			HIGH	X	X	X	X	X		X	X	X	X	X	X	-	-	-	-
51	Canada goose			2000	X	X	X	X					X	X	X	X	-	-	-	-
	Canvasback			MEDIUM	X	X	X	X						X	X	X	-	-	-	-
	Dabbling ducks			HIGH	X	X	X	X					X	X	X	X	-	-	-	-
	Greater white-fronted goose			1000	X	X	X	X					X	X	X	X	-	-	-	-
	Northern pintail			HIGH	X	X	X					X	X	X	X	X	-	-	-	-
	Ruddy duck			MEDIUM	X	X	X	X					X	X	X	X	-	-	-	-
	Short-eared owl			PRESENT			X	X	X	X	X	X	X	X	X		MAR-JUL	-	-	-
	Snow goose			200	X	X	X	X						X	X	X	-	-	-	-
	Tundra (whistling) swan			200	X	X	X							X	X	X	-	-	-	-
115	Double-crested cormorant			27	X	X	X	X	X	X	X	X	X	X	X	X	MAR-AUG	MAR-MAY	MAR-JUN	MAY-AUG
116	California least tern	S/F	E/E	4				X	X	X	X	X	X				MAY-AUG	MAY-JUN	JUN-JUL	JUN-AUG
117	California black rail	S	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
118	California black rail	S	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
120	California black rail	S	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
	Suisun song sparrow			LOW	X	X	X	X	X	X	X	X	X	X	X	X	FEB-JUN	-	-	-
121	California black rail	S	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
292	Great blue heron				X	X	X	X	X	X	X	X	X	X	X	X	JAN-AUG	-	-	-
	Great egret				X	X	X	X	X	X	X	X	X	X	X	X	FEB-AUG	-	-	-
293	Great blue heron				X	X	X	X	X	X	X	X	X	X	X	X	JAN-AUG	-	-	-
302	Suisun song sparrow			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	FEB-JUN	-	-	-

FISH:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
54	American shad			HIGH				X	X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Delta smelt	S/F	T/T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	APR-JUN	APR-AUG	JAN-DEC
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Starry flounder			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	FEB-DEC	JAN-DEC	JAN-DEC
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	APR-MAY	APR-JUN	JAN-DEC	SEP-MAY
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
55	Delta smelt	S/F	T/T	LOW	X	X	X	X	X	X	X	X	X				JAN-JUN	JAN-JUN	JAN-JUL	APR-SEP	JAN-JUL
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	APR-MAY	APR-JUN	JAN-DEC	-
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
57	Sacramento splittail			HIGH					X	X	X	X	X	X			-	-	-	JUN-NOV	JUN-NOV
96	American shad			HIGH				X	X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUL-NOV
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	OCT-MAR
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	FEB-AUG
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	NOV-MAY
	Delta smelt	S/F	T/T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	APR-JUN	APR-AUG	JAN-DEC
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Longfin smelt			HIGH	X	X	X	X									-	JAN-MAR	JAN-APR	APR-APR	-
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	APR-MAY	APR-JUN	JAN-DEC	SEP-MAY
	White croaker			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	SEP-MAR	JAN-DEC	-
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
108	American shad			HIGH				X	X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUL-NOV
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	OCT-MAR
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	FEB-AUG
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	NOV-MAY
	Delta smelt	S/F	T/T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	APR-JUN	APR-AUG	JAN-DEC
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Longfin smelt			HIGH	X	X	X	X									-	JAN-MAR	JAN-APR	APR-APR	-
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	APR-MAY	APR-JUN	JAN-DEC	SEP-MAY
	White croaker			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	SEP-MAR	JAN-DEC	-
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC

HABITAT/PLANT:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D
30	Mason's lilaeopsis			POTENTIAL	X	X	X	X	X	X	X	X	X	X	X	X
44	Soft bird's-beak	F	E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
62	Mason's lilaeopsis			POTENTIAL	X	X	X	X	X	X	X	X	X	X	X	X
118	Soft bird's-beak	F	E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
120	Soft bird's-beak	F	E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
121	Soft bird's-beak	F	E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
122	Delta tule pea			LOW	X	X	X	X	X	X	X	X	X	X	X	X
	Suisun marsh aster			HIGH	X	X	X	X	X	X	X	X	X	X	X	X
301	Delta tule pea			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
304	Antioch dunes evening-primrose	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
306	Suisun marsh aster			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
307	Delta mudwort			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X

INVERTEBRATE:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
54	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X	X		-	-	MAR-SEP	MAR-OCT	JAN-NOV
55	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X	X		-	-	MAR-SEP	MAR-OCT	JAN-NOV
96	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X	X		JAN-MAR	JAN-SEP	MAR-SEP	-	JAN-NOV
108	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X	X		-	-	MAR-SEP	MAR-OCT	JAN-NOV

REPTILE/AMPHIBIAN:

