

Draft

CHEVRON ENERGY AND HYDROGEN RENEWAL PROJECT

Environmental Impact Report
State Clearinghouse No. 2005072117
City of Richmond Project No. 1101974

Volume 1

Prepared for:
City of Richmond

May 2007



May 11, 2007

**NOTICE OF PUBLIC HEARING and
NOTICE OF AVAILABILITY OF DRAFT ENVIRONMENTAL IMPACT REPORT (DEIR)**

NOTICE IS HEREBY GIVEN that the Planning Commission will hold a **Public Hearing** to receive comments and to discuss the DEIR at its regular meeting of **June 7, 2007, at 7:00 p.m. in the City Council Chambers, 1401 Marina Way South, Richmond, CA;** and,

NOTICE IS HEREBY GIVEN that the City of Richmond Planning Department has prepared a Draft Environmental Impact Report (DEIR) to analyze the environmental effects associated with the following proposed development project in accordance with the California Environmental Quality Act (CEQA) OF 1970, as amended, and the City of Richmond's Guidelines and Procedures for Implementation of CEQA, Resolution Number 125-03, adopted September 23, 2003. The City of Richmond is the lead agency under CEQA.

Project Title: Chevron Energy and Hydrogen Renewal Project; Project Number: EID 1101974

Project Applicant: Chevron Products Company

Project Location: The Chevron Refinery is located along the western edge of the City of Richmond, in Contra Costa County, California, at 841 Chevron Way. The proposed project will be located within the approximately 2,900-acre Refinery which occupies most of the Point San Pablo Peninsula, with east and south boundaries in the vicinities of the residential communities of North Richmond and Point Richmond, respectively. The Refinery is located west of Castro Street and predominately to the North of Interstate 580 (I-580). Castro Street provides the access to the Refinery through a number of entrances.

Project Description: The proposed Energy and Hydrogen Renewal Project consists of a number of component projects. The four (4) main component projects considered in this Master EIR include Hydrogen Plant Replacement, Power Plant Replacement, Reformer Replacement, and Hydrogen Purity Improvements. The EIR also includes and analyzes a number of other, smaller projects.

In general, the Proposed Project would modify, replace and install typical refining equipment such as piping, heat exchangers, instrumentation, catalytic reactors, fractionation equipment, pumps, compressors, furnaces, tanks, hydrogen sulfide absorption capacity, hydrogen generation capacity and their associated facilities, including steam and electrical generation as well as some refinery buildings and infrastructure. These changes would include construction and installation of new facilities as well as replacement of or modifications to existing facilities. The Renewal Project would not increase Refinery use of crude oil beyond currently permitted levels, although process upgrades would allow the Refinery to use a wider range of crude oils. Included in project components are upgrades to increase energy efficiency, reduce air emissions, and increase equipment reliability.

See Other Side

The DEIR examines all of the potentially significant environmental effects of the project, and alternatives and/or mitigation measures to reduce or avoid those significant impacts. The DEIR concludes that the Project could result in significant impacts associated with Air Quality. Potential environmental impacts and any associated mitigation measures for the Project are discussed in the DEIR.

Review and Comment Period: The DEIR is being published for a 45-day public review and comment period. Comments on the completeness and accuracy of the DEIR must be received by 5:00 pm on June 25, 2007. All comments should be addressed to:

**Lamont Thompson, Senior Planner
City of Richmond
Planning and Building Regulations Department
1401 Marina Way South
Richmond, CA 94804**

For accuracy of record, written comments are desirable and encouraged, and should be supported by factual information whenever possible. If you represent a public agency, please provide information that is germane to your statutory responsibilities as may be affected by this project. Substantive comments or information on environmental issues related to the project will be included, and if necessary, responded to in the Final EIR. If you decide to challenge the action of the City in a court of law, you may be limited to raising only those issues you or someone else raised at or prior to the final public hearing on the Project.

Public Hearings on Project: Following the comment period on the Draft Environmental Impact Report, public hearings will be scheduled for additional public input on the Energy and Hydrogen Renewal Project. The initial Public Hearing before the Planning Commission has been scheduled for **July 26, 2007 at 7:00 p.m. in the City Council Chambers, 1401 Marina Way South, Richmond, CA.**

Report Availability: A copy of the Draft Environmental Impact Report will be available for review online at <http://www.ci.richmond.ca.us/>. Copies are also available at the following locations: **Richmond Public Library, Main Branch 325 Civic Center Ave, Richmond, Ca 94804** and the **Richmond Planning Department, 1401 Marina Way South, Richmond, CA 94804**

Start of Public Review: May 11, 2007

End of Public Review: June 25, 2007
June 25, 2007

Draft

CHEVRON ENERGY AND HYDROGEN RENEWAL PROJECT

Environmental Impact Report
State Clearinghouse No. 2005072117
City of Richmond Project No. 1101974

Prepared for:
City of Richmond

May 2007

225 Bush Street
Suite 1700
San Francisco, CA 94104
415.896.5900
www.esassoc.com

Los Angeles

Oakland

Petaluma

Portland

Sacramento

San Diego

Seattle

Tampa

Woodland Hills

205166



TABLE OF CONTENTS

Chevron Energy and Hydrogen Renewal Project Draft Environmental Impact Report

	<u>Page</u>
1. Introduction	1-1
1.1 Purpose of this EIR	1-1
1.2 Project Overview	1-1
1.3 Key Areas of Environmental Concern	1-4
1.4 Type and Organization of this Document	1-4
1.4.1 Master EIR	1-4
1.4.2 Organization of the EIR	1-6
1.5 Use of this Document by Agencies	1-7
1.6 Project Permits and Approvals	1-7
1.7 Environmental Review Process to Date	1-7
2. Summary of Environmental Impacts	2-1
2.1 Summary of Impacts of the Proposed Project	2-1
2.2 Review of Proposed Project Impacts	2-1
2.2.1 Aesthetics, Visual Quality, Light and Glare	2-1
2.2.2 Agricultural Resources	2-2
2.2.3 Air Quality	2-2
2.2.4 Biological Resources	2-2
2.2.5 Cultural Resources	2-3
2.2.6 Energy	2-4
2.2.7 Geology, Soils, and Seismicity	2-5
2.2.8 Hydrology and Water Quality	2-5
2.2.9 Land Use, Plans and Policies	2-5
2.2.10 Noise	2-6
2.2.11 Employment, Population, and Housing	2-6
2.2.12 Public Health	2-6
2.2.13 Public Safety	2-7
2.2.14 Public Services	2-7
2.2.15 Parks and Recreation	2-8
2.2.16 Transportation	2-8
2.2.17 Utilities and Service Systems	2-8
3. Project Description [submitted to City in August]	3-1
3.1 Project Overview and Location	3-1
3.1.1 Introduction	3-1
3.1.2 Location	3-1
3.2 Project Objectives and Components	3-4
3.2.1 Project Objectives	3-4
3.2.2 Summary of Project Components	3-4

	<u>Page</u>
3. Project Description (continued)	
3.3 Existing Chevron Refinery	3-9
3.3.1 Refinery Processes	3-9
3.3.2 Refinery Product Flow	3-14
3.3.3 Support Processes and Equipment	3-16
3.4 Components of the Proposed Project	3-21
3.4.1 Introduction.....	3-21
3.4.2 Feed Stocks	3-26
3.4.3 Project Components Detail	3-27
3.5 Construction, Decommissioning, Demolition and Dismantling of Project Components	3-47
3.6 Other Refinery Projects	3-51
3.7 Maintenance Activities	3-51
3.8 Permits and Approvals Required	3-52
4. Environmental Setting, Impacts, and Mitigation Measures	4-1
4.1 Aesthetics, Visual Quality, Light and Glare	4.1-1
4.2 Agricultural Resources.....	4.2-1
4.3 Air Quality	4.3-1
4.4 Biological Resources	4.4-1
4.5 Cultural Resources	4.5-1
4.6 Energy	4.6-1
4.7 Geology, Soils, and Seismicity	4.7-1
4.8 Hydrology and Water Quality.....	4.8-1
4.9 Land Use, Plans, and Policies	4.9-1
4.10 Noise	4.10-1
4.11 Employment, Population, and Housing.....	4.11-1
4.12 Public Health	4.12-1
4.13 Public Safety.....	4.13-1
4.14 Public Services	4.14-1
4.15 Parks and Recreation	4.15-1
4.16 Transportation and Traffic.....	4.16-1
4.17 Utilities and Service Systems	4.17-1
5. CEQA Statutory Sections	5-1
5.1 Significant Unavoidable Environmental Impacts.....	5-1
5.2 Cumulative Impacts	5-1
5.2.1 Introduction.....	5-1
5.2.2 General and Regional Plans Considered in the Cumulative Analysis.....	5-2
5.2.3 Specific Projects Considered in the Cumulative Analysis.....	5-3
5.2.4 General Approach and Method of Cumulative Analysis	5-18
5.2.5 Areas of Potential Cumulative Impacts.....	5-20
5.3 Growth-Inducing Impacts.....	5-39
5.4 Effects Found Not to Be Significant	5-39
5.5 Significant Irreversible Environmental Effects of the Proposed Projects.....	5-40

	<u>Page</u>
6. Alternatives Analysis	6-1
6.1 Introduction	6-1
6.2 Project Objectives	6-2
6.3 Alternatives Considered but Dismissed from Consideration in this EIR or Alternatives Screening Process	6-3
6.4 Potentially Significant Impacts of the Project	6-5
6.5 Alternatives to the Project	6-5
6.5.1 No Project Alternative	6-5
6.6 Alternatives of the Project	6-6
6.6.1 Introduction	6-6
6.6.2 Environmentally Superior Alternative	6-14
7. Report Preparation	7-1
7.1 Report Authors	7-1
7.2 Agencies and Organizations Contacted	7-2
8. Glossary / Acronyms / Measurement Units	8-1
8.1 Glossary	8-1
8.2 Acronyms Used in this EIR	8-10
8.3 Measurement Units Used in this EIR	8-13
 Appendices	
A. Notice of Preparation and Comment Letters	A-1
B. Species Lists for City of Richmond Chevron Renewal Project	B-1
C. Traffic Technical Appendix	C-1
D. Air Quality Technical Appendix	D-1
E. Public Health Technical Appendix	E-1
F. Water Quality Assessment	F-1
 List of Figures	
3-1 Project Location	3-3
3-2 Locations of Major Components of the Renewal Project	3-8
3-3 Chevron Refinery Existing General Features Layout	3-10
3-4 Refinery Block Flow Diagram Current Configuration	3-13
3-5 Sour Water Flow Diagram	3-18
3-6 The “Y” area of the Refinery	3-21
3-7 Renewal Project Changes to Refinery Block Flow Diagram	3-28
3-8 Example Layout for a Typical Hydrogen Plant	3-29
3-9 Example Layout for a Typical Hydrogen Plant	3-29
3-10 Hydrogen Plant Flow Diagram	3-30
3-11 Existing CoGen Units	3-31
3-12 Existing Reformer Flow Diagram	3-33
3-13 New CCR Reformer Flow Diagram	3-35
3-14 Sulfur Recovery Unit Flow Diagram	3-37
3-15 Typical Chevron Refinery Tanks	3-38

List of Figures (cont.)

4.1-1	Viewpoint Location Map.....	4.1-2
4.1-2a	Project Site Viewed from the South (I-580) – Existing and Project Features Labeled.....	4.1-3
4.1-2b	Project Site Viewed from the South (I-580) – with Project Simulated.....	4.1-4
4.1-3	Project Site Viewed from the East (Castro Street)	4.1-5
4.1-4	Project Site Viewed from the South (Crest Avenue)	4.1-6
4.1-5	Project Site Viewed from the Southeast (Buena Vista).....	4.1-7
4.1-6	Project Site Viewed from the North (Bay Trail/Wildcat Creek)	4.1-8
4.1-7	Project Site Viewed from the Northeast (Richmond Parkway)	4.1-9
4.1-8	Project Site Viewed from Richmond Bridge	4.1-10
4.3-1	Wind Roses for Richmond, Point San Pablo, and Rodeo	4.3-3
4.7-1	Active and Potentially Active Bay Area Faults	4.7-4
4.9-1	Chevron Refinery Functional Land Use and Richmond Neighborhoods Map	4.9-5
4.9-2	General Plan Land Use Designations: Refinery and Vicinity	4.9-9
4.9-3	Zoning Districts: Refinery and Vicinity.....	4.9-13
4.12-1	Maximum cancer Risk Locations, Chevron Richmond Refinery	4.12-14
4.15-1	Recreation Facilities within the Vicinity of the Project Site	4.15-4
5-1	Cumulative Refinery Project Locations	5-5

List of Tables

2-1	Summary of Impacts and Mitigation Measures for the Chevron Energy Hydrogen Renewal Project.....	2-10
3-1	Hydrocarbon Fractions, with Boiling Points at Atmospheric Pressure	3-11
3-2	Proposed Chevron Renewal Project Components.....	3-22
3-3	Renewal Project Construction Schedule.....	3-47
4.3-1	Air Quality Data Summary (2001–2006) for the Project Area	4.3-5
4.3-2	Air Quality Data Summary (2001–2006) from Facility Area	4.3-6
4.3-3	Criteria Pollutant Emissions for the Chevron Richmond Refinery	4.3-7
4.3-4	State and National Criteria Air Pollutant Standards, Effects, and Sources	4.3-10
4.3-5	Attainment Status of the Bay Area for the State and National Ambient Air Quality Standards	4.3-16
4.3-6	Net Emissions Comparison for PSD Applicability	4.3-19
4.3-7	Estimated Baseline Emissions.....	4.3-25
4.3-8	Worst-Case Project Construction Emissions	4.3-27
4.3-9	Total Net Project Daily Emissions (pounds per day).....	4.3-34
4.3-10	Total Net Project Annual Emissions (tons per year)	4.3-35
4.3-11	Proposed Project Annual CO ₂ Emissions (metric tons per year).....	4.3-40
4.4-1	Focused List of Special Status Species with Potential to Occur in or near the Chevron Refinery	4.4-11
4.5-1	Examples of Recorded Cultural Resource Sites within One Half Mile of the Project Area	4.5-6
4.7-1	Modified Mercalli Intensity Scale.....	4.7-5
4.7-2	Active Faults in the Project Site Vicinity	4.7-6
4.8-1	Refinery Effluent Waste Streams as Identified under the NPDES Permit.....	4.8-6
4.8-2	Water Quality Effluent Discharge Limitations.....	4.8-10
4.9-1	Land Uses Adjacent to and in the Immediate Vicinity of the Refinery.....	4.9-4

Page**List of Tables (cont.)**

4.10-1 Effects of Construction Vibration.....	4.10-5
4.10-2 Ambient Noise Levels at Monitored Locations	4.10-8
4.10-3 Maximum Allowable Exterior Noise Standards for Specified Land Uses	4.10-10
4.10-4 Maximum Allowable Receiving Noise Standards for Temporary Construction Or Demolition Activities.....	4.10-10
4.10-5 Maximum Vibration Criteria for Structures	4.10-11
4.10-6 Typical Commercial Construction Noise Levels.....	4.10-14
4.10-7 Typical Noise Levels from Construction Equipment.....	4.10-14
4.10-8 Operating Equipment to Be Installed as Part of the Project	4.10-19
4.10-9 Typical Noise Levels from Industrial Equipment	4.10-21
4.12-1 Average Ambient Concentrations of Carcinogenic TACs Measured at BAAQMD Monitoring Station, 1065 7th Street, Richmond	4.12-3
4.12-2 Net TAC Emissions from Combustion Sources Related to the Renewal Project	4.12-8
4.12-3 Summary of TAC Emissions from Tanks	4.12-11
4.12-4 Summary of Incremental Health Risks from Operation of the Proposed Energy and Renewal Project.....	4.12-12
4.13-1 Hazardous Wastes Generated by the Existing Facility	4.13-4
4.13-2 Changes in Hazardous Waste and Recycled Material Generation	4.13-14
4.16-1 Definitions for Intersection Level of Service	4.16-3
4.16-2 Intersection Peak-Hour Traffic Level of Service Operations – Existing Conditions.....	4.16-4
4.16-3 Chevron Richmond Refinery Renewal Project, Other Projects, Major Turnarounds, and Refinery Operations Estimated Daily Trip Generation, by Quarter	4.16-9
4.16-4 Chevron Richmond Refinery Construction Traffic Estimates	4.16-11
4.16-5 Trip Distribution – Construction Traffic.....	4.16-11
4.16-6 Intersection Peak-Hour Traffic Level of Service Operations – 2008 Baseline Conditions.....	4.16-13
4.16-7 Intersection Peak-Hour Traffic Level of Service (LOS) Operations – 2008 Baseline Plus Project Construction Conditions	4.16-13
5-1 Chevron Energy and Hydrogen Renewal Project City of Richmond Cumulative Project List	5-17
5-2 Development Plans and Projects Considered in the Analysis of Renewal Project Cumulative Impacts.....	5-18
5-3 Intersection Peak-Hour Traffic Level of Service Operations – 2025 Cumulative Conditions	5-37

ERRATA

The following errata have been noted in the **Draft EIR** for the **Chevron Energy and Hydrogen Renewal Project**.

1. DEIR page 4.5-12. The following reference was omitted in printing: Arnold, J.E., M.R. Walsh, and S.E. Hollimon 2004. *The Archaeology of California*. Journal of Archaeological Research, Vol. 12, No. 1: 1-73.
2. DEIR page 4.5-12. The following reference was omitted in printing: California Points of Historical Interest 1992. Office of Historic Preservation, California Department of Parks and Recreation. Sacramento, CA : State of California, Dept. of Parks & Recreation.
3. DEIR page 4.5-12. The following reference was omitted in printing: California Historical Landmarks 1996. Sacramento : Dept. of Parks & Recreation, State of California, Resources Agency.
4. DEIR page 4.5-12. The following reference was omitted in printing: California Inventory of Historic Resources 1976. Sacramento : State of California, Resources Agency, Dept. of Parks and Recreation.
5. DEIR page 4.5-12. The following reference was omitted in printing: City of Richmond. Richmond Chamber of Commerce Website. Available online: <http://www.ci.richmond.ca.us/index.asp?NID=112>, Accessed on November 22, 2005.
6. DEIR page 4.10-23. The following reference was omitted in printing: U.S. Environmental Protection Agency, Noise from Construction Equipment and Building Operations, Building Equipment, and Home Appliances, December 1971.
7. DEIR page 4.10-23. The following reference was omitted in printing: Hoover and Keith, Noise Control for Buildings, Manufacturing Plants, Equipment and Products, 1994.
8. DEIR page 4.17-5. The citation for Contra Costa Environmental Health 2002 has been removed.
9. DEIR page 4.17-5. The citation for CIWMB 2003 has been removed.

CHAPTER 1

Introduction

1.1 Purpose of this EIR

This Environmental Impact Report (EIR) is an informational document intended to disclose to the public and decision-makers the environmental consequences of the proposed Chevron Richmond Refinery's Energy and Hydrogen Renewal Project (Proposed Project). This document assesses the direct and indirect environmental impacts, as well as the cumulative environmental impacts, that would occur as a result of the construction and operation of Proposed Project. The project description is based on project information contained in the Chevron Richmond Refinery's application (as amended) to the City of Richmond and in the Refinery's application to the Bay Area Air Quality Management District (BAAQMD). The intent of this EIR is not to determine whether the Proposed Project should be approved, but to provide public disclosure and to aid the local planning and decision-making process.

1.2 Project Overview

The Proposed Project involves a series of modifications and additions to the Richmond Refinery. The Proposed 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. When in full operation, the Proposed Project is expected to add 10 regular employees at the Refinery. Chevron's primary objectives for the Proposed Project are:

- Replace existing facilities with modern facilities providing improved reliability, energy efficiency, and additional environmental controls.
- Ensure the Refinery's ability to process future crude and gas oil supplies.
- To decrease the amount of energy imported by the Refinery.
- Increase the portion/percentage of the Refinery's total gasoline production that can meet California specifications and be distributed to local markets by 300,000 gallons/day or 6 percent over current Refinery production levels.
- Invest in Refinery upgrades that produce a competitive return on capital.

The Proposed 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. Proposed Project components include the following:

CHEVRON ENERGY AND HYDROGEN RENEWAL PROJECT COMPONENTS

(Note: the number indicated in parentheses represents the number of units to be installed)

Hydrogen Plant Replacement

- Construct new hydrogen plant, including hydrogen separation PSA units (2 trains) ¹
- Shut down existing hydrogen plant (2 trains)
- Install hydrogen recovery PSA unit (1)
- Shut down PSA section of the existing hydrogen recovery unit (1)
- Construct new cooling water tower (1)
- Construct new flare (1)
- Shut down existing feed and steam reformer furnaces (3)
- Construct a new Hydrogen Plant Control Room (1)
- Upgrade Richmond Lube Oil Plant (RLOP) Area Compressors (4)
- Upgrade Distillation and Reforming Area Compressors (3)
- Steam Turbine Generator (1)
- Upgrade Isomax Area Compressors (8)
- Relocate electrical infrastructure and Refinery power cables (5)
- Install communication cables (6)

Power Plant Replacement

- Construct new cogeneration (CoGen) gas turbine (1)
- Construct new heat recovery / steam generation equipment with auxiliary duct burner (1)
- Shut down existing No. 1 Power Plant steam boilers (5)
- Construct new CoGen cooling water tower (1)
- Upgrade utility infrastructure
- Replace power plant condensate system
- Install new reverse osmosis system
- Replace fuel gas blending and conditioning system
- Install high pressure fuel compressors

Catalytic Reformer Replacement

- Construct new Continuous Catalytic Regeneration (CCR) Reformer (1)
- Construct new catalytic reformer furnaces (4)
- Shut down existing No. 4 Cat Reformer (1) and No. 4 Cat furnaces (4)
- Shut down existing No. 5 Cat Reformer (1) and No. 5 Cat furnaces (4)
- Install Debutanizer (1)
- Install Methanator (1)
- Install Oxygen Stripper (1)

Hydrogen Purity Improvements

- Construct new Recycle Hydrogen Amine Contactor (1) for Fluid Catalytic Cracker Feed Hydrotreater
- Refurbish and rename Fresh Amine Storage Tank T-2421 from T-2400 (1) (switched to Amine service from Caustic)
- Construct new Rich Amine Storage Tank T-2420 (1)
- Construct new Amine Regenerator (1)
- Upgrade Isomax Area Compressor (1)
- Install low-nitrogen oxides (NOx) burners on existing TKN² furnaces (3)
- Install low-NOx burners on existing Poly (Polymer) Plant furnace (1)

¹ The Proposed Project includes one new stand-alone hydrogen recovery unit, a “Pressure Swing Adsorption” (PSA) unit that recovers hydrogen from the feed to the new hydrogen plant before that feed is sent to the hydrogen plant. This is Bay Area Air Quality Management District (BAAQMD) source S-4451. Some confusion may arise because each of the new hydrogen plants (S-4449 and S-4450) also includes a PSA unit after the reformer furnace to separate produced hydrogen from byproducts. These PSA units are considered part of each respective hydrogen plant, and are not considered separate units (i.e., they do not have a separate BAAQMD source number.).

² TKN is a trade name of a process used at the Refinery.

- Construct new Oxygen Storage Tanks (2)
- Upgrade sour water processing
- Construct new Acid Gas Scrubber (1)
- Construct new Fresh Caustic Tank T-2440 (1)
- Construct new Spent Caustic Tank T-2445 (1)
- Modify existing Fluid Catalytic Cracker Feed Hydrotreater (1)
- Modify existing Sulfur Recovery Units (3)
- Install new sulfur loading rack (1) including option to replace or upgrade existing vent scrubber (1)
- Install truck and railcar loading and unloading stations for amine, sodium bisulfite, fresh and spent caustic (5)
- Install automated caustic dilution and delivery system (1)

Other New and Replacement Facilities

- Replace Tank T-231 (Water Draw³)
- Replace Tank T-298 (Sour Water)
- Replace Tank T-398 (TKN Feed)
- Replace Tank T-954 (Gasoline)
- Replace Tank T-979 (Cutter⁴)
- Replace Tank T-984 (Cutter)
- Replace Tank T-1451 (High Sulfur Fuel Oil Blend Stock)
- Replace Tank T-1504 (Recovered Oil)
- Replace Tank T-1689 (Steam Condensate)
- Replace Tank T-3075 (Aviation Gasoline)
- Install new Tank T-3108 (Crude / Gas Oil)
- Install new Tank T-3228 (CCR Feed/Product Tank)
- Install new Tank T-4004 (Diesel)
- Install new Tank T-4006 (Swing Tank containing Gas Oil)
- Install new Tank T-4007 (Swing Tank containing Heavy Crude Oil [HCO])
- Install new Tank T-4008 (De-Asphalted Oil [DAO])
- Install new Tank T-4009 (Diesel Hydro Treated or High sulfur diesel [DHT])
- Install new Tank T-4010 (Water Draw)
- Construct new Central Control Room (1)
- Construct new Refinery Maintenance Facilities

Other Renewal Project Infrastructure

- Install or modify Refinery Electrical Infrastructure
- Install or Modify Combined Off-plot Interconnecting Piping/Pipeways, Instrument and Communication Cables with Pipe-Way Structural Supports
- Install or modify as needed Infrastructure to facilitate transport of modular equipment to Richmond site from Port of Richmond⁵

Chapter 3 describes the Proposed Project and recent and on-going Refinery projects in substantial detail, explains the relationship between the Proposed Project and cumulative Refinery or other projects underway or proposed in the vicinity, discusses the regulatory context of the Proposed Project, and describes in detail the individual elements of the Proposed Project.

Chevron proposes to implement the Proposed Project, beginning construction in 2007 and, if all components are built, completing all construction in about 2015.

³ Water draw consist of slightly oily waters taken from various cleaning processes.

⁴ Cutter, or cutter stock, is a refined product about the weight of diesel fuel that is used to blend with heavier products to assist with pumping the heavier products.

⁵ Note: the Proposed Project would not require modifications at the Port of Richmond.

1.3 Key Areas of Environmental Concern

This study examined the potential impacts of the Proposed Project. All of the topics in the current CEQA Checklist and other topics pertinent to the Proposed Project were studied: Aesthetics, Visual Quality, Light and Glare; Agriculture Resources; Air Quality; Biological Resources; Cultural Resources; Energy; Geology, Soils, Seismicity and Mineral Resources; Hydrology and Water Quality; Land Use, Plans, and Policies; Noise; Population, and Housing; Public Health; Public Safety; Public Services; Parks and Recreation; Transportation; and Utilities and Service Systems.

1.4 Type and Organization of this Document

On April 6, 2005, Chevron filed an application with the City of Richmond for a Conditional Use Permit (Chevron, 2005). Chevron submitted an environmental checklist for the Proposed Project with this filing. Chevron's environmental checklist indicated that an EIR should be prepared for the Proposed Project based on potentially significant project-related impacts to air quality, hazards, noise, transportation, utilities and service systems, and cumulative impacts. The City reviewed the checklist and application materials, and agreed with this conclusion. The Proposed Project includes a number of component projects. Some of these component projects have been clearly defined and there is sufficient information available to analyze them at a project-level for environmental review purposes. However, others lack sufficient detail to be analyzed at a project-level and, therefore, are analyzed at a more programmatic level. A Master Environmental Impact Report (Master EIR) was chosen after early-on discussions between Chevron and the City as the appropriate type of CEQA document given the level of detail that was available at the time of Chevron's application filing for all Proposed Project components to apply to the environmental review of this Proposed Project.