62	Western pond turtle			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	JUN-AUG	-	JAN-DEC	JAN-DEC
117	Western pond turtle			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	JUN-AUG	-	JAN-DEC	JAN-DEC
118	Western pond turtle			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	JUN-AUG	-	JAN-DEC	JAN-DEC

TERRESTRIAL MAMMAL:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D
44	Salt-marsh harvest mouse	S/F	E/E	LOW	X	X	X	X	X	X	X	X	X	X	X	X
58	Northern river otter			HIGH	X	X	X	X	X	X	X	X	X	X	X	X
60	Salt-marsh harvest mouse	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
102	Salt-marsh harvest mouse	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
298	Salt-marsh harvest mouse	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X

SAN FRANCISCO BAY – ESIMAP 11 (continued)

HUMAN USE RESOURCES:

BOAT RAMP:

HUN#	Name
26	BOAT RAMP

MARINA:

HUN#	Name
93	CENTRAL HARBOR MARINA
115	GEORGE LOWY MARINA
118	HARRIS YACHT HARBOR
140	MCAVOY YACHT HARBOR
160	PITTSBURG MARINA
173	RIVERVIEW HARBOR MARINA

STATE/REGIONAL PARK:

HUN#	Name	Owner	Contact	Phone
234	MONTEZUMA SLOUGH STATE PUBLIC ACCESS			
240	PITTSBURG STATE FISHING PIER			

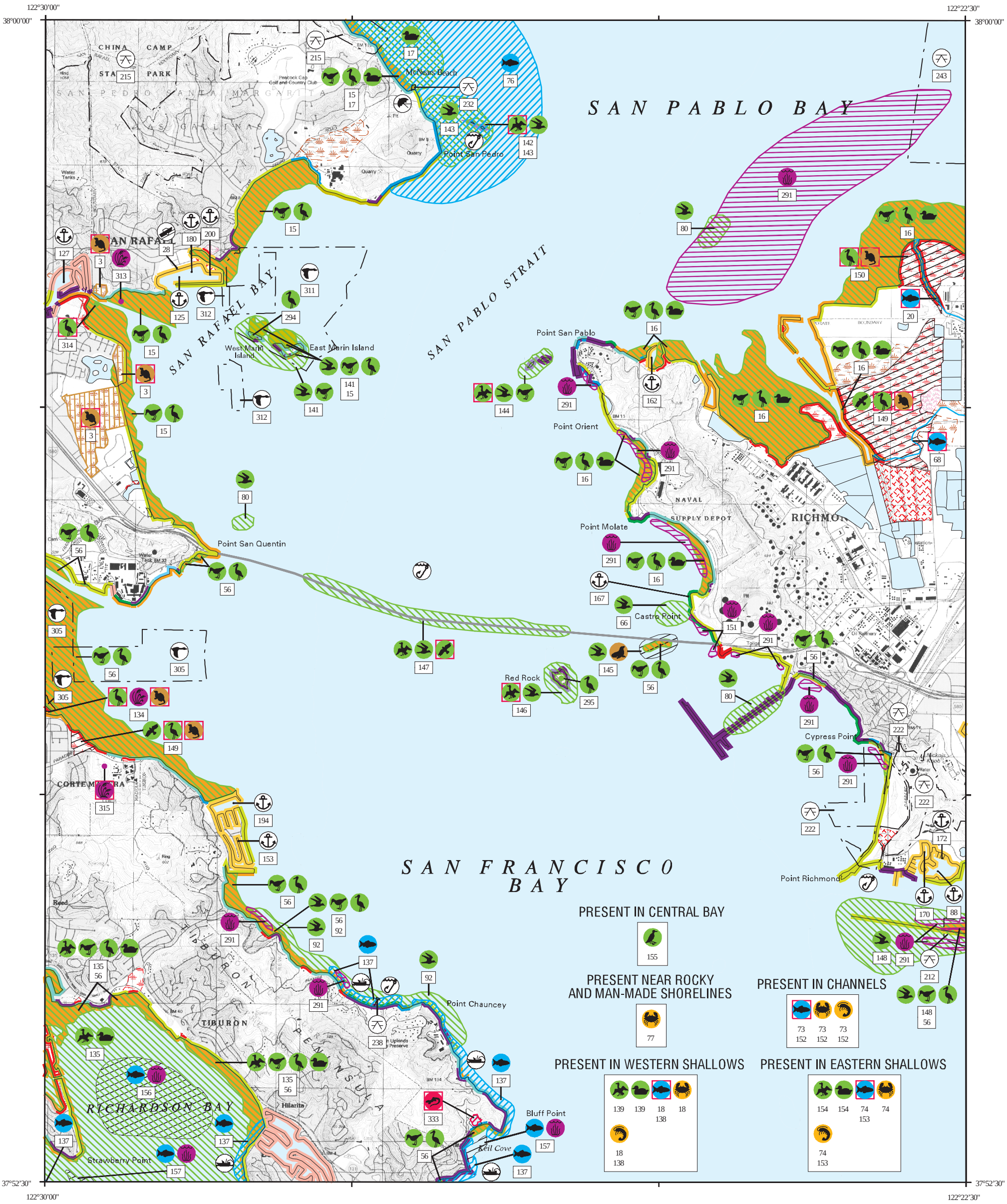
WATER_INTAKE:

HUN#	Name	Owner	Contact	Phone
301	WATER INTAKE	SUISUN RESOURCE CONSERVATION DISTRICT		707-425-9302

WILDLIFE REFUGE/MGMT AREA:

HUN#	Name	Owner	Contact	Phone
308	GRIZZLY ISLAND STATE WILDLIFE AREA	CDFG	MANAGER	707-425-3828

ENVIRONMENTAL SENSITIVITY INDEX MAP



SHORELINE HABITATS

- 1A EXPOSED ROCKY SHORES
- 1B EXPOSED, SOLID MAN – MADE STRUCTURES
- 2A EXPOSED WAVE – CUT PLATFORMS IN BEDROCK
- 3A FINE – TO MEDIUM – GRAINED SAND BEACHES
- 3B SCARPS AND STEEP SLOPES IN SAND
- 4 COARSE – GRAINED SAND BEACHES
- 5 MIXED SAND AND GRAVEL BEACHES
- 6A GRAVEL BEACHES
- 6B RIPRAP
- 7 EXPOSED TIDAL FLATS
- 8A SHELTERED ROCKY SHORES
- 8B SHELTERED, SOLID MAN – MADE STRUCTURES
- 8C SHELTERED RIPRAP
- 9A SHELTERED TIDAL FLATS
- 9B VEGETATED LOW RIVERINE BANKS
- 10A SALT – AND BRACKISH – WATER MARSHES
- TIDAL MARSHES
- MUTED TIDAL MARSHES
- MANAGED MARSHES
- DIKED MARSHES
- SALT PONDS

N W E S

SCALE 1:45000

1 .5 0 1 KILOMETER

1 .5 0 1 MILE

Not For Navigation

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Office of Response and Restoration
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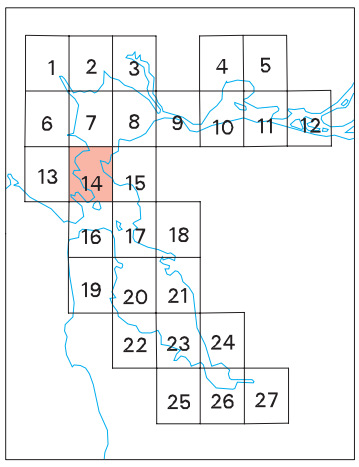


SAN QUENTIN, CA. (1993) SF-14

SAN FRANCISCO BAY – ESIMAP 14

BIOLOGICAL RESOURCES:

BIRD:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Nesting	Laying	Hatching	Fledging
15	Shorebirds			HIGH	X	X	X	X	X		X	X	X	X	X	X	-	-	-	-
	Wading birds			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
16	Dabbling ducks			HIGH	X	X	X	X				X	X	X	X	X	-	-	-	-
	Shorebirds			HIGH	X	X	X	X	X		X	X	X	X	X	X	-	-	-	-
	Wading birds			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
17	Canvasback			MEDIUM	X	X	X	X						X	X	X	-	-	-	-
	Diving ducks			HIGH	X	X	X	X						X	X	X	-	-	-	-
	Ruddy duck			MEDIUM	X	X	X	X					X	X	X	X	-	-	-	-
56	Shorebirds			LOW	X	X	X	X	X		X	X	X	X	X	X	-	-	-	-
	Wading birds			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
66	Western gull			4	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
80	Western gull			3	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
92	Western gull			2	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
134	California black rail	S	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
	California clapper rail	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUL	-	-	-
135	Canvasback			MEDIUM	X	X	X	X						X	X	X	-	-	-	-
	Diving ducks			HIGH	X	X	X	X						X	X	X	-	-	-	-
	Western grebe			VERY HIGH	X	X	X	X	X					X	X	X	-	-	-	-
139	Canvasback			MEDIUM	X	X	X	X						X	X	X	-	-	-	-
	Diving ducks			HIGH	X	X	X	X						X	X	X	-	-	-	-
	Western grebe			HIGH	X	X	X	X	X					X	X	X	-	-	-	-
141	Black oystercatcher			1	X	X	X	X	X	X	X	X	X	X	X	X	MAY-OCT	MAY-JUL	JUN-AUG	JUL-OCT
	Western gull			18	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
142	California brown pelican	S/F	E/E	HIGH					X	X	X	X	X	X	X		-	-	-	-
	Double-crested cormorant			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
	Gulls			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
143	Western gull			48	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
144	Black oystercatcher				X	X	X	X	X	X	X	X	X	X	X	X	MAY-OCT	MAY-JUL	JUN-AUG	JUL-OCT
	California brown pelican	S/F	E/E	HIGH					X	X	X	X	X	X	X		-	-	-	-
	Double-crested cormorant			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
	Gulls			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
	Western gull			89	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
145	Western gull			2	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
146	California brown pelican	S/F	E/E	HIGH					X	X	X	X	X	X	X		-	-	-	-
	Double-crested cormorant			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
	Gulls			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
	Western gull			192	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
147	Double-crested cormorant			389	X	X	X	X	X	X	X	X	X	X	X	X	MAR-AUG	MAR-MAY	MAR-JUN	MAY-AUG
	Peregrine falcon	S/F	E/E	2	X	X	X	X	X	X	X	X	X	X	X	X	MAR-AUG	-	-	-
	Western gull			9	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
148	Western gull			6	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
149	California black rail	S	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
	California clapper rail	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUL	-	-	-
	Northern harrier			LOW	X	X	X	X	X	X	X	X	X	X	X	X	APR-SEP	-	-	-
	Short-eared owl			LOW			X	X	X	X	X	X	X	X			MAR-JUL	-	-	-
	White-tailed kite			LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-
150	California black rail	S	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-MAY	-	-	-
	California clapper rail	S/F	E/E	LOW	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUL	-	-	-
154	Canvasback			MEDIUM	X	X	X	X						X	X	X	-	-	-	-
	Diving ducks			HIGH	X	X	X	X						X	X	X	-	-	-	-
	Western grebe			HIGH	X	X	X	X	X					X	X	X	-	-	-	-
155	Common murre			LOW							X	X					-	-	-	-
294	Black-crowned night-heron				X	X	X	X	X	X	X	X	X	X	X	X	MAR-AUG	-	-	-
	Great blue heron				X	X	X	X	X	X	X	X	X	X	X	X	JAN-AUG	-	-	-
	Great egret				X	X	X	X	X	X	X	X	X	X	X	X	FEB-AUG	-	-	-
	Snowy egret				X	X	X	X	X	X	X	X	X	X	X	X	MAR-AUG	-	-	-
295	Black-crowned night-heron				X	X	X	X	X	X	X	X	X	X	X	X	MAR-AUG	-	-	-
	Great egret				X	X	X	X	X	X	X	X	X	X	X	X	FEB-AUG	-	-	-
	Snowy egret				X	X	X	X	X	X	X	X	X	X	X	X	MAR-AUG	-	-	-
314	California clapper rail	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUL	-	-	-