1.4.1 Master EIR

CEQA Guidelines Section 15175(a) defines a Master EIR as follows:

The Master EIR procedure is an alternative to preparing a project EIR, staged EIR, or program EIR for certain projects which will form the basis for later decision making. It is intended to streamline the later environmental review of projects or approval included within the project, plan or program analyzed in the Master EIR. Accordingly, a Master EIR shall, to the greatest extent feasible, evaluate the cumulative impacts, growth inducing impacts, and irreversible significant effects on the environment of subsequent projects.

Also CEQA Guidelines Section 15175(b)(3) states that a lead agency may prepare a Master EIR if the project consists of smaller individual projects which will be carried out in phases.

1.4.1.1 Contents of a Master EIR

According to CEQA Guidelines Section 15176, a Master EIR must consider and discuss the environmental impacts of all phases of the Proposed Project including, planning, acquisitions, development and operation. A Master EIR must consider the following:

- (a) Significant Environmental Effects of the Proposed Project.
- (b) Significant Environmental Effects Which Cannot be Avoided if the Proposed Project is Implemented.
- (c) Significant Irreversible Environmental Changes Which Would be Involved in the Proposed Project Should it be Implemented.
- (d) Growth-Inducing Impact of the Proposed Project.
- (e) The Mitigation Measures Proposed to Minimize the Significant Effects.
- (f) Alternatives to the Proposed Project.

A Master EIR must also provide a description of anticipated subsequent projects that are within the scope of the Master EIR, including information with regard to the kind, size, intensity, and location of the subsequent projects, including, but not limited to all of the following:

- (a) The specific type of projects anticipated to be undertaken such as a single family development, office-commercial development, sewer line installation or other activities.
- (b) The maximum and minimum intensity of any anticipated subsequent projects, such as the number of residences in a residential development, and with regard to a public works facility, its anticipated capacity and service area.
- (c) A capital outlay or capital improvement program, or other scheduling or implementing device that governs the submission and approval of subsequent projects, or an explanation as to why practical planning considerations render it impractical to identify any such program or scheduling or other device at the time of preparing the MEIR.
- (d) A description of potential impacts of anticipated projects for which there is not sufficient information reasonably available to support a full assessment of potential impacts in the MEIR.

1.4.1.2 Approval and Subsequent Use of a Master EIR

If this Master EIR is certified, subsequent projects that the City determines to be within the scope of the Master EIR will be subject to only limited environmental review. However, CEQA Guidelines Section 15179 states that approvals granted due to the certified Master EIR shall not be used if either (i) the Master EIR was certified more than five years prior to the filing of an application for a later project, or (ii) if a project is not identified in the certified Master EIR as an anticipated subsequent project. Additionally, the BAAQMD has informed the City that, when acting as a responsible agency the District, would endeavor to use this Master EIR for permitting of subsequent CEQA projects envisioned in this Master EIR to the extent possible. However, if the Master EIR does not provide adequate detail to make determinations and findings as required in CEQA 15091, 15093 and 15096, future permit applications submitted for proposed projects

envisioned in this Master EIR may necessitate the BAAQMD to require the preparation of subsequent CEQA documents as appropriate.

1.4.2 Organization of the EIR

This document is organized into the following chapters:

Volume 1

Chapter 1 – Introduction

Chapter 2 – Summary of Environmental Impacts: Summarizes environmental impacts that would result from implementation of the Proposed Project and indicates the measures needed to mitigate those impacts. The summaries indicate the level of significance of those impacts, without and with the mitigation measures applied.

Chapter 3 – Project Description: Provides a detailed description of the Proposed Project, including its location, background information, major objectives, and technical characteristics.

Chapter 4 – Environmental Settings, Impacts and Mitigation Measures: Contains an analysis of environmental issue areas. Discussion of each issue area is divided into: a) a description of the environmental setting, which describes physical environmental conditions in the vicinity of the project as they existed at the time the Notice of Preparation was published, as well as applicable regulatory information; b) the standards of significance for determining the degree or level of potential environmental impacts for each issue; c) analysis of potentially significant impacts, which indicates the significant environmental effects that are anticipated from the Proposed Project, and d) proposed mitigation measures to lessen the significant environmental effects of the Proposed Projects to a less-than-significant level.

Chapter 5 – CEQA Statutory Sections: Provides discussions of various California Environmental Quality Act mandated considerations, including significant and unavoidable environmental impacts, cumulative impacts, significant irreversible environmental changes, and growth inducing impacts that would result from the Proposed Project, and growth inducing impact.

Chapter 6 – Alternatives: Describes the alternatives to the Proposed Project and lists their associated environmental effects.

Chapter 7 – Report Preparation: Lists report authors by section and City staff that assisted with the preparation and review of the Master EIR as well as agencies and organizations consulted.

Chapter 8 – Glossary and Acronyms: Presents definitions of terms used throughout the report. For some terms, expanded definitions are included to further assist the reader's understanding of refinery processes in general and specific to Chevron. A list of acronyms used in the report is included as well.

Volume 2

Appendices.

1.5 Use of this Document by Agencies

In accordance with the CEQA, as amended, the City of Richmond must consider the environmental implications of the Proposed Project before making any determination to grant or deny the Chevron Refinery's request for a Conditional Use Permit for the Proposed Project. The City of Richmond will use this EIR when considering this application for a Conditional Use Permit or for subsequent Building Permits. Other agencies that may rely on this EIR when considering approvals for the Proposed Project include the Bay Area Air Quality Management District (BAAQMD), the San Francisco Regional Water Quality Control Board (RWQCB) and Caltrans.

1.6 Project Permits and Approvals

The Proposed Project would require permits and approvals before project construction can begin. Among them are Conditional Use Permit and building permits from the City of Richmond for all components, and an Authority to Construct and Permit to Operate approvals from the BAAQMD for most components. A CEC Application for Certification or Small Power Plant Exemption. Although none are expected, any changes in the Refinery's National Pollutant Discharge Elimination System (NPDES) permits would require approval from the San Francisco RWQCB. A water supply assessment prepared by the East Bay Municipal Utility District has been prepared for the Proposed Project. A Caltrans encroachment permit may be needed to implement the traffic mitigation measures for construction traffic.

1.7 Environmental Review Process to Date

Since the filing of the application on April 6, 2005, the City of Richmond has proceeded with the environmental review of the Proposed Project and the preparation of this Environmental Impact Report. A Notice of Preparation (NOP) of this EIR was filed with the State Clearinghouse on June 15, 2005 and a 30-day public review period until July 25, 2005 was provided. This review period was extended by the City until August 25, 2005. The NOP was assigned the following clearinghouse number – 2005072117. A public scoping meeting was held on June 23, 2005 at 7pm at Richmond City Hall. During the public scoping period a total of 40 comment letters were received. Concerns raised during the scoping period included, water supply, potential local traffic impacts, and access to and completion of a local segment of the San Francisco Bay Trail⁶. A report of the scoping period and comments received is included as Appendix A of this document.

⁶ With the exception of two letters almost all scoping comments were specifically concerned with Bay Trail issues.

CHAPTER 2

Summary of Environmental Impacts

2.1 Summary of Impacts of the Proposed Project

This section provides a summary of the environmental impacts of the Proposed Project as developed during this analysis. The impacts of the Proposed Project and the mitigation measures that are included as a part of the Proposed Project have been extracted from the analyses and evaluations presented and discussed in detail in Chapter 4 of this document. The cumulative impacts of the Proposed Project are also summarized in Chapter 5. To assist readers with a brief overview of the results of the analysis contained in this document, Section 2.2 presents summary statements of impacts from each environmental area of study. Each summary statement is a formal statement of impact and proposed mitigation as well as level of significance before and after mitigations are applied. This information is presented in tabular form in Table 2-1.

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.

2.2 Review of Proposed Project Impacts

2.2.1 Aesthetics, Visual Quality, Light and Glare

The Aesthetics, Visual Quality, and Light and Glare effects that would result from the implementation of the Proposed Project would be less than significant.

- The Proposed Project would be constructed within the developed portion of the existing 2,900-acre active area of the Refinery, which has been an active industrial facility for more than 100 years.
- The Proposed Project would not have a substantial adverse effect on a scenic vista and would not substantially degrade the existing visual character or quality of the site and its surroundings.

The construction of the other non-Refinery cumulative projects, together with all of the reasonably foreseeable projects at the Refinery, would reinforce the industrial appearance of the overall complex and the northwest portion of the City of Richmond, as well. The development of the other, non-refinery cumulative projects, such as planned residential and commercial projects in the City of Richmond, including future development according to Richmond General Plan, also

would result in changes to City viewsheds in the vicinity of the Refinery and throughout the northwestern portions of the City.

2.2.2 Agricultural Resources

- Construction and operation of the Proposed Project would result in no impacts to agricultural resources. No mitigation would be required.

2.2.3 Air Quality

There would be a significant and unavoidable impact resulting from emissions of volatile organic compounds from the Proposed Project.

- Activities associated with Proposed Project construction would generate short-term emissions of criteria pollutants, including suspended and inhalable particulate matter and equipment exhaust emissions, during the term of Proposed Project construction. This would be a significant impact that would be mitigated to a less than significant level.
- Operational activities associated with the implementation of the Proposed Project would increase air pollutant emissions of volatile organic compounds by potentially significant quantities. This impact would be significant and unavoidable both for the Proposed Project and cumulatively as well.
- Operational impacts from other (non-volatile organic compounds) criteria pollutant emissions would be less than significant.
- Depending on the phasing of the commencement of operations of Proposed Project components, operational impacts from particulate matter emissions could result. A mitigation measure is provided to ensure that the commencement of operations is phased to mitigate this to a less than significant level.
- Operational activities associated with the implementation of the Proposed Project could lead to increases in odorous emissions. This would be a less than significant impact.
- Proposed Project activities could result in an increase in greenhouse gas emissions from the Refinery.

2.2.4 Biological Resources

The effects related to Biological Resources of the implementation of the Proposed Project would be less than significant.

- Proposed sites for Proposed Project components are within currently developed areas of the operating Refinery that do not provide potential habitat for special status species. Proposed Project components are separated from the San Pablo Bay and salt marsh features by the

Refinery operational area and from the San Francisco Bay by Interstate 580. Placement and construction of project components will have no impact on biological resources.

- Potential impacts to special status fisheries could result if additional wastewater or pollutant discharges into the Bay were to occur. The State Implementation Plan and the San Francisco Bay Basin Plan regulate such discharges through National Pollutant Discharge Elimination System (NPDES) permits, a principal tool used in protection of aquatic sensitive species and other “beneficial uses” of State water resources.
- Potential impacts to special status fisheries could occur with additional water discharges from other non-refinery industrial projects, together with cumulative refinery projects.
- Continued compliance with the discharge requirements of the Refinery’s NPDES permit would reduce potential biological impacts of increased pollutant discharge to less-than-significant levels.
- The Proposed Project’s impact would be mitigated to a less-than-significant level by complying with the discharge requirements established by the RWQCB, as would the other Refinery operations discharging under the Refinery’s NPDES permit. The existing regulatory programs consider cumulative impacts to water bodies, and the contribution of refineries to pollution of San Francisco and San Pablo Bays has been found to be insignificant. Therefore, the Proposed Project would not contribute to a cumulatively considerable impact.

2.2.5 Cultural Resources

Construction of the Proposed Project could result in several cultural resource impacts, all of which could be mitigated to less than significant levels:

- Construction could disturb currently unknown or unidentified cultural or paleontological resources or human remains.
- Construction would not impact historical resources, as defined in Section 15064.5, as no demolition of or substantial adverse change to historic structures would occur.
- Construction could impact previously identified cultural or paleontological resources during ground disturbance activities.

Potential impacts related to construction would be reduced to less than significant by standard mitigation measures and regulatory controls.

There would be no impacts to historical resources, unique archaeological resources, unique paleontological resources, unique geologic features or human remains during operation of the Proposed Project.

Both City of Richmond and state level regulations require identification and evaluation of cultural resources as part of environmental review effectively reduces the cumulative impacts that would occur to cultural resources. Because this uniform policy is designed in each case to reduce impacts on cultural resources to below a level of significance on a site-specific basis, cumulative impacts would be less than significant.

2.2.6 Energy

Construction and operation of the Proposed Project would increase consumption of energy within the Refinery beyond current levels. However, the Proposed Project would increase the amount of hydrogen, electricity and California Air Resources Board (CARB) approved gasoline produced by the Refinery. The impacts to energy resources are less than significant. No mitigation measures would be required.

- The existing energy supplies are adequate for construction of the Proposed Project.
- The Proposed Project's cogeneration system would supply 50 MegaWatts (MW) gross (47 MW net) of electrical power and steam for use in process units, replacing boilers that now supply electrical power plus process steam. The new Hydrogen Plant would also produce 17 MW of electrical power. This would result in a net increase of 64 MW in electricity generation at the Refinery.
- The net result of the Proposed Project would be that the Refinery would typically self-generate all of the electricity needed for normal operations and at times export electricity to the grid.
- Hydrogen and fuel gas for process feed stocks and for firing the cogeneration system would be manufactured at the Refinery from crude oils and gas oils.
- Natural gas consumption would increase by about 1/3 above the existing consumption.
- No new electrical transmission lines or natural gas pipelines would be required to deliver energy to the Refinery.¹
- The Proposed Project would not increase reliance on renewable energy resources, and would also not decrease reliance on natural gas and oil, except to improve the efficiency with which useful products would be extracted from crude oil and gas oils at the Refinery.
- However, because the Proposed Project would make more energy resources available through not only more product available to the California market but through the routine supply of a few MegaWatts of electricity to the PG&E grid, the Proposed Project would not contribute to a significant cumulative impact on the availability of energy resources.

¹ Praxair, the third party builder and operator of the proposed new Hydrogen Plant, is also proposing to build a hydrogen pipeline that is not a part of the Proposed Project (See Section 5.2.3.2 for a complete description of this cumulative project.

2.2.7 Geology, Soils, Seismicity, and Mineral Resources

- Seismic ground shaking could result in injuries to persons or structural damage to equipment or facilities.
- Facilities could be exposed to expansive soils and natural settlement.

Each of these impacts would be reduced to less than significant by compliance with applicable codes and regulations.

There are no cumulative impacts related to Geology, Soils, Seismicity, and Mineral Resources that would result from the Proposed Project.

2.2.8 Hydrology and Water Quality

The Hydrology and Water Quality effects related to the implementation of the Proposed Project would be less than significant through compliance with applicable regulations and discharge requirements:

- Pollutants, including toxic metals and chemicals, could potentially increase in the Refinery wastewater effluent discharges to San Pablo Bay due to changes in source crudes and process activities. Discharges would be required to meet discharge requirements established by the Regional Water Quality Control Board (RWQCB). Uncertainties in the amounts of the increases, if any, in toxic metal and chemical loadings and uncertainties in the ability of the receiving waters to assimilate those increases would be mitigated by the controls imposed by the RWQCB discharge requirements and therefore the potential impact would be less than significant; and,
- Rainwater runoff from stockpiles of contaminated soils excavated during site preparation of the building sites for the new Hydrogen Plant and for the Continuous Catalytic Regeneration (CCR) Reformer could introduce additional contaminant loading into the waste stream. However, these stockpiled soils would be managed under a Stormwater Pollution Prevention Plan (SWPPP) as required by the RWQCB, which would mitigate the potential impact to less-than-significant levels.

Despite uncertainties in the cumulative amounts of increases in toxic metal and chemical loading and uncertainties in the ability of the receiving waters to assimilate increases, the Proposed Project's contribution of increased metal and chemical loading in effluent discharge, if any, to the cumulative loading in Bay receiving waters also would be a less-than-significant impact. As must the Proposed Project, the other projects considered in the cumulative analysis also must comply with discharge requirements of the RWQCB.

2.2.9 Land Use, Plans and Policies

- All land use effects of the Proposed Project either would be less than significant or would result in no impact. No mitigation is required.

- The Proposed Project would not conflict with established plans, policies and ordinances.
- Because it would be contained within the existing Refinery, the Proposed Project would not potentially divide an established community.
- The Proposed Project would not affect a habitat conservation plan or natural community plan.

2.2.10 Noise

Construction and operation of the Proposed Project would result in noise effects that either would be less than significant or would be reduced to a less-than-significant level with the implementation of the identified mitigation measures:

- Proposed Project construction could result in temporary significant noise impacts to adjacent sensitive land uses, such as nearby residences. Construction impacts would be mitigated to a less-than-significant level by implementing the identified mitigation measures.
- Proposed Project operations would result in less-than-significant noise impacts on sensitive receptors.

The Proposed Project would not significantly contribute to cumulative noise in the local area.

2.2.11 Population, and Housing

The effects related to Population and Housing from the implementation of the Proposed Project would be less than significant:

- The Proposed Project would not displace existing housing or any existing population.
- The Proposed Project would not result in a substantial increase in population.
- With only 10 new permanent employees added to the Refinery workforce, the Proposed Project's contribution to cumulative population growth and associated housing impacts would not be cumulatively considerable.

2.2.12 Public Health

Public exposure to toxic air contaminant (TAC) emissions can result in health risks. However, the incremental health risks from the Proposed Project fall below the criteria established by the Bay Area Air Quality Management District (BAAQMD) for CEQA projects that emit toxic air contaminants (TACs). The public health effects related to the construction and operation of the Proposed Project would be less than significant.

- Construction activities from the Proposed Project would increase emissions of TACs, mainly from diesel-powered construction equipment and trucks throughout the construction period. The predicted offsite concentrations of TACs from construction emissions would be less than the BAAQMD CEQA significance thresholds and exposure to TACs from construction emissions would be a less than significant impact. No additional mitigation measures would be required.
- The operation of the Proposed Project would result in a less than significant cancer risk to workers and the public and would not cause any acute or chronic non-cancer hazard from TACs. The magnitudes of both these risks would fall below the significance thresholds. The health risks from the Proposed Project would therefore be less than significant. No additional mitigation measures would be required.
- The Proposed Project would not cause any cumulatively significant public health impacts.

2.2.13 Public Safety

The risks to Public Safety from the implementation of the Proposed Project were evaluated in the context of possible accidental releases of acutely hazardous substances, explosion or fire. No additional mitigation measures would be needed.

- As long as the Proposed Project components are designed to applicable codes and industry guidelines, and as long as the facility operators maintain the strict safety practices required by the California Accidental Release Prevention (CalARP) Program, the impacts from plausible accidents would be less than significant.
- The Proposed Project would not cause any cumulatively significant public safety impacts.

2.2.14 Public Services

The effects of Public Services related to the implementation of the Proposed Project would be less than significant with implementation of mitigation measures identified in this EIR.

- The Proposed Project would not significantly affect the Richmond Police Department's ability to provide police protection services to the Proposed Project site and City of Richmond.
- The Proposed Project would not significantly affect the ability of the Richmond Fire Department to provide mutual aid fire suppression and emergency response services to the Refinery or to serve other parts of the City.
- The Proposed Project would not significantly affect the ability of the West Contra Costa School District to adequately provide educational services to residents of the City of Richmond. The Proposed Project would not significantly affect other public services such as libraries or hospitals.

- The Proposed Project, with mitigation measures proposed in Section 4.14, is would have a less than cumulatively considerable impact on the need for governmental services for police or fire protection.

2.2.15 Parks and Recreation

Construction and operation of the Proposed Project would result in effects related to Parks and Recreation that would be less than significant and would not require mitigation measures:

- The construction of the Proposed Project would not increase the use of nearby neighborhood parks or increase demand by construction workers for use of the proposed segments of the Bay Trail along Western Drive.
- None of the physical changes occurring with the implementation of all components of the Proposed Project would affect the proposed Bay Trail alignment.
- The Proposed Project has no cumulatively considerable impacts on recreational resources.

2.2.16 Transportation

The Transportation effects related to the implementation of the Proposed Project would occur primarily during construction of the Proposed Project components. The construction phase of the Proposed Project would generate up to about 1,767 daily trips, including 485 a.m. peak-hour trips and 400 p.m. peak-hour trips, at the Chevron Refinery.

- Project-generated increases in traffic volumes at the signalized study intersections of Castro Street / General Chemical Access, and Richmond Parkway / Gertrude Avenue would result in a significant impact to peak-hour operations.
- The impact at the above-cited intersections can be mitigated by implementation of Mitigation Measures 4.16-1 to 4.16-2, which include (1) the provision of traffic control personnel during peak arrival and departure times in the a.m. and p.m. peak hours, and (2) reconfiguration of lanes on specific intersection approaches during the affected peak hour(s), through the use of traffic cones (and flaggers as needed). Implementation of those measures would mitigate the project impacts to a less-than-significant level.

Operation of the Proposed Project following project construction would generate about 34 new daily one-way truck trips because of increased import and export of materials to and from the Refinery. Refinery permanent employment levels would increase by 10 employees. This amount of added traffic is insignificant when compared to the 2025 traffic volumes at the study area intersections.

2.2.17 Utilities and Service Systems

The Proposed Project would have less than significant effects on the utilities and services systems:

- The increase of 0.7 MGD in water use for the Proposed Project represents a 6% increase over the current water use at the Refinery. The overall water supply would be sufficient to serve the Proposed Project, and would not require the development of new potable water sources. Thus, the contribution of the Proposed Project to the water demand would be less than significant. Under either normal or drought conditions the marginal increase in water supply is expected to be available to the Refinery and the cumulative impact to water supply from this and other projects would be expected to be less than significant as well.
- The Proposed Project would not substantially increase the amount of non-hazardous solid waste that would be produced at the Refinery and either recycled or disposed in landfills. Current landfill capacity would be sufficient to serve the Proposed Project.
- The contributions of the Proposed Project to the cumulative water use and cumulative use of landfill capacity would be less than significant.

No mitigation would be required for potential impacts to utilities and services systems.

TABLE 2-1
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Aesthetics, Visual Quality, Light and Glare			
4.1-1: The Renewal Project would add new equipment and facilities in developed, industrial portions of the Refinery. These new facilities, which would be visible from public view corridors, could potentially alter but would not degrade the visual character of the setting.	Less than Significant	None required.	
4.1-2: Proposed Project operations could cause increases in the frequency and/or magnitude of flaring events at the Refinery.	Less than Significant	None required.	
4.1-3: Operation of the Proposed Project could create water vapor plumes visible to surrounding residents and motorists. Steam would be generated as a part of the Proposed Project and used in the proposed process units. The formation of visible water vapor plumes from Refinery process units is a function of varying local meteorological conditions; including air temperature, wind speed and atmospheric humidity, as well as variation in the actual Refinery process itself.	Less than Significant	None required.	
4.1-4: The Proposed Project's new facilities could introduce new lighting on the Refinery site.	Less than Significant	None required.	
5-1: The reasonably foreseeable projects at the Richmond Refinery would expand the industrial appearance of the overall complex. However, none of the changes associated with individual projects would be expected to substantially alter the visual appearance of the Refinery or affect visual resources.	Less than Significant	None required.	

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
5-2: Other non-refinery cumulative projects, together with the Proposed Project and other Chevron Refinery projects, would combine to alter the general appearance of the northwestern portion of the City of Richmond, but would not degrade the visual character of the setting. Therefore, none of the changes would be considered to substantially impact visual resources. Agricultural Resources No agricultural resource impacts identified. Air Quality 4.3-1: Activities associated with Proposed Project construction would generate short-term emissions of criteria pollutants, including suspended and inhalable particulate matter and equipment exhaust emissions, during the term of construction.	Less than Significant Significant	None required. 4.3-1a: During construction, Chevron Richmond shall require the construction contractor to implement the following dust control procedures to maintain project construction-related impacts at acceptable levels. Construction contractors shall implement the following dust abatement program to reduce the contribution of Proposed Project construction to local PM10 concentrations. Elements of this program (in compliance with BAAQMD CEQA Guidelines) shall be implemented on days in which the ground is not otherwise damp and shall include the following: • Water all active construction areas at least twice daily. • At all times, cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard. • Pave, gravel-cover, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.	Less than Significant

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
		- Sweep daily (with water sweepers) all paved access roads, parking areas and staging areas at construction sites. - Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets. - Dry mechanical pavement sweeping shall not be allowed. The following control measures shall be implemented on construction sites greater than four acres in size: - Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas and previously graded areas inactive for ten days or more. - Enclose, cover, water twice daily or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.) - Limit traffic speeds on unpaved roads to 15 mph. - Install sandbags or other erosion control measures to prevent silt runoff to public roadways. - Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph. - Limit the area subject to excavation, grading and other construction activity at any one time. - Install wheel-washers for all exiting trucks, or wash off the tires or tracks of all trucks and equipment leaving the site. 4.3-1b: To mitigate equipment exhaust emissions, Chevron Richmond shall require its construction contractors to comply with the following requirements:	

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
		• All diesel-fueled engines used for construction shall be fueled only with ultra-low sulfur diesel, which contains no more than 15 ppm sulfur. • All construction diesel engines that have a rating of 100 hp or more shall meet, at a minimum, the Tier 2 California Emission Standards for Off-Road Compression-Ignition Engines as specified in California Code of Regulations, Title 13, section 2423(b)(1) unless it is certified by the construction contractor that such engine is not available for a particular item of equipment. In the event a Tier 2 engine is not available for any off-road engine larger than 100 hp, that engine shall be a Tier 1 engine. In the event a Tier 1 or Tier 2 engine is not available for any off-road engine larger than 100 hp, that engine shall be equipped with a CARB Level 3-verified diesel emission control device (e.g., catalyzed diesel particulate filter), unless the engine manufacturer or the construction contractor certifies that the use of such devices is not practical for specific engine types. In the event that a CARB Level 3 verified diesel emission control device is not practical for the specific engine type, then the engine shall be equipped with a CARB Level 1- or 2-verified control device (e.g., diesel oxidation catalyst), unless the engine manufacturer or the construction contractor certifies that such devices are not available for the engine in question. For purposes of this condition, the use of such devices is "not practical" if, among other reasons:	

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
		1. There is no available diesel emission control device that has been verified/certified by either the California Air Resources Board or U.S. Environmental Protection Agency for the engine in question; or 2. The construction equipment is intended to be on-site for ten (10) days or less. 3. This requirement may be waived if the construction contractor can demonstrate that it has made a good faith effort to comply with this requirement and that compliance is not possible. • The use of a diesel emission control device may be terminated immediately if one of the following conditions exists, provided that the City is informed within ten (10) working days of the termination: 1. The use of the diesel emission control device is excessively reducing normal availability of the construction equipment due to increased downtime for maintenance, and/or reduced power output due to an excessive increase in backpressure. 2. The diesel emission control device is causing or is reasonably expected to cause significant engine damage. 3. The diesel emission control device is causing or is reasonably expected to cause a significant risk to workers or the public. 4. Any other seriously detrimental cause which has the approval of the City prior to the termination being implemented. • Construction equipment shall be properly tuned and	

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
		maintained in accordance with manufacturers' specifications. • Best management construction practices shall be used to avoid (or limit) unnecessary emissions (e.g., trucks and vehicles in loading and unloading queues would turn their engines off when not in use, and to the extent practical, all diesel heavy construction equipment shall not remain running at idle for more than five minutes) • Use alternative fueled equipment when feasible (such as ULSD, CNG, biodiesel, water emulsion fuel, and electric). The construction contracts shall require each contractor and subcontractor to consider this measure and adopt it for their work unless they can demonstrate to Chevron the inapplicability or infeasibility of the measure to their specific work, or can provide mitigation measures with equivalent or better effectiveness. Chevron shall report this information to the City as part of the Mitigation Monitoring Reporting and Compliance Program. • Use on-site power when feasible to reduce reliance on portable generators. The construction contracts shall require each contractor and subcontractor to consider this measure and adopt it for their work unless they can demonstrate to Chevron the inapplicability or infeasibility of the measure to their specific work, or can provide mitigation measures with equivalent or better effectiveness. Chevron shall report this information to the City as part of the Mitigation Monitoring Reporting and Compliance Program. • Mitigation Measure 4.3-1b shall be included in the construction bid documents and contracts.	