FISH:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
18	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	SEP-NOV
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
20	Rainbow trout (steelhead)	F	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	FEB-JUN	JUL-FEB
68	Rainbow trout (steelhead)	F	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	FEB-JUN	JUL-FEB
73	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUL-NOV
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	OCT-MAR
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	FEB-AUG
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	NOV-MAY
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	SEP-NOV
	White croaker			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	SEP-MAR	JAN-DEC	-
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
74	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	California halibut			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	OCT-MAR	JAN-DEC	JAN-DEC
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Green sturgeon			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	SEP-NOV
	White sturgeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
76	California halibut			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	OCT-MAR	JAN-DEC	JAN-DEC
137	Pacific herring			HIGH	X	X	X	X						X	X	X	NOV-MAR	NOV-APR	-	-	NOV-MAR
138	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Bat ray			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	JUN-AUG	-	-	JAN-DEC	JAN-DEC
	California halibut			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	OCT-MAR	JAN-DEC	JAN-DEC
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Leopard shark			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUN	-	-	JAN-DEC	JAN-DEC
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUN-AUG
152	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Bat ray			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	JAN-DEC
	Brown rockfish			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	JAN-DEC
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUL-NOV
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	OCT-MAR
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	FEB-AUG
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	NOV-MAY
	Leopard shark			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	JAN-DEC
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUN-AUG
	White croaker			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	SEP-MAR	SEP-MAR	SEP-MAR	JAN-DEC	JAN-DEC
153	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Bat ray			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	JUN-AUG	-	-	JAN-DEC	JAN-DEC
	California halibut			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	OCT-MAR	JAN-DEC	JAN-DEC
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	English sole			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	DEC-APR	JAN-DEC	-
	Leopard shark			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUN	-	-	JAN-DEC	JAN-DEC
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUN-AUG
156	Pacific herring			HIGH	X	X	X	X						X	X	X	NOV-MAR	NOV-APR	-	-	NOV-MAR
157	Pacific herring			HIGH	X	X	X	X						X	X	X	NOV-MAR	NOV-APR	-	-	NOV-MAR

SAN FRANCISCO BAY – ESIMAP 14 (continued)

BIOLOGICAL RESOURCES (continued):

HABITAT/PLANT:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D
134	Point Reyes bird's-beak			HIGH	X	X	X	X	X	X	X	X	X	X	X	X
	Rare plants			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
151	Eelgrass				X	X	X	X	X	X	X	X	X	X	X	X
156	Eelgrass				X	X	X	X	X	X	X	X	X	X	X	X
	Gracilaria				X	X	X	X	X	X	X	X	X	X	X	X
157	Eelgrass				X	X	X	X	X	X	X	X	X	X	X	X
291	Eelgrass				X	X	X	X	X	X	X	X	X	X	X	X
313	Point Reyes bird's-beak			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
315	Marin western flax	S/F	T/T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X