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
		4.3-1c: To mitigate on-road vehicle exhaust emissions, Chevron Richmond shall require its construction contractors to comply with the following requirements: - Construction worker commuters shall be encouraged to carpool or employ other means to reduce trip generation. - Shifts shall be staggered to reduce the number of workers arriving and departing the work site at the same time. - A substantial portion of the construction workforce shall be allowed to avoid the morning and afternoon peak traffic periods.	
4.3-2: Operational activities associated with the implementation of the Proposed Project could increase air pollutant emissions.	Significant and Unavoidable	None available. Because Chevron does not have any available additional contemporaneous VOC emission reduction offsets that could be used to mitigate this significant impact. Therefore, there are no feasible mitigation measures that could reduce this impact to a less than significant level.	
4.3-3: Alternate phasing of the Proposed Project components could lead to temporary increases in PM emissions greater than significance thresholds.	Significant	4.3-3: Chevron shall commence operations of at least one of the new hydrogen trains before operations of the Power Plant, Catalytic Reformer, Hydrogen Purity Improvements, and the New and Replacement Storage Tanks are initiated to ensure that the offsetting emissions reductions associated with the new hydrogen plant are achieved. This shall not preclude the dual operations of the old and new hydrogen plants, or the dual operations of any of the Proposed Project components, as long as the combined throughput of the old and replacement units remain within present or future permitted levels when operated simultaneously during initial commissioning of the replacement units.	Less than Significant for NO _x , SO ₂ , CO, and PM. Emissions of VOC would continue to be significant and unavoidable.

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
		Chevron shall prepare periodic reports to the City and shall provide at least 30 days notice on the completion of construction and change in operational status for the new and old Hydrogen Plants, the Power Plant, the Catalytic Reformer, the Hydrogen Purity Improvements, and the New and Replacement Storage Tanks.	
4.3-4: Operational activities associated with the implementation of the Proposed Project could lead to increases in odorous emissions.	Less than Significant	None required.	
5-3: Short term criteria pollutant emissions associated with the construction of the Proposed Project could result in elevated pollutant concentrations when combined with emissions from other construction projects.	Potentially Significant	Implement Mitigation Measures 4.3-1a, 4.3-1b, and 4.3-1c (See Section 4.3, Air Quality).	Less than Significant
5-4: Operational emissions of Proposed Project-related VOC pollutants would be cumulatively significant	Significant and Unavoidable	No feasible mitigation.	
5-5: Operational emissions of criteria pollutants other than VOC from the Proposed Project could result in elevated pollutant concentrations when combined with emissions from other projects.	Less than Significant	None required.	
5-6: Operational activities associated with the implementation of the Proposed Project and other local cumulative projects could lead to cumulative increases in odorous emissions.	Less than Significant	None required.	

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Biological Resources			
4.4-1: Potential impacts to special status fisheries could result from additional wastewater or pollutant discharges by the Proposed Project into receiving waters (San Pablo Bay and San Francisco Bay). The State Implementation Plan and the San Francisco Bay Basin Plan regulate such discharges through NPDES permits, a principal tool used in protection of aquatic sensitive species and other “beneficial uses” of State water resources.	Less than Significant	None required.	
5-7: Potential impacts to special status fisheries could occur with additional discharges into receiving waters from other non-refinery industrial projects, together with cumulative refinery projects.	Less than Significant	None required.	
Cultural Resources			
4.5-1: If construction of the Proposed Project were to encounter currently unknown historical resources, including unique archaeological resources, this could cause substantial adverse changes to the significance of the resource.	Potentially Significant	4.5-1: In the event that any prehistoric or historic subsurface cultural resources are discovered, such as structural features or unusual amounts of bone or shell, artifacts, human remains, architectural remains (such as bricks or other foundation elements), or historic archaeological artifacts (such as antique glass bottles, ceramics, horseshoes, etc.) during ground disturbing activities, all work within 50 feet of the resources shall be halted and Chevron and/or the lead agency shall consult with a qualified archaeologist to assess the significance of the find per CEQA Guidelines Section 15064.5. If any find is determined to be significant, representatives of Chevron and/or the lead agency and the qualified archaeologist shall meet to determine the appropriate avoidance measures or other appropriate mitigation, with the ultimate determination to be made by the lead agency. All significant cultural materials recovered shall be, as necessary and at the discretion of the consulting archaeologist, subject to scientific	Less than Significant

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
4.5-2: The Proposed Project could adversely affect unique paleontologic resources.	Potentially Significant	analysis, professional museum curation, and documented according to current professional standards.	Less than Significant
		As part of the Mitigation Monitoring and Reporting Program for the EIR, Chevron shall have environmental monitors onsite during construction of the Proposed Project. The construction workers shall be trained by the monitors on environmental sensitivity and the identification of prehistoric or historic subsurface cultural resources.	
		In considering any suggested mitigation proposed by the consulting archaeologist in order to mitigate impacts to historical resources or unique archaeological resources, the lead agency shall determine whether avoidance is necessary and feasible in light of factors such as the nature of the find, project design, costs, and other considerations. If avoidance is infeasible, other appropriate measures (e.g., data recovery) shall be instituted. Work may proceed on other parts of the project site while mitigation for historical resources or unique archaeological resources is carried out.	
		4.5-2: In the event of unanticipated paleontologic discoveries, such as large deposits of fossil remains Chevron shall notify a qualified paleontologist who shall document the discovery as needed, evaluate the potential resource, and assess the significance of the find under the criteria set forth in CEQA Guidelines Section 15064.5. In the event of an unanticipated discovery of a breas, true, and/or trace fossil during construction, excavations within 50 feet of the find shall be temporarily halted or diverted until the discovery is examined by a qualified paleontologist (per Society of Vertebrate Paleontology standards (SVP, 1995). The paleontologist shall notify the appropriate agencies to	

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
		determine procedures that would be followed before construction is allowed to resume at the location of the find. If the lead agency determines that avoidance is not feasible, the paleontologist shall prepare an excavation plan for mitigating the effect of the project on the qualities that make the resource important, and such plan shall be implemented. The plan shall be submitted to the lead agency for review and approval.	
	Potentially Significant	As part of the Mitigation Monitoring and Reporting Program for the EIR, Chevron shall have environmental monitors onsite during construction of the Proposed Project. The construction workers shall be trained by the monitors on environmental sensitivity and the identification of prehistoric or historic subsurface cultural resources.	Less than Significant
4.5-3: Project construction could result in damage to human remains.		4.5-3: In the event that human skeletal remains are uncovered during construction activities for the Proposed Project, Chevron shall immediately halt work, contact the Contra Costa County Coroner to evaluate the remains, and follow the procedures and protocols pursuant to Section 15064.5 (e)(1) of the CEQA Guidelines. If the County coroner determines that the remains are Native American, the project proponent will contact the NAHC, in accordance with Health and Safety Code Section 7050.5, subdivision (c), and Public Resources Code 5097.98 (as amended by AB 2641). Per Public Resources Code 5097.98, the landowner shall ensure that the immediate vicinity, according to generally accepted cultural or archaeological standards or practices, where the Native American human remains are located, is not damaged or disturbed by further development activity until the landowner has discussed and conferred, as prescribed in this section (PRC 5097.98), with the most likely descendents regarding	

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
		their recommendations, if applicable, taking into account the possibility of multiple human remains.	
5-8: Future foreseeable development at and in the vicinity of the Chevron Richmond Refinery could result in cumulative impacts with respect to cultural resources.	Less than Significant	None required.	
Energy			
4.6-1: Construction of the Proposed Project would use non-renewable energy resources, primarily in the form of fuels for vehicles and equipment, and would use electrical energy from renewable and non-renewable sources for tools and lighting. The energy required is readily available, and the increased demand would not result in a substantial use of regional energy sources, nor would it require new energy infrastructure to be constructed.	Less than Significant	None required.	
4.6-2: Operation of the Proposed Project and its components would increase long-term consumption of natural gas and increase production of electricity and hydrogen at the Refinery. Hydrogen would be used to process feed stocks. Refinery Fuel Gas, natural gas, and Refinery-produced LPG would also be burned in furnaces and in the CoGen unit to produce process heat, electricity and steam for use at the Refinery.	Less than Significant	None required.	
4.6-3: Operation of the Proposed Project and its components would increase long-term generation and consumption of electrical energy at the Refinery. Proposed Project operation would increase consumption of electrical energy within the Refinery.	Less than Significant	None required.	

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
4.6-4: Operation of the Proposed Project would require energy for transportation of employees, as well as product (crude oil, additives, refined products, and byproducts). The increase or decrease in energy use for transportation and production of product would be insubstantial compared to existing Refinery consumption.	Less than Significant	None required.	
5-9: The Proposed Project would increase consumption of natural gas by one-third, but it would not add incrementally to cumulative net external energy consumption by the Refinery.	Less than Significant	None required.	
Geology, Soils, and Seismicity			
4.7-1: In the event of a major earthquake in the region, seismic ground shaking could potentially injure persons at the Proposed Project site due to structural damage of facility structures. Ground shaking could potentially expose persons and property to seismic-related hazards, including localized liquefaction and seismically-induced settlement.	Less than Significant	None required.	
4.7-2: Proposed construction could experience damage from expansive soils and natural settlement.	Less than Significant	None required.	
Hydrology and Water Quality			
4.8-1: The Proposed Project would allow for a wider range of crude sources to be processed, which could result in an increase of pollutants, including toxic metals and chemicals, in the process wastewater stream and in effluent discharges. The Refinery is required to adequately treat the effluent to avoid exceeding discharge limits that are established by the Refinery's existing NPDES permit.	Less than Significant	None required.	

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
4.8-2: Rainwater runoff from stockpiles of contaminated soils excavated during site preparation of the building sites for the Hydrogen Plant and the CCR Reformer could introduce additional contaminant loading into the waste stream.	Less than Significant	None required.	
5-10: The cumulative wastewater flows from the Proposed Project process units and storm water flows from point and non-point sources within the vicinity of the Proposed Project could potentially increase the mass load of pollutant discharges to the Bay. Given the uncertainties in the amounts of the increases in the Proposed Project toxic metal and chemical loading, and in the ability of the receiving waters to carry those increases, if any, the Proposed Project could potentially contribute to a cumulative effect in the receiving water bodies.	Less than Significant	None required.	
Land Use, Plans and Policies			
4.9-1: The Proposed Project would involve the replacement and alteration of existing equipment in several centralized process areas within the Refinery that are already developed and would add tanks within developed tank farm areas. The Proposed Project would not expand the Refinery's perimeter boundary and would maintain the buffer between existing operations and the Refinery's eastern and southern boundaries.	Less than Significant	None required.	
4.9-2: The Proposed Project would not fundamentally conflict with any applicable land use plan, policy, or 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 and result in a physical change in the environment.	Less than Significant	None required.	

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
5-11: The cumulative impacts of the Proposed Project in relationship to existing land uses on site and in the Proposed Project vicinity would be less than significant.	Less than Significant	None required.	
Noise			
4.10-1: Construction activities associated with the Proposed Project would intermittently and temporarily generate noise levels above existing ambient levels in the project vicinity over the duration of the construction period.	Significant	4.10-1a: Over the duration of pile driving activities, Chevron shall require the construction contractor to implement the following mitigation measures: • Pile driving activities shall be limited to daytime hours between 7 a.m. and 6 p.m. on weekdays. Pile driving shall be prohibited during weekends and on state and federal holidays. • Chevron shall designate a construction compliance and complaint manager(s) for the project for the duration of the construction activities. The City of Richmond shall mail telephone contact information of the compliance and complaint manager(s) and designated City of Richmond staff to business persons and residents situated within the MFR-1 Multi-family Residential Zone and C-2 General Commercial Zone located North of Golden Gate Avenue. • If pile driving takes place within 2500 feet of a residence or commercial site, Chevron and designated City of Richmond staff shall monitor sound levels at the multi-family residential and commercial sites to determine if pile driving activity causes the City's noise impact significance levels to be exceeded. • If monitoring determines that pile driving causes the City's noise impact significance levels to be exceeded (65 dBA when measured at the MFR-1	Less than Significant

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
		Multi-family Residential Zone boundaries or within the boundaries of the MFR-1 Multi-family Residential Zone, 70 dBA for C-2 General Commercial) Chevron shall implement all feasible measures as needed to reduce the noise impacts from pile driving. These noise reducing measures may include: alternate methods of pile driving, pre-drilling of pile holes, the use of more than two pile drivers to significantly reduce the total time (as determined by the Planning Director) required for driving piles, erecting temporary plywood noise barriers that block the line of sight between the impact point of pile driving and nearby residential receptors, and other measures. If Chevron does not agree with the time-line determined by the Planning Director for significantly reducing pile driving noise the matter shall be resolved by the City Council.	
		4.10-1b: Construction contractors shall be required to ensure that construction equipment is well tuned and maintained according to the manufacturer's specifications, and that the equipment's standard noise reduction devices are in good working order.	
4.10-2: Vibration from construction equipment could cause a temporary nuisance during construction.	Less than Significant	None required.	
4.10-3: Increased vehicle traffic to and from the Refinery during the construction period would increase ambient noise levels at receptors along the travel route.	Less than Significant	None required.	
4.10-4: Operational noise from the equipment to be installed as part of the Proposed Project could increase noise levels at nearby noise receptors.	Less than Significant	None required.	

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
5-12: Operation and construction of the Proposed Project, together with proposed and planned future development at the Refinery and in the City of Richmond, could result in a cumulative increase in noise levels.	Potentially Significant	Implement Mitigation Measures 4.10-1a and 4.10-1b.	Less than Significant
Employment, Population, and Housing			
4.11-1: The Proposed Project could result in direct population growth within the City of Richmond.	Less than Significant	None required.	
5-13: The combination of the Proposed Project and other local projects could result in indirect population growth within the City of Richmond.	Less than Significant	None required.	
Public Health			
4.12-1: Construction activities from the Proposed Project would increase emissions of TACs, mainly from diesel-powered construction equipment and trucks.	Less than Significant	None required.	
4.12-2: Public exposure to toxic air contaminant emissions from the Proposed Project would result in an increase in health risks. The increases in health risks would result from exposure to carcinogenic and non-carcinogenic substances emitted during the operation of the Proposed Project.	Less than Significant	None required.	
5-14: Public exposure to toxic air contaminant emissions from the Proposed Project and other projects or cumulative development could result in an increase in health risks at the same locations affected by the Proposed Project.	Less than Significant	None required.	
Public Safety			
4.13-1: Accidents could occur during construction or demolition activities. Hazardous materials would be used and either consumed, recycled or disposed of as hazardous waste during the construction of the Proposed Project and demolition of decommissioned units.	Less than Significant	None required.	

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
4.13-2: Possible accidental releases of acutely hazardous substances that might result from the Proposed Project during its expected life were evaluated, and none were found to cause an unsafe offsite impact.	Less than Significant	None required.	
5-15: The potential for accidents to occur during the construction of the Proposed Project would be mitigated to a less-than-significant level by construction safety measures included as a part of the Proposed Project and occupational worker safety regulations.	Less than Significant	None required.	
5-16: The probability of an accidental release occurring from cumulative projects at the same time that an accident would occur at the Proposed Project would be extremely low.	Less than Significant	None required.	
5-17: Transportation, use and disposal of hazardous materials by other cumulative projects, when combined with hazardous materials transportation, use and disposal by the Proposed Project, would be a less than significant cumulative impact.	Less than Significant	None required.	
Public Services			
4.14-1: Police Protection. During the construction phase, the Proposed Project could result in an increase in the number of incidents necessitating calls to the Richmond Police Department and an increased need for the Richmond Police Department to deploy traffic control personnel.	Potentially Significant	4.14-1a: During the construction phase, Chevron shall hire additional contract security officers as necessary to compensate for the increase in personnel on site. The addition of these security officers would offset any additional demand for police services that would be created by the Proposed Project.	Less than Significant

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
		4.14-1b: Chevron shall impose rules and regulations with respect to the conduct of their personnel who will be involved in the Proposed Project. These rules shall be designed to reduce the need for calls to the Richmond Police Department. Staff from the Richmond Police Department have indicated that Chevron is typically quite strict in its rules and regulations that must be followed by employees with respect to such activities as speeding and drinking. Chevron shall impose these same requirements on the contractors who would be involved in the Proposed Project. Chevron shall continue to work with the Richmond Police Department as it has done in the past (McBride, 2007). 4.14-1c: Implement Mitigation Measures 4.16-1 through 4.16-4 (See Section 4.16, <i>Traffic/Transportation</i>) to reduce the demand for help from the Richmond Police Department for traffic-related issues.	
4.14-2: Fire Protection and Prevention. The Proposed Project would contribute to the ongoing need for the Richmond Fire Department to provide mutual aid to the Refinery. Mutual aid assistance by the Richmond Fire Department could reduce the duration of fires and thus reduce emissions releases from those fires. To effectively provide mutual aid, the Richmond Fire Department needs heavy rescue training and heavy rescue equipment to respond to fires and their associated environmental impacts, including emissions of air pollutants and hazardous materials releases.	Potentially Significant	4.14-2: Chevron and the City's Fire Department shall establish an agreement to address the extent of training in the area of industrial firefighting as part of the Proposed Project. This agreement shall cover 1) Training, Travel and per diem costs for Richmond Fire Department personnel to attend the Chevron Corporate Fire Training program at either Texas A&M University, the University of Nevada, Reno or equivalent. Training shall be conducted annually. Chevron shall commit to training 6-12 RFD members per year. This will allow for the training of each RFD member on a rotation basis. Chevron and RFD will continue their mutual training programs on an annual basis at both the Richmond Refinery and Richmond Fire Training Facility.	Less than Significant
4.14-3: The Proposed Project would not result in an increase in need for other public services such as schools or libraries.	Less than Significant	None required.	

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
4.14-4: The Proposed Project could result in an increase in the number of calls to the Richmond Fire Department during the construction phase of the Proposed Project, and possibly more assistance calls for medical emergencies.	Less than Significant	None required.	
5-18: The Proposed Project, in conjunction with other proposed Refinery Projects, could add incrementally to cumulative demand for public services.	Less than Significant	None required.	
Parks and Recreation			
4.15-1: The temporary increase construction labor force during construction of the Proposed Project could increase the use of nearby neighborhood parks and increase demand for use of the proposed segments of the Bay Trail along Western Drive.	Less than Significant	None required.	
5-19: Implementation of the Proposed Project, in addition to other cumulative projects in the area, would not result in significant cumulative impacts to recreation.	Less than Significant	None required.	
Transportation			
4.16-1: Proposed Project-generated increases in traffic volumes would result in a significant impact to p.m. peak-hour traffic operations at the signalized study intersection of Castro Street / General Chemical Access (Gate 91).	Significant	4.16-1: Implement the following measures at the intersection of Castro Street / General Chemical Access: - Chevron shall reconfigure the eastbound (General Chemical Access) approach to the intersection to provide two exclusive left-turn lanes, and one exclusive right-turn lane (this would be a permanent change). - Chevron shall work with the City of Richmond's Director of Public Works Department (or the Director's designated representative) to provide modified traffic control during peak arrival and departure times in the p.m. peak hour. The modified traffic control shall be accomplished by one or more of the following methods: (1) posting a technician at	Less than Significant

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
4.16-2: Proposed Project-generated increases in traffic volumes would result in a significant impact to peak-hour traffic operations at the signalized study intersection of Richmond Parkway / Gertrude Avenue.	Significant	the intersection to manually operate signal controls (using the police key feature of standard traffic signal controllers), (2) programming an alternate signal timing plan that would be in operation during specified peak commute periods, and/or (3) posting traffic control officers at the intersection to manually control traffic movements. Chevron shall pay the full cost of this measure, including costs for sheriff's deputies or other law enforcement personnel to provide the traffic control under above-cited methods (1) or (3). 4.16-2: Implement the following measures at the intersection of Richmond Parkway / Gertrude Avenue: - Chevron shall work with the City of Richmond's Director of Public Works Department (or the Director's designated representative) to provide modified traffic control during peak arrival and departure times in the a.m. and p.m. peak hours. The modified traffic control shall be accomplished by one or more of the following methods: (1) posting a technician at the intersection to manually operate signal controls (using the police key feature of standard traffic signal controllers), (2) programming an alternate signal timing plan that would be in operation during specified peak commute periods, and/or (3) posting traffic control officers at the intersection to manually control traffic movements. Chevron shall pay the full cost of this measure, including costs for sheriff's deputies or other law enforcement personnel to provide the traffic control under above-cited methods (1) or (3). - During the a.m. peak hour, through the use of traffic cones (and flaggers as needed), Chevron shall reconfigure the southbound (Richmond Parkway)	Less than Significant

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
		approach to the intersection to provide one shared left-through lane, one through lane, and one shared right-through lane.	
4.16-3: Proposed Project-generated increases in heavy truck traffic on area roadways could result in substantial damage or wear of public roadways.	Potentially Significant	4.16-3: Chevron shall repair any roads damaged by Project construction to a structural condition equal to that which existed prior to construction activity. Prior to project construction, City of Richmond Public Services Department would document road conditions for all routes that would be used by project-related vehicles. The City would also document road conditions after project construction is completed. The pre- and post-construction conditions of the haul routes shall be reviewed, and Chevron or contractor(s), and staff of the Public Services Department, would enter into an agreement prior to construction that details the pre-construction conditions and the post-construction requirements of a rehabilitation program. Fees shall be determined by the City of Richmond Construction Road Traffic Fee, which went into effect October 1, 2006.	Less than Significant
5-20: Under 2025 conditions, operation of the Refinery would generate additional truck trips because of increased import and export of materials to and from the Refinery. Refinery permanent employment levels would increase by 10 employees due to the Proposed Project. The level of traffic increase would be insignificant when compared to the projected 2025 traffic volumes at the study area intersections.	Less than Significant	None required.	
Utilities and Service Systems			
4.17-1: Solid waste generated from Proposed Project construction and operation would not adversely affect local landfills. The Proposed Project would not affect the Refinery's ability to continue to comply with federal, state, and local statutes and regulations related to solid waste.	Less than Significant	None required.	

TABLE 2-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE CHEVRON ENERGY HYDROGEN RENEWAL PROJECT

Environmental Impact	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
4.17-2: Implementation of the Proposed Project would increase water use, however, there would be sufficient water supplies available to serve the Proposed Project from existing entitlements and resources.	Less than Significant	None required.	
5-21: Demand for solid waste handling and disposal would increase due to increased growth and development within the Bay Area region. The Proposed Project, together with proposed and planned future development at the Refinery, would not make cumulatively considerable contributions to increases in demand solid waste handling and disposal.	Less than Significant	None required.	
5-22: The Proposed Project would increase the Refinery's water use by 0.7 MGD. The Proposed Project, together with proposed and planned future development at the Refinery, would not make a cumulatively considerable contribution to increases in demand for fresh water from EBMUD.	Less than Significant	None required.	

CHAPTER 3

Project Description

3.1 Project Overview and Location

3.1.1 Introduction

The Chevron Richmond Refinery (the Refinery), processes crude oil into a variety of fuel and oil products. In addition to producing motor gasoline, jet fuel, diesel fuel, and lubricating oils, the Refinery also produces industrial fuel oil, liquefied petroleum gas, sulfur, and feedstocks commonly used in the petrochemical industry. During the lifetime of the Refinery, Chevron has added, replaced, and upgraded facilities to improve safety and reliability, operational efficiency, produce reformulated gasoline in accordance with state and federal requirements, and comply with applicable environmental regulations.

This Master Environmental Impact Report (EIR) analyzes the potential environmental impacts that could result from Chevron's proposed Energy and Hydrogen Renewal Project (Renewal Project or Proposed Project) and describes other projects that Chevron may undertake at the Refinery in the future. The Proposed Project consists of replacement and upgrade of certain manufacturing facilities to improve the Refinery's ability to provide gasoline for local and export markets using the wide range of crude oil sources that are currently processed. While the Proposed Project would not increase the Refinery's consumption of crude oil beyond currently permitted levels, it would improve the Refinery's ability to process a more varied proportional mix of crude oil types than it currently processes.

3.1.2 Location

The Refinery is located along the western edge of the city of Richmond, in Contra Costa County, California, at 841 Chevron Way (See Figure 3-1). The approximately 2,900-acre Refinery occupies most of the Point San Pablo Peninsula with east and south boundaries in the vicinities of the residential communities of North Richmond and Point Richmond, respectively. The Refinery is located west of Castro Street and mostly to the north of Interstate 580 (I-580). Castro Street provides the access to the Refinery through a number of entrances.

Southeast of the Refinery, across Castro Street and Garrard Boulevard, are the residential communities of Atchison Village, Santa Fe and Iron Triangle. Shields-Reid lies towards the northeast. Further east are central and downtown Richmond. Parchester Village is located northeast of the Refinery and Point Richmond is located to the southwest. Point Molate and the

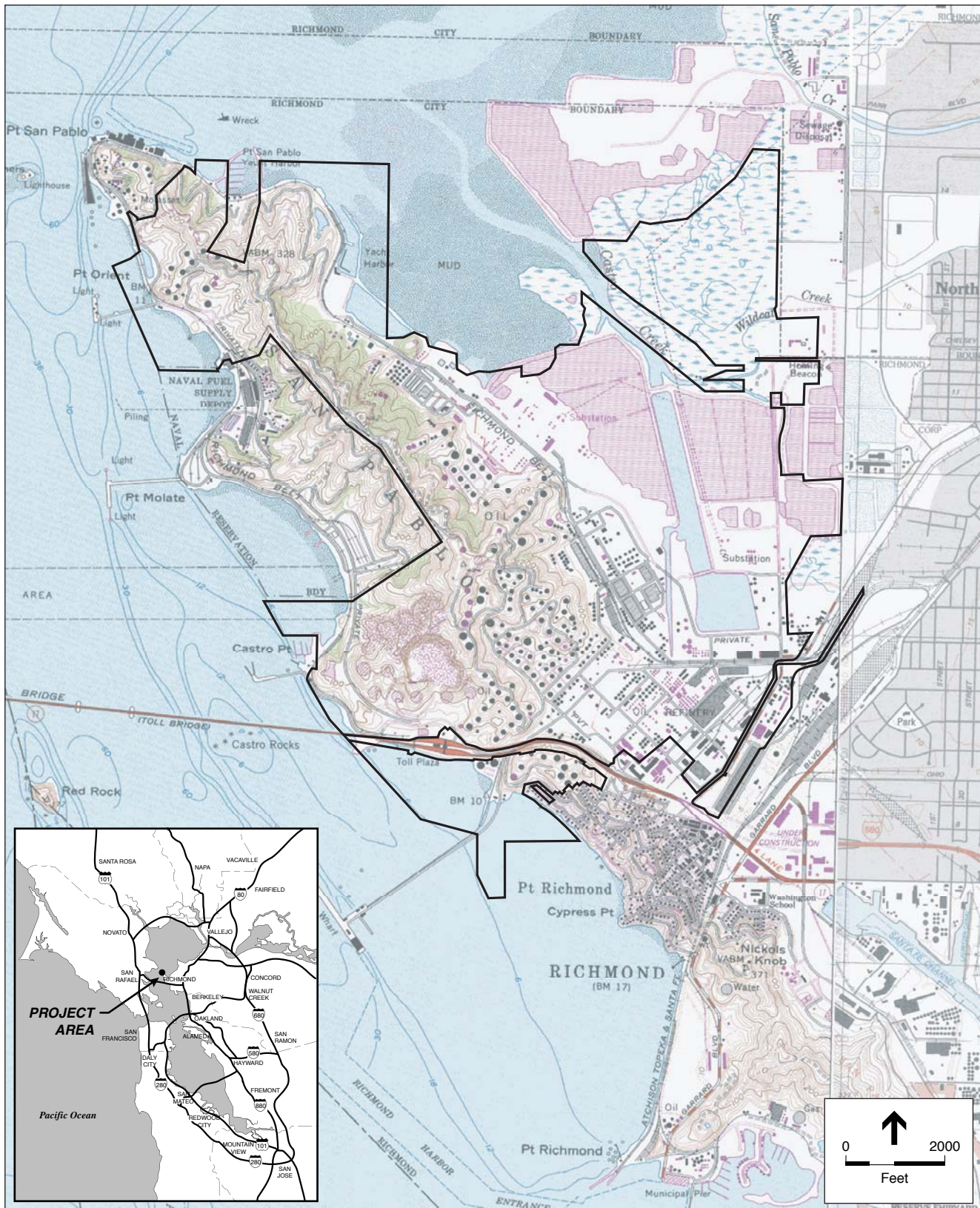
San Francisco Bay form the western border of the Refinery and San Pablo Bay forms the northern boundary of the Refinery property.