INVERTEBRATE:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
18	Blacktail bay shrimp			MEDIUM	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV
	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV
	Dungeness crab			HIGH				X	X	X	X	X	X	X	X		-	-	-	APR-DEC	-
73	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X			JAN-MAR	JAN-SEP	MAR-SEP	-	JAN-NOV
	Dungeness crab			HIGH	X	X		X	X	X					X	X	-	-	-	APR-JUN NOV-FEB	-
74	Blacktail bay shrimp			MEDIUM	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV
	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV
	Dungeness crab			HIGH				X	X	X	X	X	X	X	X		-	-	-	APR-DEC	-
77	Pacific rock crab			HIGH	X	X	X	X	X	X	X	X	X	X	X		-	-	-	JAN-DEC	JAN-DEC
	Red rock crab			HIGH	X	X	X	X	X	X	X	X	X	X	X		-	-	-	JAN-DEC	JAN-DEC
138	Blacktail bay shrimp			MEDIUM	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV
152	Blacktail bay shrimp			MEDIUM	X	X	X	X	X	X	X	X	X	X			JAN-MAR	JAN-SEP	MAR-SEP	-	JAN-NOV
	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X			JAN-MAR	JAN-SEP	MAR-SEP	-	JAN-NOV
	Dungeness crab			HIGH	X	X		X	X	X					X	X	-	-	-	APR-JUN NOV-FEB	-
153	Blacktail bay shrimp			MEDIUM	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV

MARINE MAMMAL:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Mating	Calving	Pupping	Molting
145	Harbor seal			195	X	X	X	X	X	X	X	X	X	X	X	X	-	-	MAR-MAY	JUN-AUG

REPTILE/AMPHIBIAN:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Nesting	Hatching	Internesting	Juveniles	Adults
333	California red-legged frog	F	T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	JAN-JUL	-	-	JAN-DEC	JAN-DEC

TERRESTRIAL MAMMAL:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D
3	Salt-marsh harvest mouse	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
134	Salt-marsh harvest mouse	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
149	Salt-marsh harvest mouse	S/F	E/E	LOW	X	X	X	X	X	X	X	X	X	X	X	X
	San Pablo vole			LOW	X	X	X	X	X	X	X	X	X	X	X	X
150	Salt-marsh harvest mouse	S/F	E/E	LOW	X	X	X	X	X	X	X	X	X	X	X	X
	Saltmarsh wandering shrew			LOW	X	X	X	X	X	X	X	X	X	X	X	X
	San Pablo vole			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X

HUMAN USE RESOURCES:

BOAT RAMP:

HUN#	Name
28	BOAT RAMP

MARINA:

HUN#	Name
88	BRICKYARD COVER MARINA
125	LOCH LOMOND MARINA
127	MARIN YACHT CLUB
153	PARADISE CAY YACHT HARBOR
162	POINT SAN PABLO YACHT HARBOR
167	REDROCK MARINA
170	RICHMOND YACHT CLUB
172	RICHMOND YACHT SERVICE
180	SAN RAFAEL YACHT HARBOR
194	TIBURON YACHT CLUB
200	WESTERN BOAT SHOP