The main portion of the Refinery lies within the City's M-3, Heavy Industrial Zoning District.

Within the Refinery, related facilities and operations are concentrated in specific portions of the site. Most of the Refinery storage Tank Fields are situated to the west of the center of the property along the north-south line of hills while some storage tanks and the Long Wharf marine terminal lie south of I-580. The central portion of the Refinery site contains the bulk of Chevron's oil refining process equipment and supporting infrastructure. A rail terminal is located near the center of the Refinery and truck loading of fuel products occurs at Chevron Marketing's Richmond bulk fuels terminal that is located on property southeast of the Refinery.

Since the 1970's, as various changes have been made at the Refinery, Chevron has relocated petroleum processing units northward, away from the southern and eastern boundaries of the property and now treats the resulting vacant land areas near the Refinery's southern and eastern perimeter as a buffer between Refinery operations and the surrounding community.

More detailed discussions of project component locations are provided in Section 3.4, *Components of the Proposed Project*, while additional land use information is presented and discussed in more detail in Section 4.9, *Land Use*.



— Refinery Boundary

SOURCE: USGS; ESA

Chevron Energy and Hydrogen Renewal Project . 205166

Figure 3-1
Project Location

3.2 Project Objectives and Components

3.2.1 Project Objectives

The Proposed Project involves a series of modifications and additions to the Refinery. The Proposed 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. When in full operation, the Proposed Project is expected to add 10 regular employees at the Refinery. Chevron's primary objectives for the proposed Renewal Project are:

- Replace existing facilities with modern facilities providing improved reliability, energy efficiency, and additional environmental controls.
- To decrease the amount of energy imported by the Refinery.
- Ensure the Refinery's ability to process future crude and gas oil supplies.
- Increase the portion/percentage of the Refinery's total gasoline production that can meet California specifications and be distributed to local markets by 300,000 gallons/day or 6 percent more than current refinery production levels.
- Invest in Refinery upgrades that produce a competitive return on capital.

3.2.2 Summary of Project Components

The Proposed Project consists of a number of component projects. The four (4) main component projects considered in this Master EIR are the Hydrogen Plant Replacement, Power Plant Replacement, Catalytic Reformer Replacement, and Hydrogen Purity Improvements. The EIR also includes and analyzes a number of other, smaller projects, listed here under Other New and Replacement Facilities.

In general, the Proposed Project would modify, replace and install typical refining equipment – piping, heat exchangers, instrumentation, catalytic reactors, fractionation equipment, pumps, compressors, furnaces, tanks, hydrogen sulfide absorption capacity, hydrogen generation capacity and their associated facilities, including steam and electrical generation as well as some refinery buildings and infrastructure. These changes would include construction and installation of new facilities as well as replacement of or modifications to existing facilities. The Proposed Project components are as follows:¹

¹ Note: the number indicated in parentheses to the right of each item below represents the number of units to be installed.

Hydrogen Plant Replacement

- Construct new hydrogen plant, including hydrogen separation PSA units (2 trains)²
- Shut down existing hydrogen plant (2 trains)
- Install hydrogen recovery PSA unit (1)
- Construct new hydrogen recovery units (2)
- Shut down PSA section of the existing hydrogen recovery unit (1)
- Construct new cooling water tower (1)
- Construct new flare (1)
- Shut down existing feed and steam reformer furnaces (3)
- Construct a new Hydrogen Plant Control Room (1)
- Upgrade Richmond Lube Oil Plant (RLOP) Area Compressors (4)
- Upgrade Distillation and Reforming Area Compressors (3)
- Steam Turbine Generator (1)
- Upgrade Isomax Area Compressors (8)
- Relocate electrical infrastructure and Refinery power cables (5)
- Install communication cables (6)

Power Plant Replacement

- Construct new cogeneration (CoGen) gas turbine (1)
- Construct new heat recovery / steam generation equipment with auxiliary duct burner (1)
- Shut down existing No. 1 Power Plant steam boilers (5)
- Construct CoGen cooling tower (1)
- Upgrade utility infrastructure
- Replace power plant condensate system
- Install new reverse osmosis system
- Replace fuel gas blending and conditioning system
- Install high pressure fuel compressors

Catalytic Reformer Replacement

- Construct new Continuous Catalytic Regeneration (CCR) Reformer (1)
- Construct new catalytic reformer furnaces (4)
- Shut down existing No. 4 Catalytic Reformer (1) and No. 4 Cat furnaces (4)
- Shut down existing No. 5 Catalytic Reformer (1) and No. 5 Cat furnaces (4)
- Install Debutanizer (1)
- Install Methanator (1)
- Install Oxygen Stripper (1)

² The Proposed Project includes one new stand-alone hydrogen recovery unit, a “Pressure Swing Adsorption” (PSA) unit that recovers hydrogen from the feed to the new hydrogen plant before that feed is sent to the hydrogen plant. This is Bay Area Air Quality Management District (BAAQMD) source S-4451. Some confusion may arise because each of the new hydrogen plants (S-4449 and S-4450) also includes a PSA unit after the reformer furnace to separate produced hydrogen from byproducts. These PSA units are considered part of each respective hydrogen plant, and are not considered separate units (i.e., they do not have a separate BAAQMD source number.).

Hydrogen Purity Improvements

- Construct new Recycle Hydrogen Amine Contactor (1) for Fluid Catalytic Cracker Feed Hydrotreater
- Refurbish and rename Fresh Amine Storage Tank T-2421 from T-2400 (1) (switched to Amine service from caustic)
- Construct new Rich Amine Storage Tank T-2420 (1)
- Construct new Amine Regenerator (1)
- Upgrade Isomax Area Compressor (1)
- Install low-nitrogen oxides (NO_x) burners on existing TKN³ furnace (1)
- Install low-NO_x burners on existing Poly (Polymer) Plant furnaces (2)
- Construct new Oxygen Storage Tanks (2)
- Upgrade sour water processing
- Construct new Acid Gas Scrubber (1)
- Construct new Fresh Caustic Tank T-2440 (1)
- Construct new Spent Caustic Tank T-2445 (1)
- Modify existing Fluid Catalytic Cracker Feed Hydrotreater (1)
- Modify existing Sulfur Recovery Units (3)
- Install new sulfur loading rack (1) including option to replace or upgrade existing vent scrubber (1)
- Install truck and railcar loading and unloading stations for amines, sodium bisulfite, fresh and spent caustic (5)
- Install automated caustic dilution and delivery system (1)

Other New and Replacement Facilities

- Replace Tank T-231 (Water Draw⁴)
- Replace Tank T-298 (Sour Water)
- Replace Tank T-398 (TKN Feed)
- Replace Tank T-954 (Gasoline)
- Replace Tank T-979 (Cutter⁵)
- Replace Tank T-984 (Cutter)
- Replace Tank T-1451 (High Sulfur Fuel Oil Blend Stock)
- Replace Tank T-1504 (Recovered Oil)
- Replace Tank T-1689 (Steam Condensate)
- Replace Tank T-3075 (Aviation Gasoline)
- Install new Tank T-3108 (Crude / Gas Oil)
- Install new Tank T-3228 (CCR Feed/Product Tank)
- Install new Tank T-4004 (Diesel)
- Install new Tank T-4006 (Swing Tank containing Gas Oil)
- Install new Tank T-4007 (Swing Tank containing Heavy Crude Oil [HCO])
- Install new Tank T-4008 (De-Asphalted Oil [DAO])
- Install new Tank T-4009 (Diesel Hydro Treated or High sulfur diesel [DHT])

³ TKN is a trade name of a process used at the Refinery.

⁴ Water draw consist of slightly oily waters taken from various cleaning processes.

⁵ Cutter, or cutter stock, is a refined product about the weight of diesel fuel that is used to blend with heavier products to assist with pumping the heavier products.

Other New and Replacement Facilities (cont.)

- Install new Tank T-4010 (Water Draw)
- Construct new Central Control Room (1)
- Construct new Refinery Maintenance Facilities

Other Renewal Project Infrastructure

- Install or modify Refinery Electrical Infrastructure
- Install or Modify Combined Off-plot Interconnecting Piping/Pipeways, Instrument and Communication Cables with Pipe-Way Structural Supports
- Install or modify as needed Infrastructure to facilitate transportation of modular equipment to Richmond site from Port of Richmond⁶

The general locations proposed for the four major components are shown on Figure 3-2. Each of the components of the Proposed Project is discussed in detail in Section 3.4, *Components of the Proposed Project*.

⁶ Note: the Proposed Project would not require modifications at the Port of Richmond.



SOURCE: Chevron, 2005

Chevron Energy and Hydrogen Renewal Project . 205166

Figure 3-2
Locations of Major Components of the Renewal Project

3.3 Existing Chevron Refinery

The primary purpose of the Richmond Refinery is to make gasoline for passenger cars, jet fuel for aircraft, diesel fuel for trucks, trains, and buses, and lubricating oils for motor vehicles and other uses. These useful end-products result from the refining of crude oil, which is a mixture of chemical compounds of hydrogen and carbon atoms (known as hydrocarbons). The smallest and simplest of these hydrocarbons contain only a few atoms of carbon and hydrogen, such as propane and methane, which are gases at ordinary pressures and temperatures. The larger hydrocarbon molecules making up compounds such as gasoline and diesel fuel are liquids, and the very large hydrocarbons such as paraffin, asphalt and tar, are solids at ordinary pressures and temperatures.

Crude oil contains many different hydrocarbon molecules representing many potentially useful products such as propane, butane, gasoline, jet fuel, diesel oil, fuel oil, wax, and asphalt. However, crude oil does not naturally contain a very large volume of high-demand, high-value fuel products such as gasoline, diesel, or jet fuel. Typically, a barrel of crude oil may contain 20 percent or less of the hydrocarbons that make up gasoline.

Each crude oil supply has its own unique composition. In order to process a number of different crude oils, a refinery must have equipment that is capable of transforming each of the varying crude oil mixtures into a desired set of products whose market demand may fluctuate. The Refinery now processes crude oil from several sources. Since these crudes have different characteristics, the Refinery equipment must have sufficient operating flexibility to produce the full range of refinery products from these varying crude oil feedstocks.

In addition to trying to produce as much high-value product as possible from each crude oil mixture, the Refinery also treats the impurities in the crude oil in order to comply with environmental regulations and to meet stringent petroleum product specifications.

The Proposed Project would affect a number of Refinery processes. The following sections describe general manufacturing processes currently in use at the Refinery and also describe the flow of the major products as they are manufactured. The general layout of the Refinery is shown on Figure 3-3, which also shows the locations of the existing processing units and other features.

3.3.1 Refinery Processes

Crude Oil Distillation

*Crude oil*⁷ is the basic feedstock for the Refinery. Each Refinery product is a part, or fraction, of the mixture of compounds in crude oil. Since the refining process must produce fuels with relatively homogenous characteristics there must be separation steps. *Fractionation*, or distillation,

⁷ See Glossary for definitions. Note that definitions of *italicized* terms are found in Section 8 – Glossary.



— Refinery Boundary

SOURCE: Chevron, 2005

Chevron Energy and Hydrogen Renewal Project . 205166

Figure 3-3
Chevron Refinery Existing General Features Layout

is the processing step utilized at the Refinery to separate crude oils into streams, or fractions, of hydrocarbon molecules with similar boiling points.

When crude oil is initially processed, it is fractionated to separate the lighter components, such as propane and butane, from the heavier components, such as diesel oil or the pitch that is the heaviest material from the vacuum distillation column. Fractionation requires that the petroleum compounds be heated to their boiling points and circulated through a fractionation tower. This tower has internal equipment, usually multiple trays that allow liquid from condensed vapors to cascade down the tower while the vaporized oil rises to the top of the tower. As the oil circulates, the lighter components are drawn off the top of the tower, medium-weight compounds are drawn off the middle, and the heavier components are drawn off the bottom.

The boiling point of each hydrocarbon in the crude oil is generally related to the number of carbon atoms in that compound. In refining, these hydrocarbon fractions are often referred to using the abbreviated notation. “C_n,” where the “n” is the number of carbon atoms in the compound. Thus, C₄ refers to a hydrocarbon with four carbon atoms, such as butane, while C₅ refers to a hydrocarbon with five carbon atoms, such as pentane. In general, hydrocarbons with fewer carbon atoms have lower boiling points than hydrocarbons with more carbon atoms. Table 3-1 shows the number of carbon atoms (the “n”) in typical refinery fractions and their boiling points at atmospheric pressure.

TABLE 3-1
HYDROCARBON FRACTIONS, WITH BOILING POINTS AT ATMOSPHERIC PRESSURE

C _n Notation	Fraction Name	Boiling Point (°F)
C ₁ – C ₄	butanes and lighter	under 90°
C ₄ – C ₁₂	gasolines	86° – 167°
C ₁₀ – C ₁₄	naphtha (jet)	167° – 374°
C ₁₂ – C ₁₅	kerosene (diesel)	374° – 482°
C ₁₅ – C ₁₈	gas oils	482° – 662°
C ₁₈₊	residue	over 662°

SOURCE: Wiseman, 1983.

The physical and chemical properties of hydrocarbon molecules also depend on their molecular structures, in addition to the number of carbon atoms. Four classes or types of hydrocarbon molecules found in crude oil mixtures—*paraffins*, *olefins*, *naphthenes*, and *aromatics*—have differing chemical properties. The proportions of these four hydrocarbon classes in a crude oil are important indicators of the amounts of desired products that can be made from that crude oil.

Other Refinery Processes

Once separated from the crude oil, some of those fractions are useful products. However, because the market demand for fuels such as gasoline, diesel, and jet fuel is higher than the supply

typically contained in crude oil, it is necessary to chemically or physically modify the more-abundant heavier crude oil fractions, such as the *gas oils*, to convert them into useful products. There are several processes used in the Refinery to convert these other petroleum compounds into the products that Chevron sells. These are described below.

Cracking

Cracking uses heat and catalyst to break large petroleum compounds (such as light and heavy gas oils) into smaller compounds that can be used to make gasoline and other products.

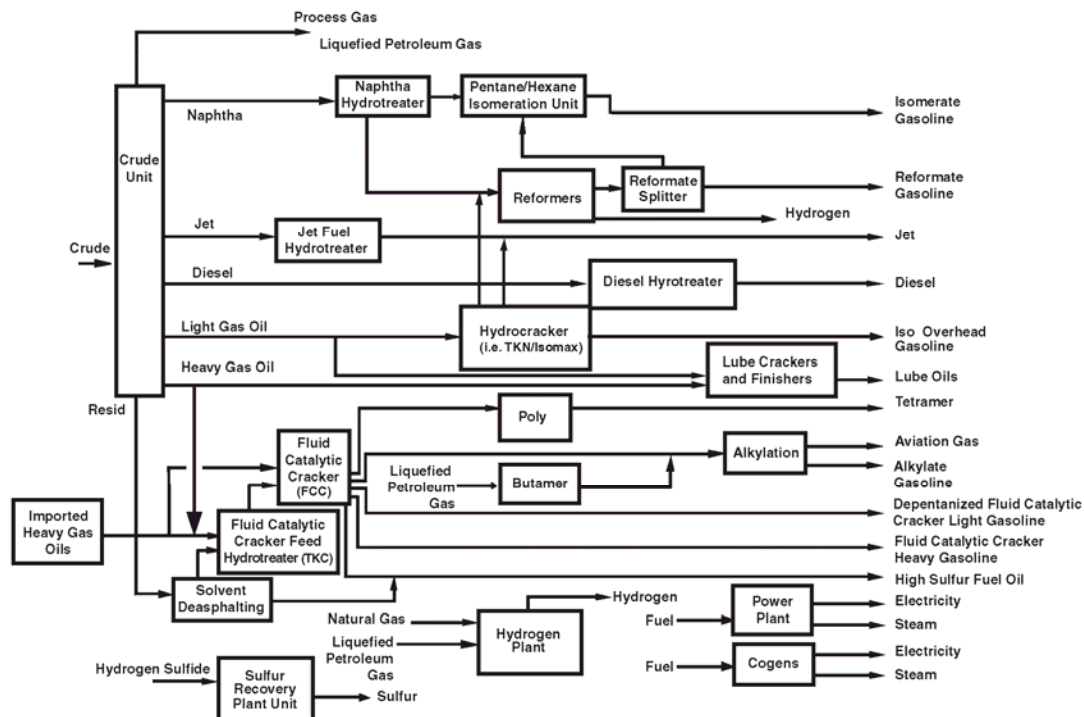
Hydrocracking is the addition of hydrogen at high temperature and pressure to the cracking process. Cracking or conversion of gas oils is a processing step that changes low-value, high-boiling-range feed streams into higher-value, lower-boiling-range products. In the Chevron Richmond Refinery these conversions occur at the TKN Hydrocracker Unit / Isomax Plant (referred to as the TKN/Isomax Plant), at the Refinery's Richmond Lube Oil Plant (RLOP) and at the Fluid Catalytic Cracker (FCC) Plant. Each conversion plant is designed and operated to produce a specific type of product (See Figure 3-4). The TKN/Isomax Plant is an important producer of jet fuel and gasoline components. The RLOP produces base stocks which are treated further to make lubricating oils. The FCC Plant is an important producer of gasoline components and Liquefied Petroleum Gas (LPG).

Reforming

Reforming is a chemical process where the structures of petroleum chemicals are transformed into new chemical structures. Reforming usually refers to a unit, or associated set of equipment, where reactant petroleum hydrocarbons are converted over a catalyst with heat in reactor vessels into product hydrocarbons with higher octane numbers. The reforming catalyst material consists of small solid cylindrical structures composed of an inert base, generally alumina, and metals such as rhenium and platinum.

Reforming has been used in refineries since the late 1940s and many improvements to the process have been made since that time. Catalysts have been developed to improve the efficiency of reforming. The usual feed materials or reactants for reforming are heavy hydrocarbons called *paraffins* and *naphthenes*. The main types of reactions that occur in the catalytic reformers produce *aromatics* (a family of hydrocarbons), re-arranged straight-chain hydrocarbons, and hydrogen. In addition, some of the larger reactant hydrocarbons are broken into smaller hydrocarbons.

There are some byproducts of the reaction that lower the overall conversion to usable products. Operating catalytic reformer reactors at a relatively low pressure (about 3 atmospheres) promotes the production of desired products and limits the production of undesirable by-products.



Chevron Energy and Hydrogen Renewal Project / 205166

SOURCE: Chevron, 2005

Figure 3-4
Refinery Block Flow Diagram
Current Configuration

Hydrotreating

Hydrotreating, which is also called *hydrofining*, uses heat, catalyst, and hydrogen to remove impurities such as sulfur, the main impurity, and nitrogen bound into the hydrocarbon feeds. The sulfur is converted into hydrogen sulfide (H_2S), which is separated from the petroleum liquids and sent to a sulfur recovery unit (SRU) where the hydrogen sulfide (H_2S) is converted in special process equipment to molten sulfur, a saleable industrial product. The nitrogen is converted to ammonia which is captured in sour water and sent to treaters where it is recovered as anhydrous ammonia. The Refinery requires substantial amounts of hydrogen to feed operating processes, such as hydrotreating, as well as for other uses.

Hydrotreating is used to improve the quality of gasoline, jet fuel, diesel fuel, and gas oil components. Sulfur and nitrogen compounds are removed, and *olefins* (unsaturated hydrocarbons) are saturated by adding hydrogen at high pressure in the presence of a catalyst. Hydrotreating catalyst usually contains nickel, molybdenum and/or cobalt.

3.3.2 Refinery Product Flow

The Refinery processes crude oil into a variety of products including motor gasoline, jet fuel, diesel fuel, lubricating oils, industrial fuel oil, LPG, sulfur, and feedstocks used in the petrochemical industry. The Refinery is composed of many plants or “units,” which contribute to the production of these products. To better understand primary Refinery processes, a discussion of the general product flow through the main process units is provided in the following sections. This discussion relies on an understanding of the processes described in Section 3.3.1, *Refinery Processes*. Figure 3-4 also provides a simplified graphical representation of the flow of hydrocarbons through the Refinery.

Crude Oil Feed

Before distillation, the crude oil first goes through a desalter (not shown on Figure 3-4), which removes brine and suspended particles from the crude. The crude oil is then distilled at Crude Unit No. 4. The crude oil feed is heated using heat recovered from hot distillation products exiting the crude column and heat from a supplemental gas-fired furnace. The heated crude is routed into the distillation column where the lighter and more volatile fractions vaporize and generally rise up through the column, become cooler and condense into liquids. The condensed fractionated liquids are drawn off at different levels in the column, as determined by their condensation points. The products from the crude distillation column include process gas and LPG, naphtha (a motor gasoline component), jet fuel components, diesel fuel components, gas oils, and residuum.

The quantities of these fractions products include relatively larger amounts of gas oils and residuum (low-value) and relatively smaller amounts of motor gasoline and jet fuel (high-value). Gas oils are further processed to transform them into higher-value products; while *residuum*, the heaviest stream, becomes industrial fuel oil and asphalt.

Distillation of crude oil results in the following hydrocarbon products (fractions) without additional processing in the Refinery:

- Process Gas, including LPG. These gasses are used as feedstocks or fuels in the Refinery. LPG intended for sale is also directed to pressurized storage tanks at the Refinery.
- Jet Fuel - The jet fuel fraction from the Crude Unit is processed in the Jet Hydrotreater to remove impurities and then directed to storage tanks in the Refinery.
- Diesel Fuel - The diesel fuel fraction from the Crude Unit is processed in the Diesel Hydrotreater to remove impurities before it is directed to storage tanks in the Refinery.

Hydrocarbon products which undergo additional processing at the Refinery are:

Naphtha

The naphtha fraction from the Crude Unit is processed in the Naphtha Hydrotreater to remove impurities. It is then processed in the Pentane/Hexane Isomerization and Catalytic Reformer Units. The Isomerization unit forms isomerate (a motor gasoline component) and the Catalytic

Reformer makes reformate (another motor gasoline component). One output stream from the catalytic reformer is a light reformate, that is sent to the Pentane/Hexane Isomerization unit to saturate the light aromatics (*i.e.*, converting benzene into a different molecule). Both the isomerate and reformate are then stored in tanks for blending motor gasoline at the Refinery.

Light Gas Oil and Heavy Gas Oil

The light gas oil fraction from the Crude Unit and imported feed stocks is processed in the TKN/Isomax Hydrocracker. Two direct outputs of the TKN/Isomax Hydrocracker are Iso Overhead Gasoline (another motor gasoline component) and jet fuel. A third output is an intermediate that is fed into the catalytic reformers and ends up either as isomerate or reformate blending stock.

Heavy gas oil comes from the Crude Unit and heavy gas oil also is imported from outside the Refinery. Part of the heavy gas oil fraction is processed in the RLOP complex to produce compounds used in manufacturing lubricating oils. Part of the heavy gas oil fraction is also directed to the Fluid Catalytic Cracker (FCC) Feed Hydrotreater (TKC) and/or to the FCC. Three direct output streams from the FCC include *depentanized FCC light gasoline* and *FCC heavy gasoline* (both motor gasoline components) and high sulfur fuel oil. Two other output streams require further processing. One stream is propylene which is directed to the Poly unit where it is polymerized to *tetramer*. The second stream is directed to the Alkylation Unit where *isobutane* combines with *olefins* to produce *isoparaffins* that are called alkylate. Alkylate has a high *octane* number and is an ideal motor and aviation gasoline blending stock.

Residuum

Crude Unit residuum (the material that is residual to fractionation in the Crude Unit) is processed in a Solvent Deasphalting process with the deasphalted gas oil stream being sent to the TKC/FCC for further processing and the asphalt being sent to high sulfur fuel oil.

Motor Gasoline

Motor gasoline made at the Refinery is a blend of the following components: Isomerate Gasoline, Reformate Gasoline, Alkylate Gasoline, Isocracker Overhead Gasoline, Depentanized FCC Light Gasoline FCC Heavy Gasoline, Butane, Pentane, and Iso-octane. As shown on Figure 3-4, the naphtha fraction from Crude Unit No. 4 is directed to the Naphtha Hydrotreater which uses hydrogen to remove impurities. After this process, the stream is directed to either of two processes. One option is the *Pentane/Hexane Isomerization Unit* where it is mixed with Reformate Splitter overhead (light reformate) which contains benzene. It is then sent to the Pentane/Hexane Isomerization Unit, where the benzene is converted to other compounds and the C5's and C6's are isomerized to increase octane. The product is then directed to Isomerate storage tanks in the Refinery. In the second option, it is mixed with a processed stream from the Hydrocracker while being directed to either the No. 4 or No. 5 Rheniformer plant. Byproduct hydrogen is then removed from the stream and the product is converted to reformate. It is then directed to the Reformate Splitter where light reformate is separated and fed to the

Pentane/Hexane Isomerization Unit while the rest of the stream is directed to the Reformate storage tanks.

Blending is the last step of the motor-gasoline-manufacturing process (this blending process is not shown on Figure 3-4). The Refinery currently produces three grades of motor gasoline, differentiated by octane, by blending the many components produced at the various Refinery plants in the proper proportions. Each component has different properties that, when blended in the correct proportions, results in a product that meets the California Air Resources Board (CARB) specifications for motor gasoline.

3.3.3 Support Processes and Equipment

The Refinery relies on many support processes that are integrated in the overall Refinery to manufacture products, to provide the utilities required for refining, and to collect and treat pollutants to meet environmental regulations. These processes are described in more detail in this section.

Flares and Flare Gas Recovery Systems

The Refinery maintains a relief system distributed through processing plants to mitigate the effects of potential plant upsets and to collect non-emergency process gas venting for recovery. As mandated by process design and safety codes, processing plant equipment is protected by safety relief valves that open automatically to prevent the equipment from reaching pressures exceeding their design criteria in the event of a plant upset or fire. The safety relief valve discharges are connected to a gas recovery system. The gas recovery system, in turn is connected to flares that provide safe disposal of any flammable gases in excess of the capacity of the gas recovery system. Except in the event of a major plant upset or when the composition of the relief gas prevents its recovery, the gases are recovered and reused, rather than flared. A gas lit pilot burns continuously in the flares to ensure there is always a source of ignition at the flare tips.

Hydrogen Plant

The Refinery requires substantial amounts of hydrogen in operating processes and for other uses. Hydrogen is used in refining to increase the fraction of crude oil which can be used to produce gasoline as well as other higher-value petroleum products. Hydrogen is also used in conjunction with a desulphurization catalyst to remove sulfur and nitrogen from hydrocarbon products. The Refinery manufactures hydrogen on site at the existing Hydrogen Plant which was constructed in the 1960's.

The manufacturing of hydrogen consists of six basic steps:

1. Natural gas or Refinery Fuel Gas is mixed with hydrogen gas in the presence of a catalyst. Any incoming sulfur compounds are converted to H₂S gas that is then adsorbed in a bed of zinc oxide.
2. After H₂S removal, the hydrogen-methane mixture is combined with steam.

3. The hydrogen-methane mixture is combined with steam and is heated in the steam methane reformer (SMR) furnace tubes in the presence of a catalyst and is converted to hydrogen, carbon monoxide, and carbon dioxide. Heat from the hot flue gas exiting the SMR furnace is used to generate steam.
4. The cooled hydrogen rich stream flows to vessels where in the presence of another catalyst the carbon monoxide reacts with steam to produce carbon dioxide and more hydrogen.
5. In the existing hydrogen plant, the hydrogen is separated from carbon dioxide (CO₂) by absorbing the carbon dioxide in a solution of *monoethanolamine* (MEA). The stripped CO₂ is emitted or sold as a product.
6. In the final purification step, trace levels of carbon monoxide and carbon dioxide are converted to methane and water by reaction with hydrogen over a catalyst.

Sulfur and Nitrogen Removal

Sulfur that enters the Refinery in compounds in crude oil fractions is converted and recovered as molten sulfur in sulfur treatment processing equipment in the Sulfur Recovery Units (SRU). SRUs are comprised of a reaction furnace, heat exchangers, catalytic converters, and tail gas units. There are three SRU trains located at the Refinery.

Sulfur in the crude oil is converted to H₂S gas in hydrotreaters located throughout the Refinery. Nitrogen in crude oil fractions is converted to ammonia and recovered. This conversion takes place in a reactor with the addition of hydrogen over a desulfurization / denitrification catalyst. Ammonia is removed in several locations by the injection of water which dissolves the ammonia and some H₂S into a sour water stream. The sour water is cooled and separated from the petroleum liquid and gas. Sour water is collected for processing to recover ammonia and H₂S.

The H₂S gas and other gasses are separated from petroleum liquids and the H₂S-rich stream, which also contains light hydrocarbon and some ammonia gas (NH₃), is directed to equipment called amine absorbers. In these units, the H₂S and ammonia gases are absorbed into the amine solution. The H₂S-rich liquid is then pumped to the amine regenerators where steam is used to release the H₂S and ammonia gases from the amine solution. The ammonia is water-washed out of the H₂S stream and recovered in the sour water stripper.

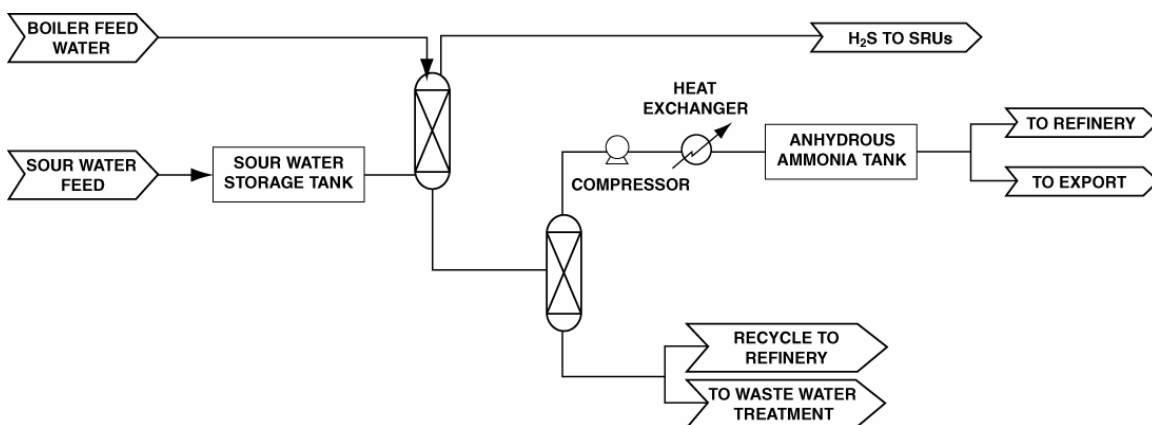
From the amine regenerators, the H₂S gases are directed to the SRU. The sulfur in H₂S gas is converted to liquid sulfur in equipment via the Claus reaction. In the first stage approximately 60 percent of the H₂S is converted to elemental sulfur in the reaction furnace; which generates heat that is then used to make steam. After cooling the exiting stream, the sulfur created is condensed from a gas to a liquid which is collected and stored in the sulfur tanks.

The remaining gases, which consist of unreacted H₂S, sulfur dioxide (SO₂), and nitrogen, are reheated and directed to vessels containing catalyst which promotes the reaction of H₂S and SO₂ to sulfur. After the gases exit the catalytic converter, the stream is cooled and liquid sulfur is condensed. The liquid sulfur is collected and stored in the sulfur tanks. This heating and reacting process is repeated in a second catalytic reactor. Chevron estimates that 96 percent of the incoming sulfur is converted to liquid sulfur in the Claus process.

Residual H_2S that was not converted to liquid sulfur in one of the SRU trains is sent to a thermal oxidizer where it is converted to SO_2 and absorbed into a sodium sulfite solution. After the H_2S has been removed from the exit gas of the SRU, the treated gases with concentrations of SO_2 within Bay Area Air Quality Management District (BAAQMD) emissions limits are released to the atmosphere (current levels are approximately 60 tons per year of SO_2). The SO_2 -rich sulfite solution is sent to equipment where the SO_2 is stripped from the solution, and this SO_2 is sent back to the first stage of the SRU train to be converted to liquid sulfur.

Sour Water Stripper

Water is used in refinery processes to remove salts, nitrogen compounds and sulfur compounds in crude oil. Because of the H_2S and ammonia collected in the water, this process stream is called “sour water.” Sour water is collected throughout the Refinery and sent to sour water strippers (See Figure 3-5).



SOURCE: Chevron, 2005

Chevron Energy and Hydrogen Renewal Project / 205166

Figure 3-5
Sour Water Flow Diagram

Sour water from Refinery processing operations is directed to sour water storage tanks. Very dilute water is sent to a concentrator which produces stripped water and a more concentrated sour water stream for feed to the sour water stripper. From the tanks a liquid stream is sent to a two-stage sour water stripper system. In the first stage, the sour water containing H_2S and liquid ammonia is heated in the H_2S stripper. There the temperature of the sour water steam is controlled so that only the H_2S vaporizes to a gas while the ammonia remains in solution. The gaseous H_2S stripped from the water is directed to the SRU.

In the second stage of the sour water treatment process, the ammonia-rich stream is heated and stripped of ammonia. The gaseous ammonia is condensed as a pure component, anhydrous ammonia (ammonia without water). The anhydrous ammonia is used in the Refinery to help remove NO_x from combustion gases and also is sold as a product.

Stripped water with the H₂S and ammonia removed is directed to the Refinery Wastewater Treatment System where it undergoes biological and chemical treatment before being discharged into San Pablo Bay.

Wastewater Treatment System

Chevron discharges stormwater and treated process wastewater which contains stormwater commingled with steam condensate, firewater, and/or groundwater (and other minor wastewater streams identified in the permit application) to outfalls in the San Francisco and/or San Pablo Bays. The discharge of treated process wastewater is regulated and permitted by the Regional Water Quality Control Board (RWQCB). The process wastewater treatment system is segregated into three collection areas, the north yard, the central yard, and the south yard. Each of these collection system areas accepts flows from the process units in their respective area and routes them via three separate oil water separators to a 165 million gallon biological treatment unit. Temperatures at each of the separators are estimated at 26.7 °C (80 °F) year round while temperatures in the bioreactor vary from 26.7 °C (80.0°F) in the Aggressive Biological Treatment Area to between 15.6 °C (60 °F) and 18.3 °C (65 °F) in the settling basin area.

The Aggressive Biological Treatment Area (bioreactor) has approximately 900 subsurface air aerators supplied by two compressors that deliver approximately 17,000 cubic feet per minute of air to the bioreactor. The aerators supply oxygen for biological treatment and to provide mixing. From the bioreactor treatment segment, there are two options for further effluent treatment. Bioreactor effluent can either be routed directly to the deepwater outfall point sump for discharge to the Bay via the granular activated carbon unit or a portion may be routed through the three tier constructed wetlands for tertiary polishing and selenium removal. Effluent from the wetlands rejoins the main wastewater stream at the deepwater outfall sump and these commingled streams are discharged via the granular activated carbon unit to a 36-inch diffuser outfall at an average depth of 30 to 50 feet into the San Pablo Bay (approximately 2,000 feet offshore to the north of Point San Pablo) in accordance with the Refinery's National Pollutant Discharge Elimination System (NPDES) Permit issued by the RWQCB.

Wetlands

The Richmond Refinery Water Enhancement Wetland (RRWEW) is a natural treatment and polishing system primarily for solids and metals removal. This system consists of natural filtration carried out in three stages that can contain approximately 30 million gallons of effluent at any given moment. This effluent is supplied from the bioreactor at approximately 1.5 million gallons per day (mgd); however, this flow may be increased depending on seasonal conditions and other ecological requirements. The wetland consists of primarily cattails and bulrushes to assist in settling and biotreatment. The flow is supplied to this first stage via a hardpiped system directly from the bioreactor settling area. Effluent from the wetlands is pumped to the deepwater outfall sump to rejoin the remaining water from the bioreactor. Based on a two year study of the RRWEW between 1994 and 1995 by Chevron on the environmental value of the RRWEW additional management actions were implemented to limit bird exposures to selenium in the

RRWEW food chain. In follow up studies between 2000 and 2004 a significant reduction (up to one third 1994 levels) in selenium was observed (Chevron, 2004).

CoGeneration

Process units at the Refinery generally require sources of steam and/or electricity. CoGeneration (CoGen) is the simultaneous production of electrical energy and another form of useful thermal energy (such as heat or steam) from the same fuel source, and a CoGen unit produces steam and electrical power. Depending on the Refinery's power demand at any given time, some of the electricity can also be routed to the PG&E public power grid.

A CoGen unit first produces electricity by burning natural gas in a gas turbine (similar to those used on a jet airplane). The gas turbine turns a shaft that powers an electric generator. Hot combustion gases from the gas turbine are then used in steam generators to produce steam. Additional fuel, such as natural gas or Refinery Fuel Gas (RFG), can be burned to further heat the combustion gases as needed to meet refinery steam demands. Cooled combustion gases are treated to remove air pollutants and then exhausted to the atmosphere.

Refinery Fuel Gas

Oil refining processes require heat, generated primarily in furnaces and steam boilers that burn RFG. RFG is generated by many refining processes that produce incondensable gases. Some of these gases can be separated and sold as LPG. The remainder of the RFG is mixed with natural gas and burned as fuel in furnaces and steam boilers. Most of the H₂S must be removed before RFG can be burned as fuel.

3.4 Components of the Proposed Project

3.4.1 Introduction

As previously discussed, the Proposed Project consists of a number of component projects. Table 3-2 provides an overview of all Proposed Project components. Note that all dimensions presented on Table 3-2 are based on preliminary design and are approximate. Similarly, the installation and completion schedule information is also approximate and represents the Applicant's current planning for implementation of the Proposed Project. A more detailed description of each of the Proposed Project components is provided in the following sections. The potential impacts of each Proposed Project component are described in Chapter 4, *Environmental Setting, Impacts, and Mitigation Measures*.

The proposed locations of the four main Proposed Project components (Hydrogen Plant Replacement; Power Plant Replacement; Catalytic Reformer Replacement; and Hydrogen Purity Improvements) are shown on Figure 3-2, as well as on Figure 3-3 which also shows the locations of the existing units. The Refinery proposes to install the replacement Hydrogen Plant, and Catalytic Reformer, in an area of the Central Yard referred to as the "Y" (See Figure 3-3). The "Y," as it is referred to by Chevron due to its location at a split in two roads, Petrolite Street and Channel Street, is currently unoccupied and is generally covered by asphalt and some temporary structures (See Figure 3-6). Proposed Renewal Project modifications to the FCC Feed Hydrotreater and Sulfur Recovery Plant would occur at the location of the existing facilities (See Figure 3-3) located in the Cracking Division off Fluid Street within the North Yard. The locations of other projects are shown on Figure 3-3. Generally, the replacement tanks and new tanks would be located in the Main Tank Field, Pole Yard Tank Field, Office Hill Tank Field, SP Hill Tank Field and Quarry Tank Field. One replacement tank would be located at the foot of the Long Wharf.



Figure 3-6
The "Y" area of the Refinery

**TABLE 3-2
PROPOSED CHEVRON RENEWAL PROJECT COMPONENTS**

EIR Section:	3.4.3.1	3.4.3.2	3.4.3.3	3.4.3.4
Renewal Project Component:	Hydrogen Plant Replacement	Power Plant Replacement	Catalytic Reformer Replacement	Hydrogen Purity Facilities
Description	Replace existing hydrogen plant with a more efficient hydrogen plant that produces more and higher quality hydrogen.	Replace existing steam boilers with electrical generation from increasing cogeneration capacity.	Replace two existing naphtha reformers using batch regeneration of catalyst with one reformer using continuous regeneration.	Modify and install facilities to remove and recover additional quantities of sulfur from the sour gas system.
Equipment to Be Installed	New hydrogen plant and recovery vessels Train 1 Steam Reformer Furnace Train 2 Steam Reformer Furnace PSA Recovery Unit Flare Upgrade RLOP Area compressors Upgrade distillation and reforming areas compressors Cooling Water Tower Steam turbine generator (provides electric power to the Hydrogen Plant) Process piping and fittings New Control Room Off-plot Interconnecting Piping/Pipeways Modify and Upgrade electrical and communications infrastructure	New CoGen unit consisting of: One new combustion gas turbine One new duct burner One heat recovery steam generator (HRSG) Cooling water tower Upgrades to utility infrastructure Replace power plant condensate system Install new reverse osmosis system Replace fuel gas blending and conditioning systems Install high pressure fuel compressors Process piping and fittings Off-plot Interconnecting Piping/Pipeways	Catalytic Reformer reactor Catalyst regenerator Charge Furnace No. 1 Intermediate Charge Furnace No. 2 Intermediate Charge Furnace No. 3 Intermediate Charge Furnace No. 4 Debutanizer Methanator Oxygen Stripper Process piping and fittings Off-plot Interconnecting Pipeline/Pipeways	Upgrades to sulfur recovery unit Upgrades to sour water concentrator FCC Hydrotreater feed effluent heat exchangers and trim cooler Recycle Amine Contactor Recycle Amine Regenerator Low-nitrogen oxides burners on existing TKN furnaces Low-nitrogen oxides burners on existing Poly Plant furnace Liquid Oxygen Storage Tank and Vaporizer Sulfur Truck Loading Rack Amine Storage Tanks Fresh Amine Storage Tank Fresh Caustic Storage Tank Spent Caustic Storage Tank. Acid gas scrubber. Process piping and fittings Modifications to existing rail loading facilities New truck loading/unloading rack for bisulfite, caustic and amine Off-plot Interconnecting Pipeline/Pipeways
Equipment Location	Refinery "Y" area.	One new CoGen unit adjacent to the existing CoGen units	Refinery "Y" area	In existing FCC Hydrotreater and SRU areas. Amine Regenerator to be in SRU area and Amine Contactor to be in FCC Hydrotreater area.
Site / Area	585 ft x 585 ft	505 ft x 450 ft	400 ft x 200 ft	475 ft x 150 ft (existing)
Equipment Dimensions and Capacities	<u>Heights:</u> Furnace: 162 ft. Flare: 195 ft Cooling water tower: 43 ft <u>Capacity:</u> 140 million SCFD per train; steam turbine with 17 MW net output	<u>Height:</u> Stack: 166 ft <u>Capacity:</u> 544 million Btu/hr combustion turbine with 47 MW net output generator; 438 million Btu/hr duct burner; 860 million Btu/hr combined max firing rate	<u>Heights:</u> Reformer reactors 1 and 2: 197 ft Reformer reactors 3 and 4: 210 ft. Charge Furnace Stack: 300 ft Regenerator structure: 285 ft <u>Capacity:</u> 3,750 bbl/hr reactor throughput with daily limit of 75,000 bbl/day; combined (4) reformers max firing rate 743 million Btu/hr	<u>Heights:</u> Heat exchangers: 10 ft Trim Cooler: 25 ft Amine Contactor: 100 ft Acid gas scrubber: 70 ft Sulfur loading rack: 50 ft LOx storage tank: 50 ft NaOH storage tank: 40 ft Amine regen: 120 ft Amine Stripper 70 ft <u>Capacity:</u> Amine Contactor – 0.3 million SCF/hr; Amine Storage Tank(s) – 70,000 and 130,000 gals.; Caustic Storage Tank(s) – 200,000 and 400,000 gals; Sulfur Loading Racks – 157 long Tons/hr
Initial Installation	4Q07	4Q08	3Q08	4Q07
Estimated Completion	4Q08	3Q09	4Q09	4Q08

TABLE 3-2 (continued)
PROPOSED CHEVRON RENEWAL PROJECT COMPONENTS

EIR Section:		3.4.3.5		
Renewal Project Component:	Tank T-231 Water Draw Tank Replacement	Tank T-298 Sour Water Tank Replacement	Tank T-398 TKN Feed Tank Replacement	Tank T-954 Gasoline Tank Replacement
Description	Replace existing Water Draw storage tank	Replace existing Sour Water storage tank	Replace existing TKN (Hydrocracker) feedstock storage tank.	Replace existing Gasoline storage tank
Equipment to Be Installed	Replacement floating-roof or fixed-roof tank, including emission control system. Reuse or replace connection piping run in existing pipeways	Replacement floating-roof tank Capacity increased from 46,000 bbls to 75,000 bbls Reuse or replace connection piping run in existing pipeways	Replacement floating-roof tank Reuse or replace connection piping run in existing pipeways	Replacement floating-roof or fixed-roof tank Reuse or replace connection piping run in existing pipeways
Equipment Location	Main Tank Field	Pole Yard Tank Field.	TKN Process Area, east of the FCC Unit	SP Hill Tank Field
Site / Area	Same as existing	Same as existing.	Same as existing	Same as existing
Equipment Dimensions and Capacities	Same size as existing tank, 67-ft diameter x 56-ft high	115-ft diameter x 50-ft high. 75,000 bbls	150-ft diameter x 70-ft high 200,000 bbls	115-ft diameter x 50-ft high 150,000 bbls
Initial Installation	2007	2007	2007	1Q08
Estimated Completion	2008	2008	2008	3Q08

TABLE 3-2 (continued)
PROPOSED CHEVRON RENEWAL PROJECT COMPONENTS

EIR Section: 3.4.3.5 (continued)				
Renewal Project Component:	Tank T-979 Cutter Tank Replacement	Tank T-984 Cutter Tank Replacement	Tank T-1451 High Sulfur Fuel Oil Blend Stock Tank Replacement	Tank T-1504 Recovered Oil Tank Replacement
Description	Replace existing tank	Replace existing tank	Replace existing tank	Replace existing Recovered Oil storage tank
Equipment to Be Installed	Replacement cone-roof tank Reuse or replace connection piping run in existing pipeways	Replacement cone-roof tank Reuse or replace connection piping run in existing pipeways	Replacement floating-roof tank Reuse or replace connection piping run in existing pipeways	Replacement floating-roof tank Reuse or replace connection piping run in existing pipeways
Equipment Location	Main Tank Field	Main Tank Field	Office Hill Tank Field near the foot of Chevron's Long Wharf	Office Hill Tank Field near the foot of Chevron's Long Wharf
Site / Area	Same as existing	Same as existing	Same as existing	Same as existing.
Equipment Dimensions and Capacities	Same size as existing tank, 120-ft diameter x 140-ft high	Same size as existing tank, 60-ft diameter x 46-ft high	Same size as existing tank, 120-ft diameter x 50-ft high	Same size as existing tank, 80-ft diameter x 40-ft high
Initial Installation	2014	2014	2009	2007
Estimated Completion	2015	2015	2010	2008

EIR Section: 3.4.3.5 (continued)				
Renewal Project Component:	Tank T-1689 Steam Condensate Tank Replacement	Tank T-3075 AvGas Tank Replacement	Tank T-3108 New Gas Oil Tank	Tank T-3228 New CCR Feed / Product Tank
Description	Replace existing Steam condensate storage tank	Replace existing Aviation Gasoline (AvGas) storage tank	Install new Gas Oil storage tank	Install new CCR feed / product tank
Equipment to Be Installed	Existing T-1689 is a fixed roof tank, 50-ft diameter x 48-ft high. Replacement tank will be the same size as T-1148 or T-1149. The preference is to use either one of these existing tanks if in acceptable condition. If both are unusable, any newly constructed tank would be the same size as these tanks.	Replacement floating-roof tank Reuse or replace connection piping run in existing pipeways	New floating-roof tank Reuse or replace connection piping run in existing pipeways	New floating-roof tank Reuse or replace connection piping run in existing pipeways
Equipment Location	Near the existing 1A Separator and the Reverse Osmosis Plant.	Main Tank Field	Quarry Tank Field	Main Tank Field
Site / Area	Same as existing.	Same as existing	2 acres ±	1 acre ±
Equipment Dimensions and Capacities	Same size as Tank T-1148, 63-ft diameter x 47-ft high, or, Same size as Tank T-1149, 69-ft diameter x 48-ft high.	Same size as existing tank, 85-ft diameter x 40-ft high	290-ft diameter x 64-ft high	125-ft diameter x 80-ft high 200,000 bbls.
Initial Installation	2007	1Q08	2007	2Q08
Estimated Completion	2008	3Q08	2008	4Q09

TABLE 3-2 (continued)
PROPOSED CHEVRON RENEWAL PROJECT COMPONENTS

EIR Section:	3.4.3.5 (continued)			
Renewal Project Component:	Tank T-4004 New Diesel Tank	Tank T-4006 New Gas Oil Swing Tank	Tank T-4007 New Heavy Cycle Oil Swing Tank	Tank T-4008 New DAO Tank
Description	Install new Diesel storage tank	Install new Gas Oil storage tank.	Install new Heavy Cycle Oil storage tank	Install new DAO storage tank
Equipment to Be Installed	New fixed-roof tank with 150,000 barrel capacity. Reuse or replace connection piping run in existing pipeways	New floating-roof tank Reuse or replace connection piping run in existing pipeways	New floating-roof tank Reuse or replace connection piping run in existing pipeways	New fixed-roof tank Reuse or replace connection piping run in existing pipeways
Equipment Location	SP Hill Tank Field	Pole Yard Tank Field	Main Tank Field	Pole Yard Tank Field
Site / Area	1 acre ±	1 acre ±	2 acres ±.	1 acre ±
Equipment Dimensions and Capacities	115-ft diameter x 60-ft high	150-ft diameter x 70-ft high 200,000 bbls	115-ft diameter x 60-ft high 100,000 bbls	145-ft diameter x 50-ft high 175,000 bbls
Initial Installation	2009	2010	2011	2009
Estimated Completion	2010	2011	2012	2010

EIR Section:	3.4.3.5 (continued)		3.4.3.6	3.4.3.7
Renewal Project Component:	Tank T-4009 New DHT Tank	Tank T-4010 New Water Draw Tank	Construct Central Control Room Replacement	Construct New Maintenance Facility
Description	Install new DHT storage tank	Install new Water Draw tank	Replace 6 existing control rooms with a new central control room. Convert six existing control rooms to offices that meet current seismic requirements for "Immediate occupancy".	Replace existing facility and shops
Equipment to Be Installed	New floating-roof tank Reuse or replace connection piping run in existing pipeways	New floating-roof or fixed-roof tank Reuse or replace connection piping run in existing pipeways	The six existing control rooms will be converted to "Immediate occupancy" offices for technical, operations, and maintenance personnel.	Two new buildings.
Equipment Location	Main Tank Field	Pole Yard Tank Field	Near the former Asphalt Plant.	Near the existing Maintenance Shop near Gate No. 14.
Site / Area	2 acre ±	1 acre ±	3 acres ±.	2 acres ±.
Equipment Dimensions and Capacities	150-ft diameter x 65-ft high 750,000 bbls.	80-ft diameter x 40-ft high 350,000 bbls.	Building contains three 30,000 sq-ft. floors.	Two new buildings: #1. One floor @ 44,000 sq ft #2. Two floors @ 12,000 sq ft per floor
Initial Installation	2009	2010	1Q10	1Q09
Estimated Completion	2010	2011	4Q11	4Q10

3.4.2 Feed Stocks

3.4.2.1 Crude Oil & Gas Oil

The Richmond Refinery currently imports crude oil and gas oil which are processed into transportation fuels and lubricants. The crude oil and gas oil are purchased in the global market place and then blended with like stocks before and during processing. Impurities, such as nitrogen, metals, salts and sulfur, are removed during processing.

Completion of the Renewal Project would improve the Refinery's ability to obtain and process reliable supplies of globally available crude oils and gas oils, including those with higher sulfur content. Refinery throughput will be maintained at or below currently permitted levels. However, the Refinery would be able to increase the portion of California gasoline produced by reducing production of other products, including conventional (i.e., non-California) gasoline.

The Refinery is currently permitted by the BAAQMD to run up to 257,000 barrels per day of crude oil⁸ on a daily average basis and 243,000 barrels per day on an annual average basis. For reference purposes California's 21 refineries have a combined rated capacity of approximately 2 million barrels per day (EIA, 2006). These limits are based on historic operating levels. The Refinery currently operates near to, but not in excess of, these limits and would continue to do so after the Proposed Project is implemented.

The amount of sulfur in the crude that the Refinery can process varies but is limited by refined product specifications, emission limits, and economics. Presently, the Refinery can process crude oil with a sulfur content of about 2 percent. Typical sulfur content of the Refinery crude mix is about 1.7 percent. The Renewal Project would enable the Refinery to process crude mixes with a typical sulfur content of up to 3 percent. Through the addition of air pollution controls and other process changes, the net effect of the Proposed Project would be to make a substantial reduction of sulfur emissions to the atmosphere (as SO₂).

The implications of the differences in crude oil and variations in feedstocks with respect to the operation and equipment changes for the affected refinery units are described and discussed in Section 3.4.3, *Project Components* below. Furthermore, the material changes in the environmental effects that would result from processing the different feedstocks are discussed in Chapter 4, *Environmental Setting, Impacts and Mitigation Measures*.