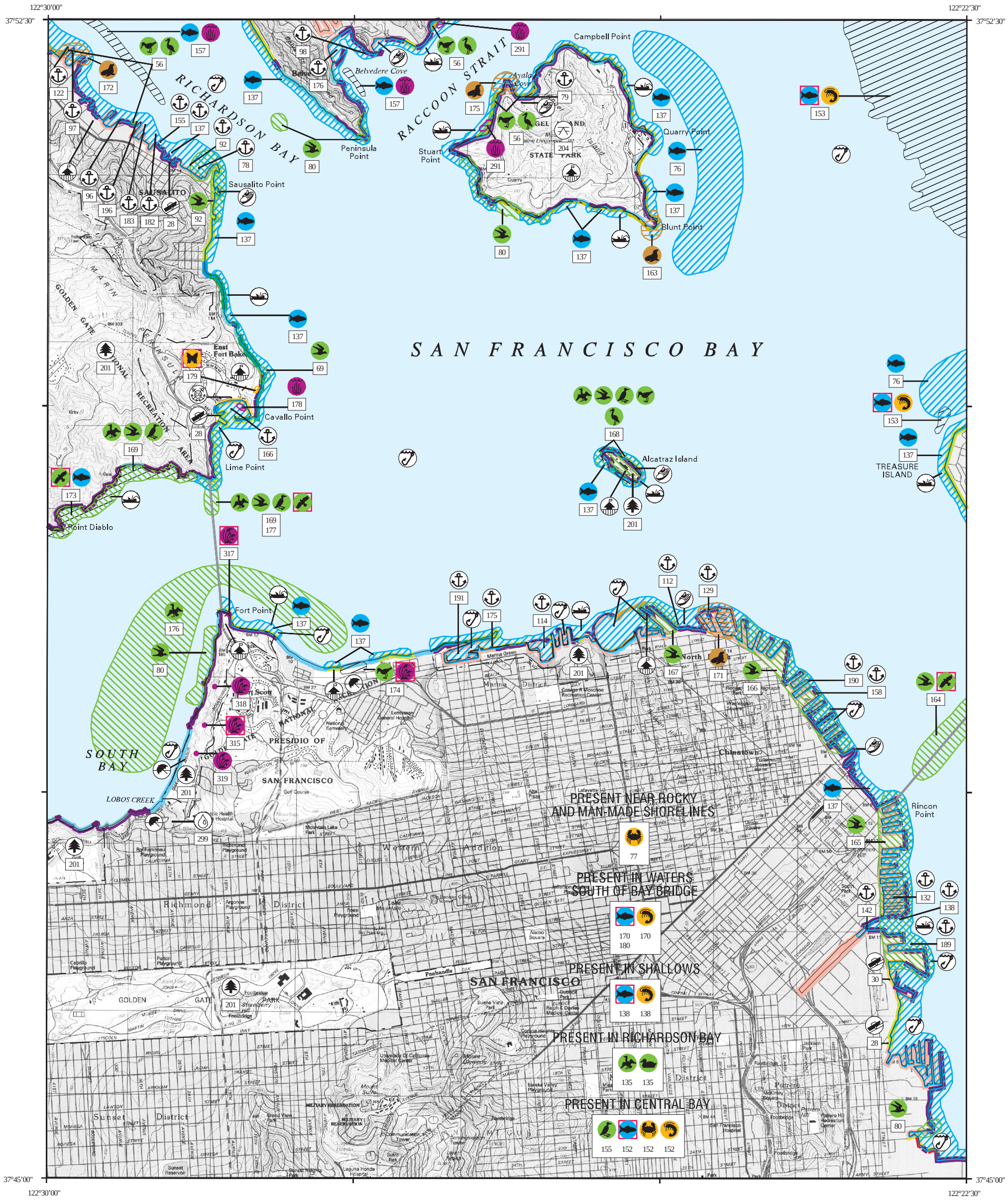
STATE/REGIONAL PARK:

HUN#	Name	Owner	Contact	Phone
212	BROOKS ISLAND REGIONAL PRESERVE	EBRP	DISPATCH	510-881-1833
215	CHINA CAMP STATE PARK	CDPR	DISPATCH	916-988-7322
222	G.MILLER JR./JOHN T. KNOX REG. SHORELINE	EBRP	DISPATCH	510-881-1833
232	MCNEAR'S BEACH STATE FISHING PIER	CDPR	DISPATCH	916-988-7322
238	PARADISE BEACH STATE FISHING PIER	CDPR	DISPATCH	916-988-7322
243	POINT PINOLE REGIONAL SHORELINE	EBRP	DISPATCH	510-881-1833

WILDLIFE REFUGE/MGMT AREA:

HUN#	Name	Owner	Contact	Phone
305	CORTE MADERA MARSH STATE ECOLOGICAL RES.	CDFG	REGIONAL OFFICE	707-944-5500
311	MARIN ISLANDS NATIONAL WILDLIFE REFUGE	USFWS	REGIONAL MANAGER	510-792-0222
312	MARIN ISLANDS NATIONAL WILDLIFE REFUGE	USFWS	REGIONAL MANAGER	510-792-0222

ENVIRONMENTAL SENSITIVITY INDEX MAP



SHORELINE HABITATS

- 1A EXPOSED ROCKY SHORES
- 1B EXPOSED, SOLID MAN – MADE STRUCTURES
- 2A EXPOSED WAVE – CUT PLATFORMS IN BEDROCK
- 3A FINE – TO MEDIUM – GRAINED SAND BEACHES
- 3B SCARPS AND STEEP SLOPES IN SAND
- 4 COARSE – GRAINED SAND BEACHES
- 5 MIXED SAND AND GRAVEL BEACHES
- 6A GRAVEL BEACHES
- 6B RIPRAP
- 7 EXPOSED TIDAL FLATS
- 8A SHELTERED ROCKY SHORES
- 8B SHELTERED, SOLID MAN – MADE STRUCTURES
- 8C SHELTERED RIPRAP
- 9A SHELTERED TIDAL FLATS
- 9B VEGETATED LOW RIVERINE BANKS
- 10A SALT – AND BRACKISH – WATER MARSHES
- TIDAL MARSHES
- MUTED TIDAL MARSHES
- MANAGED MARSHES
- DIKED MARSHES
- SALT PONDS