3.4.2.2 Natural Gas & Electricity

The Refinery imports natural gas for raw material and energy use at an approximate rate of 90 million cubic feet per day. Natural gas is a raw material for the Refinery and this annual use rate has remained approximately the same since Chevron implemented its Reformulated Gasoline

⁸ This is the rating of Crude Unit No. 4 which is the current Refinery crude processing unit. The amount of gas oil imported to the Refinery is limited by the BAAQMD feed rate limits to the permitted process units. This quantity depends on the amount of gas oils produced by Crude Unit No. 4 from crude oil (which is the preferred source) as well as the availability of gas oils on the global market. Imported gas oils are fed directly to the FCC (See Figure 3-4) unit or to the FCC Feed Hydrotreater as needed to assist the unit in meeting product specifications and BAAQMD emission limits.

and FCC Upgrade Project in 1995. Natural gas consumption after implementation of the Renewal Project is expected to increase by approximately 33 percent, depending on the size of the facilities actually built and the impact of energy conservation benefits of the Proposed Project. This increase in natural gas consumption is necessary to support the additional electrical generation capacity proposed by Chevron to become a full self-generator of electricity and also to accommodate the capacity of the new Hydrogen Plant.

Although the Refinery generates a substantial amount of its own electrical power and can at times sell power back to PG&E based on different Refinery unit load conditions, currently the Refinery imports approximately 10 MegaWatts (MW) electrical requirements from the PG&E grid. With the Proposed Project a new single turbine cogeneration system that would supply 50 MW gross (47 MW net) of electricity, as well as process steam, for the Refinery, the new Hydrogen Plant also generates 17 MW net of electrical energy. Thus, the net change would be an increase of 64 MW in electricity generation at the Refinery. Other processes included in the Proposed Project would require additional electricity to operate and would consume portions of the increased generation capacity of the Refinery resulting from the Proposed Project. Even with the increased consumption by the Proposed Project components, the increased generation capacity of the Proposed Project would enable the Refinery to self-generate all of the electricity needed for normal operations and may be a modest exporter (a few MegaWatts) to PG&E's grid.

3.4.3 Project Components Detail

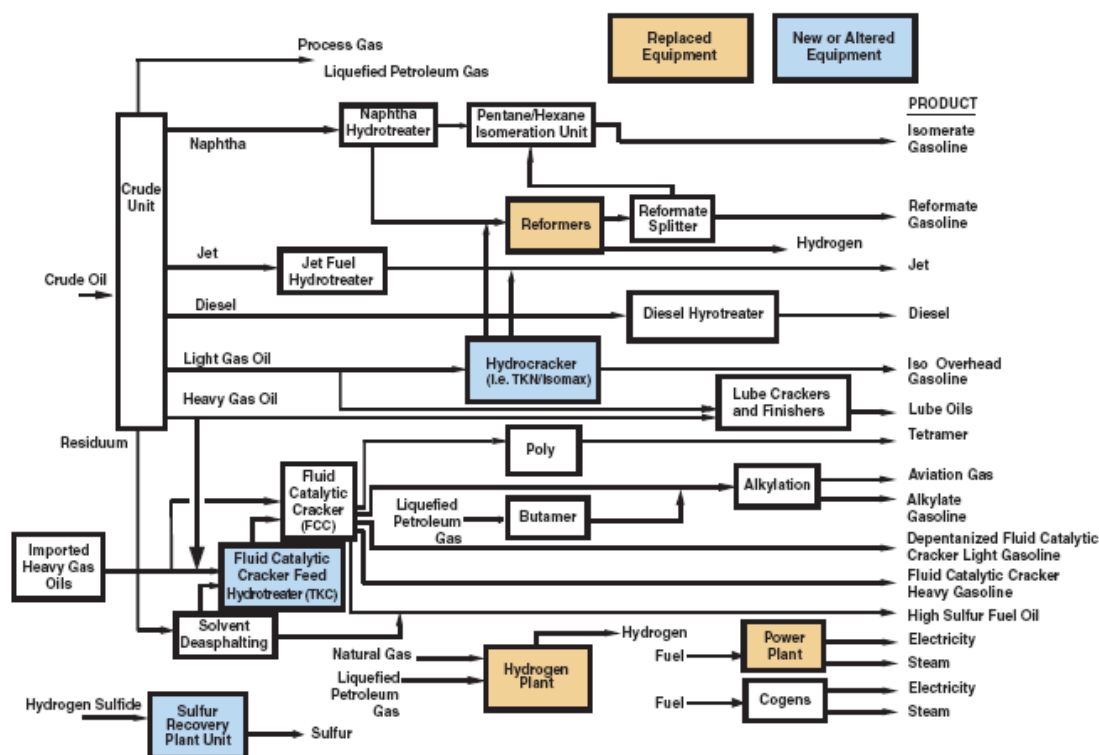
For each of the components of the Renewal Project, the relation to the Proposed Project objectives, a description of current operation, the proposed changes in operation and equipment (including prominent physical features) and schedule are presented below. The proposed changes to the Refinery block flow diagram shown on Figure 3-4 due to the construction and operation of the four major components of the Renewal Project: Hydrogen Plant Replacement, Power Plant Replacement, Catalytic Reformer Replacement and Hydrogen Purity Improvements are shown on Figure 3-7.

All dimensions and general locations given are approximate, because final designs for these facilities have not been completed. The proposed schedule for each component states the amount of time necessary to accomplish the construction and start up of that component based on the expected start of date of construction for that component. The currently available information on the construction schedule is contained in Sections 3.4.3.1 through 3.4.3.8 and 3.5. In the event that the schedule, operational considerations, dimensions of the components or their locations are critical to identifying or mitigating a potential environmental impact of the Proposed Project, these considerations are covered in the related impact analysis or mitigation discussion.

As required by CEQA, alternatives to the Proposed Project components described below in Sections 3.4.3.1 through 3.4.3.9 are considered in Chapter 6, *Alternatives Analysis*. In general, those alternatives include a no project alternative, a reduced project alternative, alternate site location(s), and in some cases the use of different technologies to achieve project goals (See Chapter 6, *Alternatives Analysis*).

3.4.3.1 Hydrogen Plant Replacement

Hydrogen is necessary to produce clean fuels required by existing CARB environmental regulations. As part of the Renewal Project, the Refinery proposes to replace the existing Hydrogen Plant with a new Hydrogen Plant using technology developed since the existing unit began operating in 1965. The new Hydrogen Plant would have an increased capacity of 30 percent, and would also be able to produce higher purity hydrogen gas than the existing facility. The new Hydrogen Plant would be owned and operated by a third-party called Praxair. Praxair has safely operated Hydrogen Plants for many years. Praxair has recently filed applications to construct a 21.5 mile export hydrogen pipeline proposed to go to the ConocoPhillips Refinery in Rodeo and to the Shell Refinery in Martinez, California (this project is called the “Contra Costa Pipeline Project” by Praxair). The Notice of Preparation published by the City of Richmond on July 15, 2006 for this Proposed Project identified the proposed hydrogen pipeline as part of the Proposed Project. However, the Praxair Contra Costa Pipeline Project is more appropriately considered in the Cumulative Impacts section of this EIR because it is part of a larger project within Contra Costa County and because it is not a crucial aspect of the Proposed Project. Neither the implementation nor the scope of the Proposed Project depends on the Contra Costa Pipeline Project, and this Proposed Project can and would proceed with or without this export pipeline being constructed by Praxair. The Contra Costa Pipeline Project is discussed in Section 5.2.3.2 *Other Refinery and Pipeline Projects*.



Chevron Energy and Hydrogen Renewal Project / 205166

SOURCE: Chevron, 2005

Figure 3-7
Renewal Project Changes to Refinery Block Flow Diagram

Current Operation

Currently hydrogen is generated in two identical sets of equipment, called hydrogen trains that were originally commissioned and constructed in 1965. The existing production capacity of each of the hydrogen trains is 90 million standard cubic feet per day (SCFD) for a total of 180 million SCFD for the both trains. Currently, the hydrogen product is 95 percent hydrogen with 5 percent impurities.

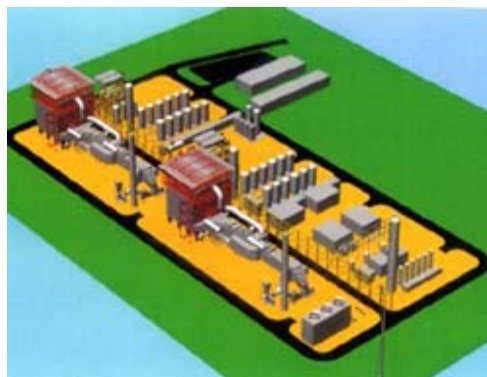


Figure 3-8
Example Layout for a
Typical Hydrogen Plant

The hydrocrackers and hydrotreaters in the Refinery also create a byproduct stream that contains hydrogen. Currently, the hydrogen in this byproduct is purified in a Pressure Swing Adsorption System (PSA). The Refinery estimates that the PSA is approaching the end of its useful economic lifetime and may need to be replaced in the future. It is not as efficient as newer technology, and it is not large enough to recover the hydrogen that is contained in all of the process gas streams.

Proposed Changes

Under the Proposed Project, hydrogen production at the Refinery would be upgraded by shutting down the existing hydrogen trains and constructing two new hydrogen trains, each rated at 140 million SCFD for a total of 280 million SCFD for both trains, a net increase of 100 million SCFD (See Figure 3-8 and Figure 3-9 which shows a vertical view of computer rendering of a typical hydrogen plant). These new trains would use Pressure Swing Adsorption (PSA) technology allowing the Refinery to generate hydrogen from

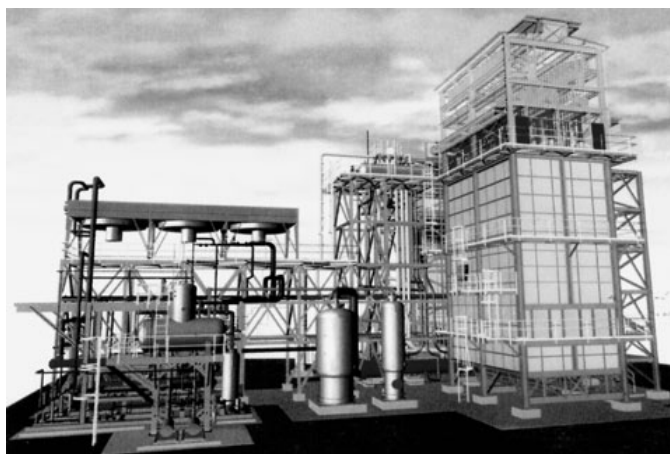


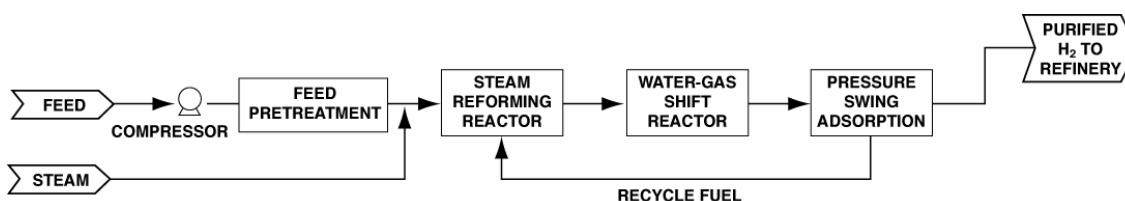
Figure 3-9
Example Layout for a
Typical Hydrogen Plant

natural gas, ammonia, and Refinery Fuel Gas. The resulting PSA hydrogen product is expected to be greater than 99 percent hydrogen, a net increase of four percent in hydrogen gas purity. When operational, the new Hydrogen Plant will be a state-of-the-art facility compliant with all modern codes, regulations, and industry standards, which would provide the Refinery with improved reliability, added energy efficiency, and additional environmental protections and safety systems through the use of stronger and safer piping materials, fire detection equipment, and leak detection equipment than compared to the existing Hydrogen Plant.

Equipment Changes

The new Hydrogen Plant would be constructed in a currently vacant area of the Refinery, adjacent to the Diesel Hydrotreater (See Figure 3-2). When the new Hydrogen Plant is operational, the old Hydrogen Plant will be decommissioned.

Figure 3-10 shows a flow diagram of the Hydrogen Plant component of the Renewal Project. Hydrogen Plants have air emission release sources, as does the existing plant; each steam-methane reformer furnace would discharge combustion byproducts to the atmosphere. A deaerator vent would discharge gases that do not condense after cooling steam condensate from the Hydrogen Plant trains. Such gases are expected to include oxygen and other compounds, but will not include methanol. In the existing plant, the deaerator vent contains methanol, and is water washed to remove it. In the new plants, the methanol is not vented, but instead is stripped out and



Chevron Energy and Hydrogen Renewal Project / 205166
SOURCE: Chevron, 2005

Figure 3-10
Hydrogen Plant Flow Diagram

returned to the process or burned in a furnace. The Carbon Monoxide (CO) flare (not shown on Figure 3-10) is designed to safely treat any unplanned over-pressurization of the processing streams and the CO, hydrogen, and methane vented during startup and shutdown in the new Hydrogen Plant trains by combusting them prior to release into the atmosphere. To burn the released process gases the flare maintains a pilot burner supplied with natural gas and would be operating at all times.

A cooling tower that uses the evaporation of water will be installed to provide cooling to lower the temperature of process streams and process equipment. Water is evaporated by pulling air upwards through falling streams of water in the tower. The cooling towers release particulate matter resulting from the forced upward movement of air (See 4.3, *Air Quality* for additional information about these emissions).

The Proposed Project would replace the existing PSA unit with a larger capacity unit. Chevron is also considering adding small caustic scrubbers at No. 4 and No. 5 H₂S Plants (or other locations) to remove remnant amounts of sulfur from RFG, to allow the option of burning RFG in Refinery heaters, instead of feeding it to the new Hydrogen Plant.

Schedule

The new Hydrogen Plant installation is planned to start in the Fourth Quarter of 2007, and will become operational in the Fourth Quarter of 2008. Construction of this component is discussed in Section 3.5, *Construction of Project Components*.

3.4.3.2 Power Plant Replacement

As part of the Renewal Project, the Refinery proposes to replace five existing steam boilers with one new CoGen unit. The new CoGen unit would increase the amount of power Chevron could export to Pacific Gas & Electric Company (PG&E). The increase in electrical generation from the new CoGen unit would not exceed 50 MW⁹.

Current Operation

Currently in the Refinery No. 1 Power Plant, the Refinery uses five of seven existing steam boilers (approximately 250 million British thermal units¹⁰ per hour [Btu/hr] each) that were built in the 1930s and 1940s. Two of these seven existing boilers were shut down after the existing CoGen units were installed in the late 1980s (See Figure 3-11). Maintenance requirements for these older units are increasing and replacement parts are becoming more difficult to obtain.

Proposed Changes

The Power Plant Replacement portion of the Renewal Project involves construction of CoGen facilities that would replace the existing No. 1 Power Plant boilers. The new cogeneration facilities include one new CoGen gas turbine that would burn natural gas and/or LPG (including pentanes) and new duct burners that would be fired with RFG.

The new unit would utilize low emission control technology (an oxidation catalyst bed and SCR), and provide a more reliable power supply to the Refinery as well as replace the steam currently being produced by the five old No. 1 Power Plant boilers. The new CoGen unit will help make the Refinery self-sufficient in electricity generation, which will indirectly help to improve electrical supply and reliability for the public by reducing Refinery demand on the PG&E electrical power grid. The new CoGen would have a total electrical output of 50 MW gross (47 MW net). The CoGen Unit Gas Turbine (S-4473) and the Heat Recovery Steam Generator (S-4474) would be permitted at a maximum combined hourly firing rate of 860 million Btu/hr and a maximum annual average combined firing rate of 840 million Btu/hr. Individually, S-4473 has a maximum firing rate of 544 million



Figure 3-11
Existing CoGen Units

⁹ The California Energy Commission (CEC) regulates the generation of electric power in California and thus, has jurisdictional authority for siting power plants with over 50 MW electrical generation capacities. California State law and CEC regulations authorize the CEC to grant a “small power plant” exemption to power plant modifications that add less than 100 MW of electrical generation capacity to an existing power plant. The regulations exempt thermal power plants with a generating capacity of up to 100 MW and modifications to existing generating facilities that do not add capacity in excess of 100 MW. The Refinery’s existing cogeneration turbines were exempted from the CEC Application for Certification (AFC) permitting process as a “small power plant” in 1987.

¹⁰ One British thermal unit (Btu) is the quantity of heat required to raise the temperature of one pound of water from 60° to 61°F at a constant pressure of one atmosphere, or the quantity of heat equal to 1/180 of the heat required to raise the temperature of one pound of water from 32° to 212°F at a constant pressure of one atmosphere.

Btu/hr and S-4474 has a maximum firing rate of 438 million Btu/hr. The 860 million Btu/hr firing limit essentially prohibits the combustion turbine and duct burner from simultaneously operating at full capacity for any full hour. The Refinery proposes to burn natural gas, medium-Btu natural gas, or LPG in the turbines and RFG in the duct burners. The new CoGen unit would be fitted with catalytic converters for carbon monoxide and precursor organic compounds (POC) control and selective catalytic reduction catalyst and chemicals for NO_x control.

Other processes included in the Proposed Project would require additional electricity to operate and would consume portions of the increased generation capacity of the Refinery resulting from the Proposed Project. Even accounting for the increased consumption of the Proposed Project components and 10 MW that the Refinery currently imports from PG&E, the increased generation capacity of the Proposed Project would enable the Refinery to self-generate all of the electricity needed for normal operations and at times to be a modest exporter (a few Mega Watts) to PG&E's grid.

Under the Proposed Project, the five (5) existing boilers would be shut down and be decommissioned when the new cogeneration equipment is installed and operating. Included are upgrades to the utility infrastructure for replacement of the power plant condensates systems, installation of a new reverse osmosis (RO) system, replacement of fuel gas blending and condition systems, and installation of high pressure gas compressors.

Equipment Changes

Construction of one new CoGen unit in the existing CoGen area of the Refinery.

Schedule

Installation of new equipment and modifications to existing equipment that are included in the Power Plant Replacement project are scheduled to start in the Fourth Quarter of 2008 and continue through the Third Quarter of 2009. Construction of this component is discussed in Section 3.5, *Construction of Project Components*.

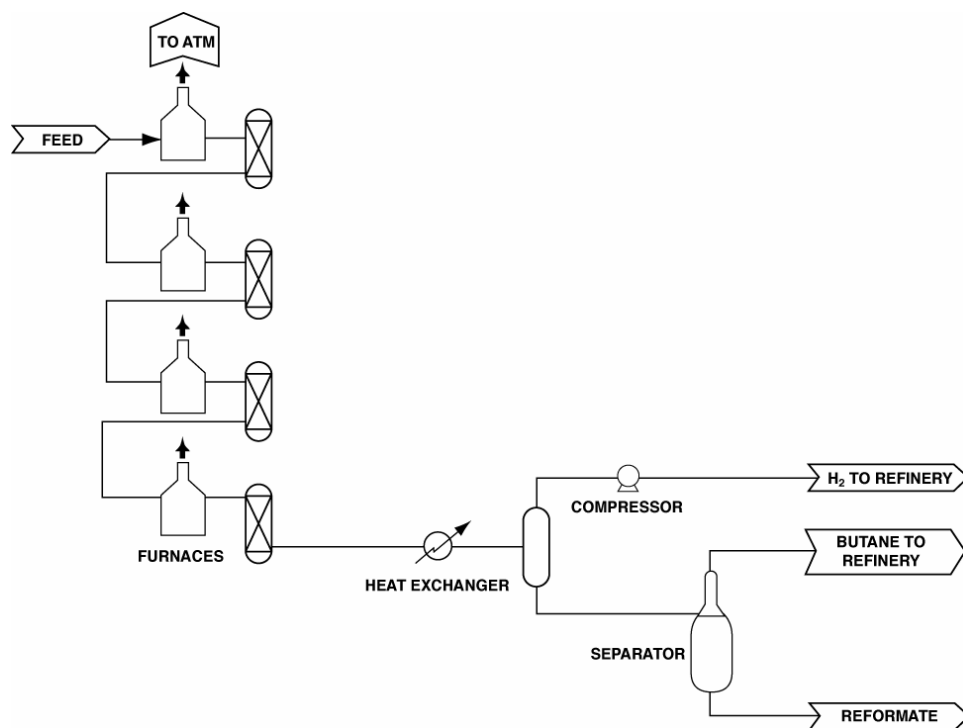
3.4.3.3 Catalytic Reformer Replacement

Reforming, in general, alters the shape of hydrocarbon molecules using a catalyst, which increases the octane number of the hydrocarbon products and makes them better components for gasoline. Chevron proposes to replace the two existing Reformer Process Units, installed in the 1960s and 1970s, with a single new Reformer unit. The new unit would utilize a technology developed since the installation of the existing Catalytic Reformers. This technology, Continuous Catalyst Regeneration (CCR), allows the regeneration of the reforming catalyst¹¹ while the Reformer is operational instead of requiring a Reformer shut down to regenerate the reforming catalyst to regain catalyst activity.

¹¹ A catalyst is an agent that promotes or accelerates a chemical reaction without being consumed itself in the reaction. Although catalysts are not consumed in the reformer, over time they become deactivated and the overall effectiveness of the reformer unit decreases as the catalyst beads become covered with coke (carbon), which presents a physical barrier to the contact of hydrocarbons with the active sites on the catalyst beads. Catalyst activity can be recovered by burning off the coke layer in a process called catalyst regeneration. See also the EIR Chapter 8, Glossary, entries under *Catalyst* and *Continuous catalyst regenerating reformer*.

Current Operation

Currently, the Refinery uses two catalytic reformer reactor trains and associated equipment to employ the “*Rheniforming*” process which converts naphtha feed streams into higher-octane products. Operationally, the Rheniforming catalyst activity degrades with time, continuing until the Refinery elects to regenerate the catalyst to regain a higher level of effectiveness. The current reformer reactor catalyst requires regeneration about every six-to-twelve months. Regeneration of the catalyst takes about ten to fourteen days, during which time the reformer train is inoperable (See Figure 3-12 for the existing catalytic reformer schematic).



SOURCE: Chevron, 2005

Chevron Energy and Hydrogen Renewal Project / 205166

Figure 3-12
Existing Reformer Flow Diagram

In the existing catalytic reformer the reactors consist of several vertical, cylindrical vessels. The catalyst is contained inside each reactor by screens.

Proposed Changes

As a component of the Renewal Project, the Refinery proposes to install one CCR Reformer Unit to replace the two units currently in production. When operational, the two existing units would be decommissioned. The new CCR Reformer would differ in configuration and operating practice from the current units. The proposed CCR Reformer would be installed with CCR technology. CCR technology continuously regenerates a small amount of catalyst in contrast to the present mode of regenerating all the catalyst at one time. By implementing CCR technology, Chevron would be able to increase the period between CCR Reformer turnarounds to about five years.

In the new CCR Reformer configuration, there would be four reactors stacked vertically. The catalyst beads would flow down from the first reactor on top to the fourth reactor on the bottom. The Catalyst would be removed from the bottom reactor and conveyed to regeneration equipment where the coke would be burned off and the catalyst surface re-conditioned. The regenerated catalyst would then be directed back to the first reactor. In contrast to the static catalyst bed configuration, in the CCR configuration, catalyst regeneration occurs while the CCR Reformer unit is in production. Reformer shutdown is not required for catalyst regeneration. Chevron estimates that using the CCR Reformer configuration, the length of time the CCR Reformer can operate between production shut downs would extend to three years, which would provide greater periods of uninterrupted production than the present configuration currently does.

There are several steps in catalyst regeneration in the CCR process. These steps are carried out continuously with spent catalyst being removed from the fourth reformer reactor at the same time regenerated catalyst is being added to the first reactor. Initially, fine particles of catalyst are separated from the catalyst to be regenerated and directed to a fines collection system. Then the spent catalyst drops into the *Chlorosorb* section to adsorb chlorine compounds. The chlorine compounds are returned to the process with the catalyst. The spent catalyst is directed to the regenerator, where controlled amounts of oxygen, coming from air, are introduced to support the burning of coke into carbon dioxide and water vapor. After burning off the coke deposits, the catalyst drops into a drum where it is purged with nitrogen to remove any residual oxygen remaining from coke burning and treated with chlorides to reactivate catalyst sites. The regenerated catalyst is directed to the top of the first reactor and starts another cycle in the reformer reactors.

The single new 75,000 barrel per day CCR Reformer unit¹² would replace the manufacturing capacity of the two existing Reformer units¹³.

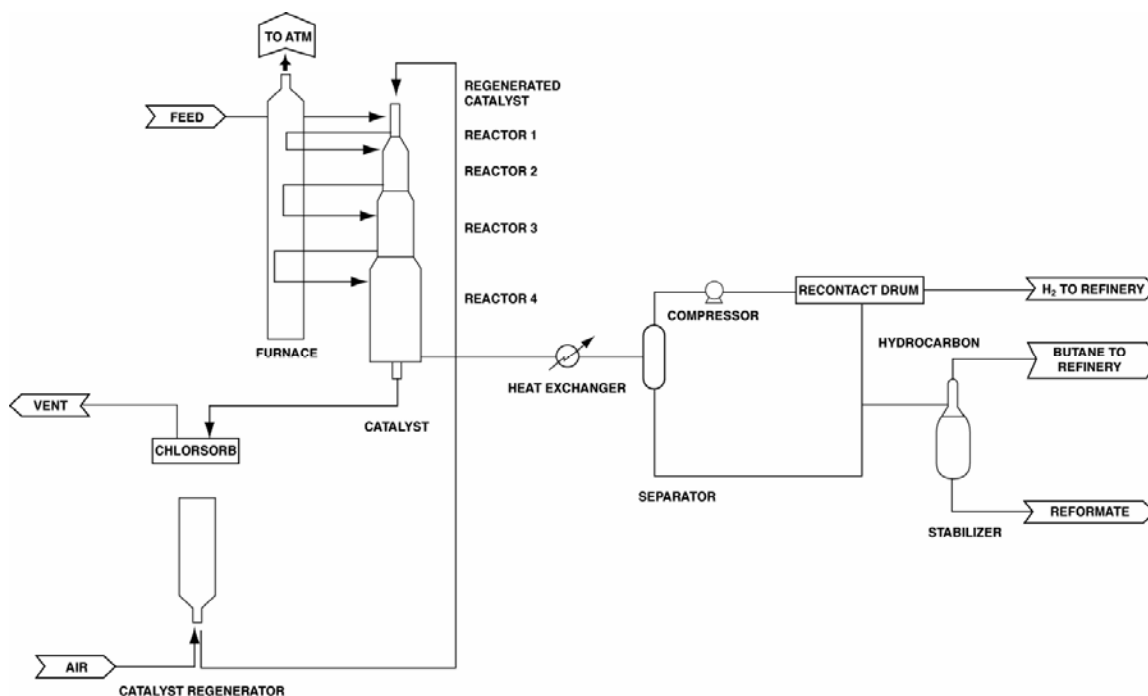
The catalyst used in the CCR Reformer chemical reactors would allow the Refinery to increase the portion of motor gasoline produced that meets California gasoline regulations. The Refinery plans to direct the same feed streams, hydrobate, hydrotreated naphtha, and hydrocrackate, a product stream from the hydrocracker unit, to the new reformer (See Figure 3-13 for the proposed reformer schematic)

Equipment Changes

A new reformer using CCR technology and regeneration and support equipment would be installed in the Reformer Component of the Renewal Project. Chevron proposes to install two chemical injection systems to maintain optimal conditions for the catalyst. Sulfide is injected to

¹² Note that the maximum hourly throughput is 3,750 bbl/hr x 24 hrs/day = 90,000 bbl/day for the unit. The annual daily average throughput is 75,000 bbl/day (or 3,125 bbl/hr).

¹³ The combined capacity of the existing Reformer units is 75,000 barrels per day.



Chevron Energy and Hydrogen Renewal Project / 205166
 SOURCE: Chevron, 2005

Figure 3-13
 New CCR Reformer Flow Diagram

limit carbon deposition on reactor interior surfaces and perchloroethylene and water may be injected to maintain a desired ratio of chlorine to moisture to the catalyst. Because of the recovery of chloride in the Clorsorb section, Chevron anticipates a large (circa 90 percent) reduction of perchloroethylene injection.

Support equipment for the CCR process unit are: heat exchangers to reuse heat provided in the charge furnaces, a recycle compressor provided to recycle part of the hydrogen-rich gas generated in the reforming reactions back into the feed, a booster compressor to export the remainder of the hydrogen-rich gas generated in reforming reactions back to the Refinery, a feed surge drum, recontact drums and net gas compressors, a methanator, and a debutanizer to separate butane and low molecular weight hydrocarbons from product reformate.

The Refinery proposes to use several technologies for treating emissions from the CCR Reformer, including low NO_x burners with Selective Catalytic Reduction to further reduce NO_x and Chlorsorb for treating CCR Reformer vent gas, as well as a system to treat hydrogen gas directed back to the RFG system.

Schedule

The new Reformer installation is planned to start in the Third quarter of 2008 and become operational in late 2009. Construction of this component is discussed in Section 3.5, *Construction of Project Components*.

3.4.3.4 Hydrogen Purity Improvements

When the hydrogen that is used in Refinery processes is recirculated, it becomes contaminated with other compounds and impurities such as methane (a hydrocarbon) and sulfur. Since the effectiveness of the Refinery processes that use hydrogen depends on the purity of the hydrogen feed, the Hydrogen Purity Improvement¹⁴ component of the Renewal Project proposes several measures to increase the purity of hydrogen streams at the Refinery:

- New equipment would increase hydrogen purity and enable more productivity through the FCC Feed Hydrotreater.
- New equipment would increase the capacity of the Sulfur Recovery Units.
- A new sulfur truck loading facility would replace the existing sulfur truck loading facility.

The FCC Feed Hydrotreater upgrade would not allow an increase in the processing capacity of the existing FCC unit; rather, the upgrades would increase the range of imported gas oils that could be processed in the Refinery.

Current Operations

The Refinery currently uses the FCC Feed Hydrotreater to remove sulfur, nitrogen, and metal impurities in the feed stream processed in the FCC Unit. In the FCC Unit, incoming petroleum compounds are broken up into smaller compounds. The smaller petroleum compounds produced in the FCC Unit are the starting materials for further chemical conversion into motor gasoline.

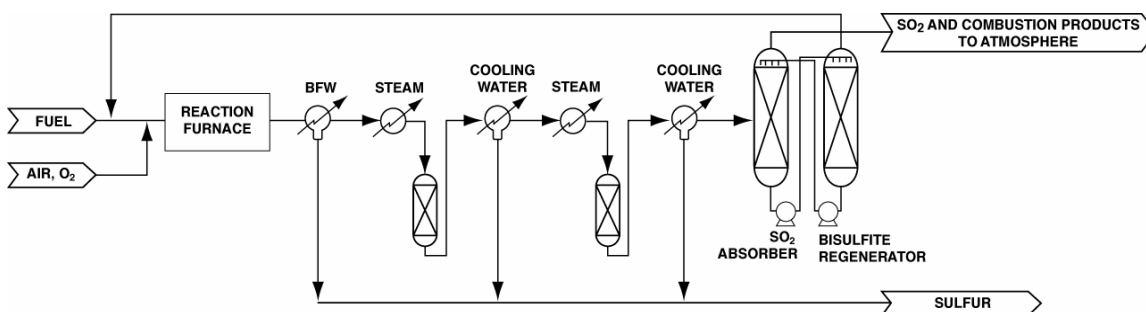
Proposed Changes

The Hydrogen Purity component proposes to install new equipment that would allow an increased production rate through the FCC Feed Hydrotreater and would also increase the purity of hydrogen in the feed to the FCC Feed Hydrotreaters. This increase in hydrogen purity would be accomplished by adding equipment on the existing FCC Feed Hydrotreater recycle compressor process stream to remove more sulfur in the form of gaseous H₂S. Chevron also proposes to increase the capacity of the existing Refinery Sulfur Recovery Units (SRU) to process ammonia and the increase of H₂S anticipated as a result of the Renewal Project components.

The Proposed Project would add a new H₂S absorber in the FCC Feed Hydrotreater and an amine regenerator in the existing SRU in the Refinery. The existing No. 5 H₂S plant will have some

¹⁴ Hydrogen and hydrotreating catalysts are used in the Refinery to remove sulfur and nitrogen from crude or petroleum fractions separated from crude oil. In the Hydrogen Purity Improvement component in the Renewal Project, Chevron plans to increase the hydrotreating processing of the petroleum streams processed in the Fluid Catalytic Cracker to allow more flexibility in processing crude oils and other process streams imported into the Refinery. The sulfur removed in the increased hydrotreating would be converted to liquid sulfur in an upgraded Sulfur Recovery Unit.

pipelines made to circulate higher rates of amine to improve reliability. To convert the acid gas streams from the amine generators, the Refinery would modify the existing SRU. This modification would increase the capacity of the SRU by installing an oxygen enrichment capability to increase the capacity of the existing equipment and upgrading equipment in the SRUs (See Figure 3-14).



SOURCE: Chevron, 2005

Chevron Energy and Hydrogen Renewal Project / 205166

Figure 3-14
Sulfur Recovery Unit Flow Diagram

As part of the Hydrogen Purity component, a new sulfur truck loading facility would replace the existing facility. The new sulfur truck loading rack would include a new vent scrubber. The existing Sulfur Loading Rack would be dismantled following construction of the new Sulfur Loading Rack. This would involve cleaning of loading lines and connecting piping, removal of pertinent equipment from the existing rack and immediate area around it, and then cutting up the rack and recycling the steel. There would be minimal or no soil disturbance as a result of removing the existing rack.

Equipment Changes

For the Hydrogen Purity Improvement component, the above-described equipment (See also Table 3-2) would be installed in the existing FCC Feed Hydrotreater and in the existing SRU areas of the Refinery.

Chevron will install low-nitrogen oxides (NO_x) burners on their existing TKN furnaces and low-NO_x burners on their existing Poly Plant furnaces as well.

Schedule

Installation of new equipment and modifications to existing equipment would start in Fourth Quarter 2007 and last through Fourth Quarter 2008. Construction of this component is discussed in Section 3.5, *Construction of Project Components*.

In addition to the four main project components listed above, the Renewal Project also includes other smaller projects as described in the following sections.

3.4.3.5 Replacement and New Tanks

Chevron plans to construct 10 replacement tanks (i.e. removal of old tanks and addition of new ones) and 8 new tanks. The replacement tanks and new tanks would be built in existing Tank Fields or process areas in consultation with the City of Richmond regarding specific siting and color selection. Pursuant to the City of Richmond's Zoning Ordinance, Chevron must obtain conditional use permits from the City to ensure that the replacement tanks and new tanks will be designated, located, and operated compatibly with adjoining land uses. Chevron would obtain any BAAQMD permits for construction and operation of these tanks as necessary.



SOURCE: Chevron, 2005

Chevron Energy and Hydrogen Renewal Project / 205166

Figure 3-15

Typical Chevron Refinery Tanks

Construction of new or replacement tanks at the Refinery is an ongoing process, and there is usually at least one tank being replaced at any given time. For the Renewal Project, the 18 tanks proposed for construction over the duration of the Proposed Project require generally the same level of labor force, construction equipment and approximate time frame to complete the construction and testing process to put the tanks into service. In many cases the same crew could be expected to complete one tank and then move to the next one, i.e., all tanks could not, and would not be built at the same time.

For sixteen of the tanks, the Refinery estimates the Proposed Project would require 20,000 field person-hours and take up to 14 months to complete construction. This assumes 10 workers at peak for the tank and two workers for electrical connection at the end of construction.

Construction equipment would include two pieces of major moving equipment on site, cranes and/or bulldozers. Approximately 10 crew personal vehicles would be required to be parked at Gate 91. One material delivery per week at peak of construction is estimated. The typical work schedule for this size tank construction is assumed to be five 10-hour periods on day shift with an average maximum number three pickup trucks parked at site per day.

Tank T-4004 (Diesel) is a larger tank, described below, which Chevron estimates would require 40,000 field person-hours and take up to 18 months to complete construction. This assumes 25 workers at peak for the tank and four workers for electrical connection at the end of construction. Construction equipment would include four pieces of major moving equipment on site, cranes or bulldozers. It would be unlikely for cranes and bulldozers to be in use at the same time. Approximately 25 crew personal vehicles would be required to be parked at Gate 91. Two material deliveries per week at peak of construction are estimated. The typical work schedule for this size tank construction is assumed to be five 10-hour periods on day shift with an average maximum number of four pickup trucks parked at site per day.

One tank T-3108 (Sour Water) is a much larger tank, described below, which Chevron estimates would require 60,000 field person-hours and take up to 24 months to complete construction. This assumes 25 workers at peak for the tank and four workers for electrical connection at the end of construction. Construction equipment would include four pieces of major moving equipment on site, cranes or bulldozers. It would be unlikely for cranes and bulldozers to be in use at the same time. Approximately 25 crew personal vehicles would be required to be parked at Gate 91. Two material deliveries per week at peak of construction are estimated. The typical work schedule for this size tank construction is assumed to be five 10-hour periods on day shift with an average maximum number of six pickup trucks parked at site per day.

Proposed tank construction activities would be generally conducted in disturbed soils on current and previously used tank fields located within the Refinery. For the 10 proposed tank replacement components the removal of the existing tanks would involve some demolition activities (e.g., tank walls, pipe supports, concrete slabs, etc.). Nine (9) of the 10 replacement tanks (T-231, T-298, T-398, T-954, T-979, T-984, T-1451, T-1689, T-3075) will be constructed in the exact same location as the existing tank, necessitating the removal of the existing tank before construction of the replacement tank begins. This process involves removal and disposal of any hazardous materials, cleaning of the tank interior using an inert material (nitrogen or steam) or water, 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. The remaining replacement tank (T-1504) would be constructed in essentially the same location as the existing tank. The existing tank would then be added to the ongoing list of facilities and equipment in the Refinery to be demolished at a later date.

The following sections provide specific detail on the tank components replacements as part of the Renewal Project:

Tank T-231 (Water Draw) Replacement

Tank T-231, located in the southern portion of the Main Tank Field (See Figure 3-3), is used to store the water that is separated from processing streams in the Refinery, and referred to as water draw. Because of contact with hydrocarbons, the water contains dissolved hydrocarbons.

Proposed Changes

Chevron proposes to construct a new floating or fixed roof storage tank to replace Tank T-231. The tank, needed for water draw removed from gas oil shipments, would improve product quality and reliability. The new tank would be located in the same place as the existing tank and would have the size and capacity as the existing tank. This tank would require a BAAQMD permit and would have BAAQMD best available control technology to control emissions.

Schedule

This tank replacement project is scheduled to begin immediately after the approval of the Proposed Project.

Tank T-298 (Sour Water) Replacement

Tank T-298, an existing floating roof storage tank, is located near the FCC in the Pole Yard Tank Field (See Figure 3-3). T-298 contains sour water, which contains dissolved ammonia and sulfur-bearing compounds and has a very sour strong aroma.

Proposed Changes

The existing Tank T-298 has reached the end of its useful and economic life and must be replaced. Chevron proposes to construct one new floating roof aboveground storage tank to replace tank T-298. This new tank would be located in the same place and would have dimensions of 115-feet in diameter and 50-feet in height. The replacement tank project would increase the sour water storage capacity from the existing 46,000 barrels to 75,000 barrels. This tank would require a BAAQMD permit and would have BAAQMD best available control technology to control emissions.

Schedule

This tank replacement project is scheduled to begin in 2007 and be completed in 2008.

Tank T-398 (TKN Hydrocracker Feed Tank) Replacement

Tank T-398 is located in the Pole Yard Tank Field located just east of the FCC Unit (See Figure 3-3) and north of tank T-298. Tank T-398 has dimensions of 150 feet in diameter and is 65 feet high, and would feed the TKN Hydrocracker unit.

Proposed Changes

The existing Tank T-398 has reached the end of its useful and economic life, but was not replaced when it was originally taken out of service. The Refinery proposes to construct one new floating roof storage tank to replace Tank T-398. The new tank would be in the same location and service as the existing tank, however, the replacement would have a larger capacity of 200,000 barrels

and dimensions of 150-feet in diameter by 70-feet in height. This tank would require a BAAQMD permit and would have BAAQMD best available control technology to control emissions.

Schedule

This tank replacement project is scheduled to begin in 2007 and be completed in 2008.

Tank T-954 (Gasoline) Replacement

Tank T-954, located in the southern portion of the SP Hill Tank Field (See Figure 3-3), is 115 feet in diameter with a height of 38 feet. Tank T-954 is used to store gasoline.

Proposed Changes

The existing Tank T-954 has reached the end of its useful and economic life and must be replaced. Chevron proposes to construct one new fixed-roof or floating-roof storage tank to replace Tank T-954. The new tank would be located in the same place as the existing tank, but the capacity would be increased to 150,000 barrels with increased tank dimensions of 115-feet in diameter by 50-feet in height. This tank would require a BAAQMD permit and would have BAAQMD best available control technology to control emissions.

Schedule

This tank replacement project is scheduled to begin in the first quarter of 2008.

Tank T-979 (Cutter) Replacement

T-979 is located in the southern portion of the Main Tank Field. Tank T-979 is 120-feet in diameter and 40-feet high. It is used to store Cutter stock, which is a refined product that is about the weight of diesel fuel and which is blended with heavier products to assist with pumping those heavier products.

Proposed Changes

The existing Tank T-979 has reached the end of its useful and economic life and must be replaced. Chevron proposes to construct one new cone roof storage tank to replace Tank T-979. The new tank would be the same size and service as the existing tank and installed in the same location as the existing tank. This tank would require a BAAQMD permit and would have BAAQMD best available control technology to control emissions.

Schedule

This tank replacement project is scheduled to begin in 2014.

Tank T-984 (Cutter) Replacement

Tank T-984, located in the southern portion of the Main Tank Field, is 60-feet in diameter and 46 feet in height. Tank T-984 is used to store Cutter stock.

Proposed Changes

The existing Tank T-984 has reached the end of its useful and economic life and must be replaced. Chevron proposes to construct one new cone-roof storage tank to replace Tank T-984. The new tank would be the same size and service as the existing tank and installed in the same

location as the existing tank. This tank would require a BAAQMD permit and would have BAAQMD best available control technology to control emissions.

Schedule

This tank replacement project is scheduled to begin in 2014.

Tank T-1451 (High Sulfur Fuel Oil Stock [HSFO]) Replacement

T-1451, located in the Office Hill Tank Field near the foot of Chevron's Long Wharf, is 120-feet in diameter and 50 feet in height. Tank T-1451 is used to store fuel oil that has a high sulfur concentration.

Proposed Changes

The existing Tank T-1451 has reached the end of its useful and economic life and must be replaced. Chevron proposes to construct one new floating-roof storage tank to replace Tank T-1451. The new tank would be located in the same place as the existing tank and have the same capacity and services as the existing tank. This tank would require a BAAQMD permit and would have BAAQMD best available control technology to control emissions.

Schedule

This tank replacement project is scheduled to begin in 2009 and be completed in 2010.

Tank T-1504 (Recovered Oil) Replacement

Tank T-1504 is located in the Office Hill Tank Field near the foot of Chevron's Long Wharf (See Figure 3-3) south of I-580. Tank T-1504 contains oil that is recovered from various Refinery sources including: water from crude oil tanks, discharges from the Long Wharf marine terminal, and waste from various refinery waste water sumps. Tank T-1504 is 80-feet in diameter and 40 feet in height.

Proposed Changes

The existing Tank T-1504 has reached the end of its useful and economic life and must be replaced. Chevron proposes to construct one new floating roof storage tank to replace Tank T-1504. The new tank would be located in essentially the same location as the existing tank, and would be 80-feet in diameter by 40-feet in height. This tank would require a BAAQMD permit and would have BAAQMD best available control technology to control emissions.

Schedule

This tank replacement project is scheduled to begin in the 2007 and be completed in 2008.

Tank T-1689 (Steam Condensate) Replacement

Tank T-1689 is located near the existing 1A separator and the reverse osmosis plant (See Figure 3-3). Tank T-1689 is 50 feet in diameter and 48 feet in height. Tank T-1689 contains water that is condensed from the steam from various processes at the Refinery.

Proposed Changes

The existing Tank T-1689 has reached the end of its useful and economic life and must be replaced. Chevron proposes to construct one new fixed roof storage tank to replace T-1689. The replacement tank would be the same size as T-1148 [63 feet in diameter by 47 feet high] or T-1149 [69-feet in diameter by 48 feet high] and Chevron's preference would be to use either one of these existing tanks if they are in acceptable condition. If, after project approval, Chevron finds that neither tanks T-1148 and T-1149 are in acceptable condition, a new replacement tank would be required. The new tank, if needed, would be constructed in the same location as the existing T-1689, and would be a maximum size of 69 feet in diameter by 48 feet in height.

Schedule

This tank replacement project is scheduled to begin in the 2007 and be completed in 2008.

Tank T-3075 (Aviation Gas) Replacement

T-3075 is located in the Main Tank Field (See Figure 3-3) near the center of the Refinery and tank car loading racks. Tank T-3075 is 85 feet in diameter and 40 feet high, and is used to store aviation gasoline, a high-octane gasoline that performs well in aircraft engines.

Proposed Changes

The existing Tank T-3705 has reached the end of its useful and economic life and must be replaced. The Refinery proposes to construct one new floating roof storage tank to replace Tank T-3075. The new tank would be an exact replacement in-kind of the existing tank and be located in the same place. This tank would require a BAAQMD permit and would have BAAQMD best available control technology to control emissions.

Schedule

This tank replacement project is scheduled to begin in the first quarter of 2008.

New Tank T-3108 (Gas Oil Tank)

The Refinery proposes to construct an additional Gas Oil Tank to handle a shortfall in storage capacity occurring when existing tanks are taken out of service for maintenance. The new floating-roof storage tank would be located in the existing Quarry Tank Field (See Figure 3-3) just north of I-580 and the San Rafael Bridge Toll Plaza. Tank T-3108 would be 290 feet in diameter and 64 feet in height. It would be used to store gas oils, one of the heavier fractions resulting from the initial distillation and separation of crude oil. Gas oils have low volatility and emissions would be low. Tanks that contain gas oils are exempt from BAAQMD permitting; however, air emission control would still be achieved through use of industry standard designs for floating roof tanks.

Schedule

This tank replacement project is scheduled to begin in the 2007 and be completed in 2008.

New Tank T-3228 (Continuous Catalytic Reformer [CCR] Feed / Product)

The Refinery proposes to construct one new floating-roof storage tank in the existing Main Tank Field (See Figure 3-3). Tank T-3228, which would be an essential component of the CCR Reformer Replacement project, would be 125 feet in diameter and 80 feet in height, with a capacity of 200,000 barrels. It would be used to store reformat / heavy gasoline for the new CCR Reformer. This tank would require a BAAQMD permit and would have BAAQMD best available control technology to control emissions.

Schedule

This tank replacement project is scheduled to begin in the second quarter of 2008 and be completed by the fourth quarter of 2009.

New Tank T-4004 (Diesel)

To replace rental storage, the Refinery proposes to construct one new fixed-roof storage tank in the existing SP Hill Tank Field (See Figure 3-3). Tank T-4004 would be 115 feet in diameter and 60 feet in height, with a capacity of 150,000 barrels. Tank T-4004 would be used to store diesel. Diesel fuels have low volatility and emissions would be low. Tanks that contain Diesel are exempt from BAAQMD permitting; however, air emission control would still be achieved through use of industry standard designs for fixed-roof storage tanks.

Schedule

This tank replacement project is scheduled to begin in 2009 and be completed in 2010.

New Tank T-4006 (Gas Oil Swing)

The Refinery proposes to construct a new Gas Oil Swing Tank to handle a storage when existing tanks are taken out of service for regular maintenance. The new floating-roof storage tank would be located in the existing Pole Yard Tank Field (See Figure 3-3). Tank T-4006 would be 150 feet in diameter and 70 feet in height, with a capacity of 200,000 barrels. Tank T-4006 would be used to store mixtures of gas oils and other hydrocarbons. This tank would require a BAAQMD permit and would have BAAQMD best available control technology to control emissions.

Schedule

This tank replacement project is scheduled to begin in 2010 and be completed in 2011.

New Tank T-4007 (Heavy Crude Oil Swing)

The Refinery proposes to construct an additional Heavy Crude Oil Swing Tank to handle a shortfall in storage capacity occurring when existing tanks are taken out of service for maintenance. The new floating-roof storage tank would be located in the existing Main Tank Field (See Figure 3-3). Tank T-4007 would be 115 feet in diameter and 60 feet in height, with a capacity of 100,000 bbls. Tank T-4007 would be used to store heavy crude oils. This tank would require a BAAQMD permit and would have BAAQMD best available control technology to control emissions.

Schedule

This tank replacement project is scheduled to begin in 2011 and be completed in 2012.

New Tank T-4008 (Deasphalted Oil [DAO])

The Refinery proposes to construct an additional DAO Tank to handle a shortfall in storage capacity occurring when existing tanks are taken out of service for maintenance. The new fixed-roof storage tank would be located in the existing Pole Yard Tank Field (See Figure 3-3). Tank T 4008 would be 145 feet in diameter and 50 feet in height, with a capacity of 175,000 barrels. Tank T-4008 would be used to store deasphalted oils. This tank would require a BAAQMD permit and would have BAAQMD best available control technology to control emissions.

Schedule

This tank replacement project is scheduled to begin in 2009 and be completed in 2010.

New Tank T-4009 (Diesel Hydrotreater [DHT] Feed)

The Refinery proposes to construct an additional DHT Feed Tank to handle a shortfall in storage capacity occurring when existing tanks are taken out of service for maintenance. The new floating-roof storage tank would be located in the existing Main Tank Field (See Figure 3-3). Tank T-4009 would be 150 feet in diameter and 65 feet in height, with a capacity of 750,000 barrels. The tank would be used to store hydrotreated diesel or high sulfur diesel. This tank would require a BAAQMD permit and would have BAAQMD best available control technology to control emissions.

Schedule

This tank replacement project is scheduled to begin in 2009 and be completed in 2010.

New Tank T-4010 (Water Draw)

The Refinery proposes to construct one new fixed-roof or floating-roof storage tank in the existing Pole Yard Tank Field (See Figure 3-3). The tank is needed for product quality and reliability improvements (it is required to “draw” or remove water from raw material, such as gas oil, shipments). Tank T-4010 would be 80 feet in diameter and 40 feet in height. It would be used to store the water component that is separated from processing streams in the Refinery (referred to as water draw). This tank would require a BAAQMD permit and would have BAAQMD best available control technology to control emissions.

Schedule

This tank replacement project is scheduled to begin in 2010 and be completed in 2011.

3.4.3.6 New Central Control Room

The Refinery proposes to build a new Central Control Room to help optimize control efficiency for the entire Refinery.

Proposed Changes

The Refinery proposes to construct one three-story building with a floor plate area of approximately 30,000 square feet per floor. When the new Central Control Room is operational the existing control rooms would then be available as additional office complexes for technical, operations, and maintenance personnel. The new central control room would be located near the non-operational asphalt plant on Asphalt Street (See Figure 3-3).

Schedule & Construction

Work on the central control room is scheduled to begin in 2010 and end in 2011. Construction would include site clearing, foundation laying and erection of the building. The size of the construction crew cannot be estimated at this time but would be consistent with crews required to construct similar buildings.

3.4.3.7 New Maintenance Facilities

Chevron proposes to replace its existing maintenance and shop facilities with two new buildings.

Proposed Changes

Construct two new buildings near the existing Chevron Machine Shop near Gate 14 (See Figure 3-3) on Castro Street or near the existing Maintenance Division Offices south of the existing boilers. The first building would be a one-story, 44,000-square-foot building (approximately 210 feet by 210 feet) and the second building would be a two-story, 24,000-square-foot building with 12,000 square feet per floor. When complete, activities in the current Machine Shop would be relocated to the new buildings. Following operation of the new Maintenance Facility, the existing facilities would be decommissioned.

Schedule & Construction

Work on the maintenance facilities is scheduled to begin in 2009 and end in 2010. Construction would include site clearing, foundation laying and erection of the buildings. Demolition of the old buildings within the timeframe of the Renewal Project is considered unlikely and is not part of this project. The size of the work crew cannot be estimated at this time but would be consistent with crews required to construct similar buildings.

3.5 Construction, Decommissioning, Demolition and Dismantling of Project Components

This section discusses the construction methods and schedule for the major components of the Renewal Project. Construction and schedule aspects of the other projects are provided in Table 3-2 and Sections 3.4.3.5 through 3.4.3.7. The construction and start of operation schedules for the major components are shown in Table 3-3.

**TABLE 3-3
RENEWAL PROJECT CONSTRUCTION SCHEDULE**

Major Project	Proposed Start Date	Completion Date
Hydrogen Plant Replacement	4 th Quarter 2007	4 th Quarter 2008
Power Plant Replacement (CoGen 3000)	4 th Quarter 2008	3 rd Quarter 2009
Hydrogen Purity Improvements	4 th Quarter 2007	4 th Quarter 2008
Catalyst Reformer Replacement	3 rd Quarter 2008	4 th Quarter 2009
Combined Off-plot (New Pipeway)	4 th Quarter 2007	2 nd Quarter 2008
Tanks	Ongoing through 2015	
Central Control Room	1 st Quarter 2010	4 th Quarter 2011
New Maintenance Facilities	1 st Quarter 2009	4 th Quarter 2010

NOTE: Schedule subject to change as the Renewal Project is further developed.

SOURCE: [Lizarraga, 2007]

Construction of the Proposed Project would not require the demolition of any operating Refinery facilities, although some minor equipment, such as piping, pumps and exchangers would be removed. Grading, transport of materials, and building and installation of new equipment and necessary structural components would be required. The construction schedule, construction areas, decommissioning, dismantling and demolition, grading, materials and services, and labor force are discussed below. Some aspects of the construction plan may change slightly as Renewal Project details are finalized.

Project construction is expected to occur over 60 months, beginning in 2007, and with the exception of construction on several tanks, ending in the fourth quarter of 2011. The peak construction periods are expected to be in the first quarter of 2008. During peak construction periods, Chevron is proposing to work five days per week (Monday through Friday), 10 hours per shift, and one shift per day¹⁵. The sixth and seventh days of the week (Saturday and Sunday)

¹⁵ There are no plans to work a night shift to construct the Renewal Project. However, in the event that weather or other factors significantly impact the project construction schedule, Chevron may decide some work activities will be necessary at night. There are cost increase and logistics issues raised by performing work at night, plus additional worker safety considerations and precautions that must be taken. The decision to work at night is a significant one, and Chevron would only undertake work at night if absolutely necessary, and for only as long as necessary and only after consultation with the City. Work would be limited to ensure minimal noise generation and lighting/glare potential.

would be used if and as necessary to maintain the Proposed Project construction schedule, as would addition of selected second-shift activities.

Staggered shifts (e.g., a portion of the construction workforce starting at 6:00 a.m. and another portion starting at 7:00 a.m.) would be utilized during peak construction periods. Staggered shifts would reduce the number of workers arriving and departing the work site at the same time, and reduce the load on the street and highway system in the Refinery vicinity. The planned schedule is intended to allow a substantial portion of the construction workforce to avoid the morning and afternoon peak traffic periods, in order to reduce potential traffic impacts.