N W E S

SCALE 1:45000

1 .5 0 1 KILOMETER

1 .5 0 1 MILE

Not For Navigation

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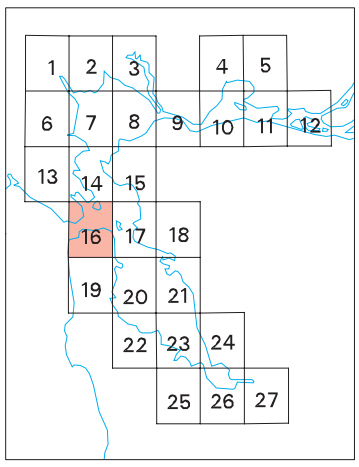

SAN FRANCISCO NORTH, CA. (1993) SF-16

SAN FRANCISCO BAY – ESIMAP 16

BIOLOGICAL RESOURCES:

BIRD:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Nesting	Laying	Hatching	Fledging
56	Shorebirds			LOW	X	X	X	X		X	X	X	X	X	X		-	-	-	-
	Wading birds			HIGH	X	X	X	X	X	X	X	X	X	X	X		-	-	-	-
69	Western gull			1	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
80	Western gull			3	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
92	Western gull			2	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
135	Canvasback			MEDIUM	X	X	X	X						X	X	X	-	-	-	-
	Diving ducks			HIGH	X	X	X	X						X	X	X	-	-	-	-
	Western grebe			VERY HIGH	X	X	X	X	X					X	X	X	-	-	-	-
155	Common murre			LOW							X	X					-	-	-	-
164	Peregrine falcon	S/F	E/E	2	X	X	X	X	X	X	X	X	X	X	X	X	MAR-AUG	-	-	-
	Western gull			24	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
165	Western gull			116	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
166	Western gull			31	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
167	Western gull			33	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
168	Black oystercatcher			1	X	X	X	X	X	X	X	X	X	X	X	X	MAY-OCT	MAY-JUL	JUN-AUG	JUL-OCT
	Black-crowned night-heron			300	X	X	X	X	X	X	X	X	X	X	X	X	MAR-AUG	-	-	-
	Brandt's cormorant			220			X	X	X	X	X	X	X				APR-SEP	APR-JUL	MAY-AUG	JUN-SEP
	Great egret			1	X	X	X	X	X	X	X	X	X	X	X	X	FEB-AUG	-	-	-
	Pelagic cormorant			15		X	X	X	X	X	X	X	X				MAY-SEP	MAY-JUL	JUN-AUG	JUL-SEP
	Pigeon guillemot			30			X	X	X	X	X	X	X				APR-SEP	APR-JUL	MAY-AUG	JUL-SEP
	Snowy egret			15	X	X	X	X	X	X	X	X	X	X	X	X	MAR-AUG	-	-	-
	Western gull			520	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
169	Pelagic cormorant			7		X	X	X	X	X	X	X	X				MAY-SEP	MAY-JUL	JUN-AUG	JUL-SEP
	Pigeon guillemot						X	X	X	X	X	X	X				APR-SEP	APR-JUL	MAY-AUG	JUL-SEP
	Western gull			17	X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	APR-JUN	MAY-JUL	JUL-AUG
173	Peregrine falcon	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X	MAR-AUG	-	-	-
174	Shorebirds			LOW	X	X	X	X	X		X	X	X	X	X	X	-	-	-	-
176	Western grebe			HIGH	X	X	X	X	X					X	X	X	-	-	-	-
177	Peregrine falcon	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X	MAR-AUG	-	-	-

FISH:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
76	California halibut			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	OCT-MAR	JAN-DEC	JAN-DEC
137	Pacific herring			HIGH	X	X	X	X						X	X		NOV-MAR	NOV-APR	-	-	NOV-MAR
138	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Bat ray			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	JUN-AUG	-	-	JAN-DEC	JAN-DEC
	California halibut			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	OCT-MAR	JAN-DEC	JAN-DEC
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Leopard shark			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUN	-	-	JAN-DEC	JAN-DEC
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUN-AUG
152	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Bat ray			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	JAN-DEC
	Brown rockfish			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	JAN-DEC
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUL-NOV
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	OCT-MAR
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	FEB-AUG
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	NOV-MAY
	Leopard shark			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	JAN-DEC
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUN-AUG
	White croaker			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	SEP-MAR	SEP-MAR	SEP-MAR	JAN-DEC	JAN-DEC
153	American shad			HIGH					X	X	X	X	X	X	X	X	-	-	-	AUG-DEC	MAY-JUL
	Bat ray			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	JUN-AUG	-	-	JAN-DEC	JAN-DEC
	California halibut			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	OCT-MAR	JAN-DEC	JAN-DEC
	Chinook salmon (fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (late fall)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (spring)			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (winter)	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	English sole			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	DEC-APR	JAN-DEC	-
	Leopard shark			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUN	-	-	JAN-DEC	JAN-DEC
	Striped bass			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JUN-AUG
157	Pacific herring			HIGH	X	X	X	X						X	X	X	NOV-MAR	NOV-APR	-	-	NOV-MAR
170	Bat ray			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	JUN-AUG	-	-	JAN-DEC	JAN-DEC
	Chinook salmon (fall)			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (late fall)			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (spring)			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (winter)	S/F	E/E	MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Leopard shark			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUN	-	-	JAN-DEC	JAN-DEC
173	Pacific herring			HIGH	X	X	X	X						X	X	X	NOV-MAR	NOV-APR	-	-	NOV-MAR
180	Bat ray			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	JAN-DEC
	Chinook salmon (fall)			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (late fall)			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (spring)			MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Chinook salmon (winter)	S/F	E/E	MEDIUM	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Leopard shark			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	JAN-DEC
	White croaker			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	SEP-MAR	JAN-DEC	-

HABITAT/PLANT:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D
157	Eelgrass				X	X	X	X	X	X	X	X	X	X	X	X
174	California seablite	F	E	POTENTIAL	X	X	X	X	X	X	X	X	X	X	X	X
	Point Reyes bird's-beak			POTENTIAL	X	X	X	X	X	X	X	X	X	X	X	X
	Rare plants			POTENTIAL	X	X	X	X	X	X	X	X	X	X	X	X
178	Eelgrass				X	X	X	X	X	X	X	X	X	X	X	X
291	Eelgrass				X	X	X	X	X	X	X	X	X	X	X	X
315	Marin western flax	S/F	T/T	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
317	Marsh sandwort	S/F	E/E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
318	San Francisco gumplant			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X
319	San Francisco campion			PRESENT	X	X	X	X	X	X	X	X	X	X	X	X

INVERTEBRATE:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
77	Pacific rock crab			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
	Red rock crab			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
138	Blacktail bay shrimp			MEDIUM	X	X	X	X	X	X	X	X	X	X			-	-	MAR-SEP	MAR-OCT	JAN-NOV
152	Blacktail bay shrimp			MEDIUM	X	X	X	X	X	X	X	X	X	X	X		JAN-MAR	JAN-SEP	MAR-SEP	-	JAN-NOV
	California bay shrimp			HIGH	X	X	X	X	X	X	X	X	X	X	X		JAN-MAR	JAN-SEP	MAR-SEP	-	JAN-NOV
	Dungeness crab			HIGH	X	X		X	X	X					X	X	-	-	-	APR-JUN NOV-FEB	-
153	Blacktail bay shrimp			MEDIUM	X	X	X	X	X	X	X	X	X	X	X		-	-	MAR-SEP	MAR-OCT	JAN-NOV
170	Blacktail bay shrimp			MEDIUM	X	X	X	X	X	X	X	X	X	X	X		-	-	MAR-SEP	MAR-OCT	JAN-NOV
179	Mission blue butterfly	F	E	PRESENT	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-

MARINE MAMMAL:

RAR#	Species	S/F	T/E	Concen	J	F	M	A	M	J	J	A	S	O	N	D	Mating	Calving	Pupping	Molting
163	Harbor seal			21	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JUN-AUG
171	California sea lion			HIGH			X	X	X			X	X	X			-	-	-	-
172	Harbor seal			5	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JUN-AUG
175	Harbor seal			3	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JUN-AUG

HUMAN USE RESOURCES:

BOAT RAMP:

HUN#	Name
28	BOAT RAMP
30	BOAT RAMP

SAN FRANCISCO BAY – ESIMAP 16 (continued)

HUMAN USE RESOURCES (continued):

MARINA:

HUN#	Name
78	ANDERSONS BOAT YARD
79	ANGEL ISLAND STATE PARK
92	CARUSOS SPORTFISHING CENTER
96	CLIPPER YACHT HARBOR #1
97	CLIPPER YACHT HARBOR (# 2, 3, 4)
98	CORINTHIAN YACHT CLUB
112	FISHERMANS WHARF
114	GAS HOUSE COVE MARINA
122	KAPPAS YACHT HARBOR
129	MARINA
132	MARINA
137	MARINSHIP YACHT HARBOR
138	MARIPOSA HUNTERS POINT YC
142	MISSION CREEK HARBOR ASSOC
155	PELICAN YACHT HARBOR
158	PIER 39 MARNIA
166	PRESIDIO YACHT CLUB
175	SAN FRANCISCO MARINA
176	SAN FRANCISCO YACHT CLUB
182	SAUSALITO YACHT HARBOR
183	SCHOONMAKER MARINA
189	SOUTH BEACH HARBOR
190	SOUTH BEACH HARBOR - PIER 40
191	ST. FRANCIS YACHT CLUB
196	TURNEY STREET LAUNCHING RAMP

NATIONAL PARK:

HUN#	Name	Owner	Contact	Phone
201	GOLDEN GATE NATIONAL RECREATION AREA	NPS	DISPATCH	415-561-5505

STATE/REGIONAL PARK:

HUN#	Name	Owner	Contact	Phone
204	ANGEL ISLAND STATE PARK	CDPR	DISPATCH	916-988-7322

WATER_INTAKE:

HUN#	Name	Owner	Contact	Phone
299	PRESIDIO DRINKING WATER INTAKE	NPS	DISPATCH	415-561-5505