During the period when the Renewal Project is being constructed, some Refinery process units would go through their normally scheduled maintenance turnarounds. Two 10-hour shifts of craft workers would work the turnarounds, five or six days per week. Critical path work would be performed by two 10-hour shifts per day, seven days per week. The first shift would start at 6:00 a.m. and the second shift would start at 4:00 p.m. The peak turnaround workforce would occur in the fourth quarter of 2008, when 1500 workers would be on-site. Staggered shutdown crew shifts would be utilized where possible to reduce the load on the street and highway system in the Refinery vicinity.

3.5.1 Site Preparation

In general Renewal Project facilities and equipment would be constructed in disturbed soils on current and previously used process areas within the Refinery. Some equipment would be dismantled and removed (e.g., pipe supports, concrete slabs) as a result of the Proposed Project. These activities, as well as the management and disposal of the wastes from the various construction activities (e.g., asbestos-containing insulation, lead-containing blasting grit from paint removal, containers from paint applied at new/modified units) would be conducted in accordance with established procedures and the applicable regulatory requirements.

Chevron estimates that grading and filling activities will require up to 110,000 cubic yards of clean fill to be imported. In addition, Chevron estimates that there would be up to 500 cubic yards of graded / excavated soil that would need to be transported off site for disposal. This soil would be removed prior to placing and grading imported clean fill and commencing necessary work to construct the Hydrogen Plant, CCR, and CoGen facilities and equipment. These estimates take into account soil that may be removed and/or imported in the future as part of the projects analyzed in this EIR. Chevron estimates that transporting excavated soil off-site, plus importing the necessary clean fill, would require up to 42 truck loads per day, for a total of 18,600 truck trips. 6,400 of these truck trips would be for work done at the Hydrogen Plant site, and would occur over a four-month period beginning in the fourth quarter of 2007. The balance of the truck trips would occur over the remainder of the project construction schedule (through fourth quarter of 2011). The balance of these truck trips would occur intermittently, when and if necessary, at a rate less than 42 truck loads per day. The excavated soil would be tested for hydrocarbons and managed in conformance with the Refinery's Regional Water Quality Control Board-approved Soil Management Program for disposition. Also as required, excavated soil that is contaminated

would be managed in accordance with BAAQMD Regulation 8 (Organic Compounds), Rule 40 (Contaminated Soil).

Chevron would implement BAAQMD guidelines to control fugitive 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.

3.5.2 Construction Labor Force

Over the Proposed Project's construction period, the Refinery would hire construction contractors whose workforce would be expected to average roughly 300 workers per day, with a six-month peak in 2008 of approximately 750 workers. The construction contractors employ a skilled workforce that would include a variety of crafts, such as cement finishers, ironworkers, pipe fitters, welders, carpenters, boilermakers, electricians, riggers, painters, operators, and laborers. The entire construction workforce is expected to come from the construction labor pool available in the Bay Area.

3.5.3 Construction Materials and Services

During project construction, deliveries of materials, such as concrete, structural steel, pipe and fittings, vessels and equipment, electrical equipment, and insulation, would be required. Deliveries also would be necessary for additional construction services equipment (e.g., portable toilets, temporary office trailers for construction contractors). Materials generally would be delivered by truck, although a small percentage of the needed equipment and materials also may arrive by rail. It is estimated that a peak of approximately 86 truck deliveries per day would occur during the peak construction period of the Proposed Project. During process unit turnarounds, which may coincide with project construction, additional peaks of 30 trucks per day are expected to make deliveries to the Refinery.

3.5.4 Construction Traffic and Parking

No physical entrance, roadway, or intersection improvements would be needed to accommodate construction traffic volume. Construction contractors would be required to notify their employees to use the Richmond Parkway or Interstate 580 in arriving and departing the work site, in order to avoid travel through the Richmond community. Project construction workers would park in a number of permanent and temporary on-site lots within the Refinery boundaries.

3.5.5 Construction Areas

All construction would take place within the Refinery boundaries. Any required staging, fabrication, or laydown areas would also be within Refinery boundaries.

3.5.6 Decommissioning, Demolition and Dismantling

When the Refinery decommissions a unit, the unit or equipment to be decommissioned is isolated from other operating units using the Refinery's Lockout/Tagout (energy and material input

isolation) procedures. This terminates all inputs to the unit. Next, all materials are removed from piping and equipment and captured in existing Refinery effluent and waste handling systems for proper management and/or disposal. Hazardous materials are removed from equipment and the Refinery in accordance with proper hazardous waste regulatory requirements. Then, sections of piping are cut from the unit in selected appropriate locations to create physical air gaps that render the unit completely unusable. The unit would then be placed on the Refinery's ongoing list of equipment to be dismantled. As is discussed in Section 3.4, many of the existing facilities replaced by Proposed Project components would be decommissioned as part of the Proposed Project.

Although construction of the Proposed Project would not require the demolition of any operating Refinery facilities, some minor equipment, such as piping, pumps, and exchangers would be dismantled and removed. In addition, the existing Hydrogen Plan, existing No. 4 and No. 5 Rheniformers, and No. 1 Power Plant would be shut down and decommissioned. Chevron does not propose to dismantle or demolish these facilities. The demolition and dismantling of these facilities is not considered part of the scope of the five-year Proposed Project.

Chevron's normal Refinery operations include keeping an ongoing inventory of facilities to be demolished, and planning and executing demolition as resources, funding, and equipment reclamation opportunities become available. Demolition activities tend to be ongoing. Demolition equipment emissions and traffic tend to be a normal part of day-to-day refinery maintenance activities. Demolition normally entails notification to the BAAQMD and Cal-OSH to ensure regulatory requirements for asbestos abatement are met. Building permits are obtained from the City of Richmond. Demolition utilizes trucks, cranes, tractors, backhoes, welding rigs, and related tools and equipment. Metals are recycled, and non-recyclable materials are properly disposed of at suitable landfills. Hazardous materials, if any, are profiled and disposed of at the appropriate Class I or Class II disposal facilities in accordance with hazardous waste regulations. Applicable Storm Water Pollution Prevention Plan requirements are implemented throughout demolition activities. Excavation work is minimized to limit dust emissions.

The tanks that would be replaced as part of the proposed project will be demolished and dismantled within the five-year project timeframe. For tanks, demolition is a slow, low intensity process. It generally takes a few weeks to a month to dismantle a tank, and typically involves approximately 12 to 20 truck round trips to remove the steel to a recycler.

3.6 Other Refinery Projects

Refineries typically have other previously approved projects under construction and / or on-going maintenance projects underway at any given time period. The Chevron Refinery is no exception; there are a number of projects in various phases of planning or completion. Because these projects are already approved, they are considered to be “cumulative” projects, and their descriptions as well as the consideration of cumulative impacts from those projects are discussed in Section 5.2, *Cumulative Impacts* of this document.

3.7 Maintenance Activities

Operation of the Refinery requires substantial on-going maintenance activities so that all process units operate within their design parameters, especially for emissions and pressure containing equipment, and to ensure that products meet quality and regulatory specifications and quantity goals. Regular maintenance is essential to the overall safe operation of the Refinery, and in general is not subject to CEQA review. Regular maintenance activities include mechanical equipment inspection, repair and preventative maintenance, and minor soil excavation to remove, for example, out of service piping, foundations, and contamination.

In addition to the on-going maintenance activities, scheduled large-scale maintenance actions, called turnarounds, are also necessary at the Refinery. The term “turnaround” refers to the period of time when refinery equipment is down for maintenance and inspections and not available to process feedstocks, as opposed to refinery equipment’s typical 24 hour a day, 365 day a year operation. Turnarounds are scheduled to:

- Inspect the internals of Refinery vessels;
- Clean pipe and vessel internals;
- Upgrade existing refinery equipment and vessels;
- Renew catalysts in vessels which do not use continuous regeneration;
- Make connections for new equipment being installed at the Refinery;
- Perform maintenance or inspection on critical equipment;
- Repair and renew piping and equipment before they fail.

Turnarounds are determined to be major when significant portions of the Refinery are shut down for extended periods of time (3 to 6 weeks). Minor turnarounds may affect only certain units or parts of the total refinery for short periods of time (1 to 2 weeks). Refinery turnarounds affect production and staff plans them precisely and carefully so that work can be accomplished quickly in a turnaround and process units can be started up again as soon as possible. Planning for a turnaround includes insuring all necessary supplies and equipment are on site and available when needed. Refinery maintenance and technical staff, as well as additional contract maintenance staff, work in shifts 24 hours per day to minimize the duration of a turnaround.

3.8 Permits and Approvals Required

The following additional permits and approvals may be required for the some and / or many of the components of the Proposed Project:

- A BAAQMD Authority to Construct and Permit to Operate;
- City of Richmond Conditional Use Permit, design review, grading and building permits;
- CEC Application for Certification or Small Power Plant Exemption;
- A water supply assessment prepared by the East Bay Municipal Utility District;
- A Caltrans encroachment permit may be needed for implementation of proposed traffic mitigation measures.

References – Project Description

Chevron USA, Energy & Hydrogen Renewal (Renewal) Project Environmental Impact Report and Conditional Use Permit Application Package, April 6, 2005

Chevron, *Chevron Richmond Refinery Water Enhancement Wetland Studies, 1994-2004*, 2004.

Leffler, William L., 1985. *Petroleum Refining for the Nontechnical Person*, Second Edition, Pennwell Publishing Company, 1985.

Lizarraga, T. A., Letter to Lamont Thompson, Senior Planner City of Richmond, February 14, 2007.

Praxair, Inc., *Contra Costa Pipeline Project Land Use Permit Application*, submitted to Contra Costa County Community Development Department, February 2007.

Weisman, Peter, *An Introduction to Organic Chemistry*, 2nd Ed., 1983

CHAPTER 4

Environmental Setting, Impacts, and Mitigation Measures

4.1 Aesthetics, Visual Quality, Light and Glare

The Aesthetics, Visual Quality, and Light and Glare effects that would result from the implementation of the Proposed Project would be less than significant.

- The Proposed Project would be constructed within the developed portion of the existing 2,900-acre active area of the Refinery, which has been an active industrial facility for more than 100 years.
- The Proposed Project would not have a substantial adverse effect on a scenic vista and would not substantially degrade the existing visual character or quality of the site and its surroundings.

4.1.1 Introduction

The section includes a description of existing visual conditions and an evaluation of potential aesthetic effects associated with implementation of the Renewal Project. Computer-generated visual simulations illustrating “before” and “after” visual conditions at the Proposed Project site as seen from seven representative vantage points are included and discussed as part of this analysis (see Figures 4.1-2 through 4.1-8). Digitized photographs and computer modeling and rendering techniques were utilized to prepare the simulation images, which are based on plans and project drawings provided by the project applicant. Additionally, an assessment of visible water vapor plume formations associated with refinery operations has been included as part of this analysis.

Viewpoint Locations

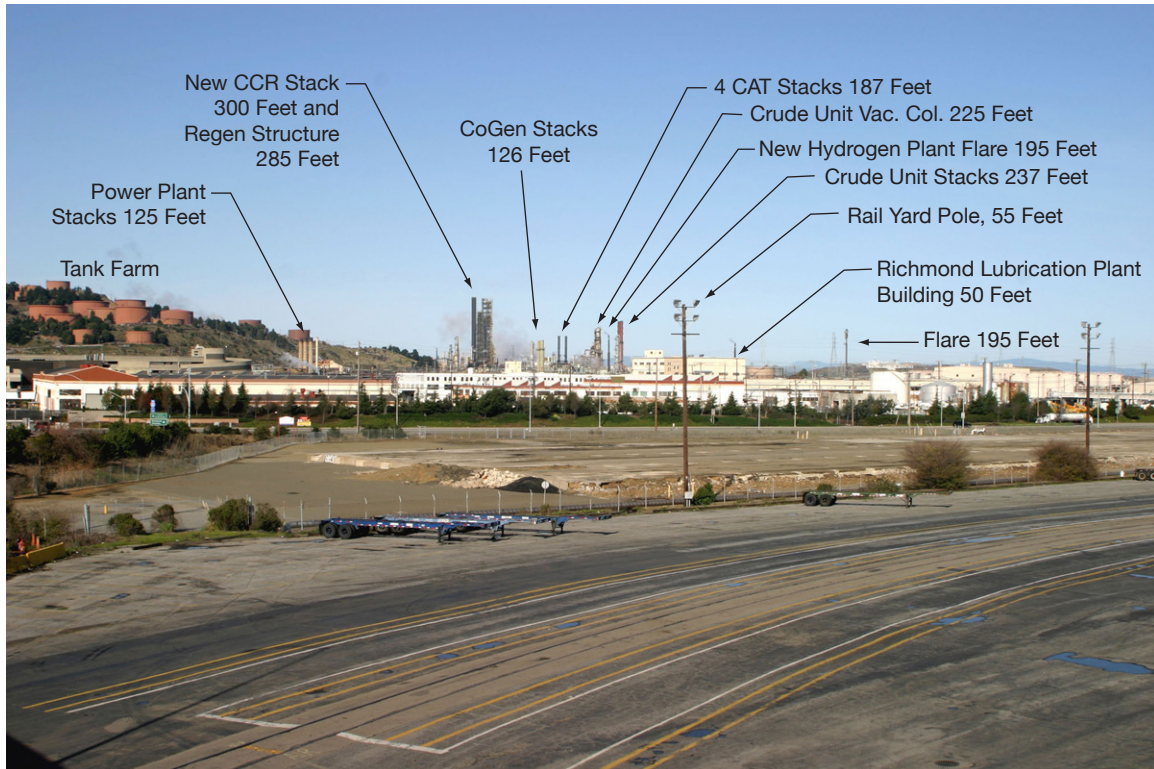
- 1 I-580 (see Figure 4.1-2)
- 2 Castro Street (see Figure 4.1-3)
- 3 Crest Avenue (see Figure 4.1-4)
- 4 Buena Vista (see Figure 4.1-5)
- 5 Wildcat Creek/Bay Trail (see Figure 4.1-6)
- 6 Richmond Parkway (see Figure 4.1-7)
- 7 Richmond/San Rafael Bridge (see Figure 4.1-8)



SOURCE: Google, Inc.

Chevron Energy and Hydrogen Renewal Project . 205166

Figure 4.1-1
Viewpoint Location Map



Simulated view of Refinery Site - Existing and Project features labeled.



Existing view of Refinery Site.



Simulated view of Refinery Site.

SOURCE: Vallier Design Associates, Inc.

Chevron Energy and Hydrogen Renewal Project . 205166

Figure 4.1-2b
 Project Site Viewed from the South
 (I-580)



Existing view of Refinery Site.



Simulated view of Refinery Site.

SOURCE: Vallier Design Associates, Inc.

Chevron Energy and Hydrogen Renewal Project . 205166

Figure 4.1-3
 Project Site Viewed from the East
 (Castro Street)



Existing view of Refinery Site.



Simulated view of Refinery Site.

SOURCE: Vallier Design Associates, Inc.

Chevron Energy and Hydrogen Renewal Project . 205166

Figure 4.1-4
 Project Site Viewed from the South
 (Crest Avenue)



Existing view of Refinery Site.



Simulated view of Refinery Site.

SOURCE: Vallier Design Associates, Inc.

Chevron Energy and Hydrogen Renewal Project . 205166

Figure 4.1-5
Project Site Viewed from the Southeast
(Buena Vista)



Existing view of Refinery Site.



Simulated view of Refinery Site.

SOURCE: Vallier Design Associates, Inc.

Chevron Energy and Hydrogen Renewal Project . 205166

Figure 4.1-6
 Project Site Viewed from the North
 (Bay Trail/Wildcat Creek)



Existing view of Refinery Site.



Simulated view of Refinery Site.

SOURCE: Vallier Design Associates, Inc.

Chevron Energy and Hydrogen Renewal Project . 205166

Figure 4.1-7
 Project Site Viewed from the Northeast
 (Richmond Parkway)



Existing view of Refinery Site.



Simulated view of Refinery Site.

SOURCE: Vallier Design Associates, Inc.

Chevron Energy and Hydrogen Renewal Project . 205166

Figure 4.1-8
Project Site Viewed from Richmond Bridge

4.1.2 Setting

4.1.2.1 Existing Setting

Visual Character

The assessment of visual attributes and patterns of setting features in this report is organized according to the following general descriptive categories: site location and spatial organization; land form; land use; vegetation; surface waters; and light and glare. Flare emission visibility as well as water vapor are also addressed. The Refinery site does not contain any individual structures or natural features (e.g., heritage trees) that have aesthetic significance. Atmospheric and lighting effects influence the existing site character to a relatively limited degree. In addition to evaluating the components of the site's existing visual character, this analysis discusses available views of the site from various public viewpoints.

Site Location and Spatial Organization

The 2,900-acre Refinery occupies a substantial area of western Richmond including a major portion of the Point San Pablo Peninsula. The site is bordered by Interstate 580 (I-580) to the south, the Point Molate and San Francisco Bay to the west, the San Pablo Bay waterline, the Paktank area and an active landfill site to the northwest and industrial developments including the Santa Fe Intermodal Facility and rail yards to the north and east. In addition to the Point Richmond residential area to the south, residential neighborhoods of Central and North Richmond are located further east and north of the project site. Santa Fe and Atchison Village neighborhoods are approximately 0.75 and 0.25 miles east the Refinery boundary. North of Atchison Village, the Iron Triangle neighborhood's western edge ranges from approximately 0.25 miles to one mile east of the Refinery boundary. Shields-Reid neighborhood is approximately 0.25 miles east of the Refinery and Parchester Village is approximately 1.75 northeast of the site. The Refinery site is situated at the eastern terminus of the Richmond-San Rafael Bridge.

The entire Refinery site occupies an expanse of Bay plain, including marsh and mudflat areas, and the northwesterly-trending Point San Pablo Peninsula that protrudes into the San Pablo Bay waters. A northwesterly-trending ridge extends at elevations up to approximately 380 feet above mean sea level (msl) though the site and along the Peninsula, visually terminating along the water line at the northwestern tip of the Point San Pablo Peninsula. The ridge affords prominent views, screens parts of the site in views from the south and west, and provides a major element of visual contrast to the lower-lying areas surrounding the Refinery property. Unobstructed views of the Refinery facilities along the northeastern slopes and the crest of the ridge are generally available from viewpoints to the east and northeast; development to the southwest of the ridgeline is not visible from those points. Similarly, visual features of the southeastern portion of the site are highly prominent from viewpoints to the south and east, although the ridge obstructs most views of the site to the north and west of the ridge. A visual corridor extends northerly from the I-580 freeway, affording relatively open, mobile views of the Refinery to motorists. The corridor is defined by the 380-foot-high ridge to the west and intervening development to the east (which, in concert with a drop in roadway elevation, obstructs further views of the lower plains of the site).

The corridor focuses views of the southeastern Bay plain area of the site, with San Pablo Bay views and northern Richmond Hills in the background.

Landform

Landform substantially determines the overall sense of visual space in the Refinery area and frames and focuses major views of the site. As discussed above, there are two major component landform types: Bay Plain, occurring mostly in the eastern and northeastern portions of the Refinery site; and hills, occurring along the southern portion of the site and along the axis northwesterly of the Peninsula. The Bay Plain areas to the north of the Refinery are generally undeveloped marsh and Bay mudflats (and are covered with seasonal plants and water). Adjacent to the ridge, the Bay Plain is developed with heavy-industrial facilities, equipment, and ancillary land uses such as storage areas and oxidation ponds. Visible along either side of the ridge itself are heavy-industrial facilities, most prominent among which are several dozen large cylindrical storage tanks. The ridges appear partially developed, as Refinery facilities occupy the slopes along with grasses, shrubs, and trees.

Land Uses

The Chevron Refinery occupies a substantial area of western Richmond, including a major portion of the Point San Pablo Peninsula. Major surrounding land uses include heavy industrial facilities, residential developments and open space. The area to the west of the Refinery is largely undeveloped open space; there are plans to provide public access to this area as well as some mixed-use development in the future.

Vegetation

Existing vegetation on the Richmond Refinery is a positive visual component that diminishes the industrial character of the site and provides visual buffer areas between the heavy-industrial uses of the site and the visually prominent natural features surrounding it, including Bay waters, marshes and hills. From off-site viewpoints, the ridges appear naturally vegetated in places not occupied by storage tanks or related facilities. Vegetation on the slopes includes grasses and shrub species, such as coyote brush, French broom and toyon, and trees, including Monterey pine and eucalyptus. The hillside vegetation both diminishes the appearance of industrialization along the Point San Pablo Peninsula and partially obstructs some views of industrial equipment. The marshes and mud flats in the northern portion of the Refinery site include a range of vegetation typical of that habitat, including cattails and pickleweed. These plants are generally grayish brown except during the growing season, late summer to early autumn, when they exhibit shades of green.

Surface Waters

Surface water surrounding the Refinery provides a dominant visual element in the field of view and contrasts with the industrial nature of the site. The waters to the west, north, and south of the site provide a distinct visual edge to the industrialized peninsula. The site is surrounded by San Francisco Bay waters to the south and southwest and San Pablo Bay waters to the north and northwest. Tidal waters and marshlands extend directly north of the Point San Pablo Peninsula.

The salt marshes covering the northern area of the site are subject to some tidal flooding and contain pools of surface water throughout the year. In addition to providing a visual edge to the site, Bay waters accentuate views of the site by providing extended unobstructed surfaces across which the site can be seen from great distances. Wildcat Creek is a meandering channel that runs westerly across the Wildcat marsh area to Castro Creek, which in turn runs northerly between marshland and mud flats to San Pablo Bay.

Light and Glare

At night, the Refinery constitutes the principal outdoor illumination source in the western Richmond area. Night lighting at the Refinery consists of flood lighting that provides illumination for general and non-process areas, and focused or spot lighting in operation areas that require higher light intensities.

Glare is produced on the Refinery site in places where reflective surfaces are exposed to direct or indirect lighting. Glare is most noticeable during the day, when surface water, metallic or brightly colored surfaces of processing facilities, tanks, pipes, equipment, vehicles and windows may all reflect sunlight. Because of the site's location adjacent to San Francisco and San Pablo Bays, which are themselves expansive open reflective surfaces; site glare is diminished in its relative prominence in the vicinity of the west Richmond area.

Flare Emission Visibility

The Refinery maintains a flare relief system for all processing plants that provides a safety service during planned maintenance operations or to mitigate the effects of unexpected potential process interruption. Processing plant equipment is protected by safety relief valves that open automatically to prevent the equipment from exceeding design pressure in the event of a process interruption or fire. The safety relief valves are connected to flares that provide safe elimination of flammable gases. The flares are also connected to a flare gas recovery system to minimize the amount of gas that is actually directed to the flare. A continuous gas-lit pilot in each flare ensures there is always a source of ignition at the flare tips.

Flaring could have visual effects, dependent on the size of the flare, existing atmospheric conditions, and the time of day (or night) of the event. Pursuant to BAAQMD Regulation 12-11, the Refinery reports to the BAAQMD when any gas flows to a flare and additional reporting is required for flows above one million standard cubic feet (scfd) within a 24 hour period. The Refinery reported 268 occasions where flare gasses flowed to a flare in 2005 and 325 occasions in 2006. Of these flare events, only 26 in 2005 and 15 in 2006 required additional reporting to the BAAQMD. The difference in flaring events between 2005 and 2006 is primarily due to additional planned and controlled maintenance activities to help ensure the safe and reliable operation of the refinery, and not unplanned process interruption. Most flaring events were minor in duration and size, and would have likely been imperceptible to the public.

The Refinery has historically implemented and continues to implement several programs to manage operating practices and procedures to reduce and minimize flaring. Recently adopted BAAQMD Regulation 12-12, further encourages refineries to reduce flaring. In September 2006,

the Refinery submitted its Flare Minimization Plan (“FMP”) to the BAAQMD under this regulation. This plan formalizes operational and maintenance turnaround planning procedures for continued minimization of flare events. The plan identifies successful past flare reduction actions taken, as well as planned future procedure, process, and equipment modifications for further flare event reduction.

A discussion of Refinery flare emissions with respect to the Proposed Project follows in Section 4.3, *Air Quality*. Because the Proposed Project would predominately replace or upgrade existing facilities, the expectation is that it would cause minimal or no increase in relief system gas recovery load or flaring events. In addition, the Proposed Project improvements are anticipated to reduce the likelihood of flaring due to planned unit shutdown and startup activities, potential upset caused by a loss of power from PG&E, and potential shut down due to mechanical breakdown of the existing Sulfur Recovery Units (SRUs). Because the older hydrogen plant facilities would be decommissioned, the net impact of new Hydrogen Plant flaring during startup, shutdown or upset conditions is estimated to be less-than-significant. An FMP update for each element of the Proposed Project will be submitted to the BAAQMD for review of further proposed flare reduction measures.

Water Vapor Plume Visibility

Whenever steam is used in manufacturing processes, water vapor plumes are formed. At the Refinery, steam is generated and used in many process units. Water is used in cooling at the Refinery cooling water tower, leading to the potential for visible water vapor plumes to be formed.

The formation of visible water vapor plumes from Refinery cooling water tower is a function of varying local meteorological conditions; including air temperature, wind speed and atmospheric humidity, as well as variation in the actual Refinery process itself. These plumes typically appear either directly emanating from a process unit stack or forming a slight distance away from the process unit stack. Plumes of this type are generally white in color and are typically composed mostly of small, condensed water droplets. If the requisite atmospheric conditions exist (generally low temperature with calm winds and relative high humidity), it is possible for a water vapor plume to form. The plume will remain visible until the water in the plume evaporates into the local air surrounding the plume. The plume would extend away from its formation point flowing downwind in the direction of the local wind flow. As it moves it may spread out both vertically and horizontally, dependent again on the existing local meteorological and process unit conditions. In actuality, plume formation/dissipation is a continuous process of creation, movement, and dispersion and is typically of short duration.

4.1.2.2 Public View Locations and Corridors

Public View Locations

The Refinery is visible from public view locations. Most of the following viewsheds are shown in visual simulations included in this discussion below. The locations of seven representative public viewpoints are shown on Figure 4.1-1, *Viewpoint Location Map*. The changes in visual character

of the site as seen from these public viewpoints are shown in Figures 4.1-2 through 4.1-8, and discussed below.

Public View Corridors

View corridors are formed by physical elements, such as buildings, that guide lines of sight and control view directions available to pedestrians and motorists. View corridors include the total field of vision from a specific viewpoint. Public view corridors are areas in which views are available from publicly accessible places, such as city streets, parks, and other public spaces.

Existing view corridors in the Proposed Project area are discussed in the analysis of Proposed Project impacts on views. The analysis considers three categories of views of the site: short-range (up to about ¾-mile from the site), medium-range (between about ¾-mile and 1.5-mile from the site), and long-range (more than 1.5-miles from the site). Representative short-range view corridors are from viewpoints along I-580 looking north, from Castro Street looking west, and from the Richmond/San Rafael Bridge looking east toward the Refinery. Representative medium-range view corridors are from two elevated viewpoints in residential portions of the Point Richmond community immediately south of the Refinery, and one view from a public trail along Wildcat Creek northeast of the Refinery. A representative long-range view corridor is available from the Richmond Parkway to the north of the Refinery (see Figures 4.1-2 through 4.1-8.) Specific Proposed Project sites are generally visible from viewpoints to the north and northeast, although views of the easternmost Proposed Project sites are also available from viewpoints to the south. Views of the Refinery's process areas from the west are blocked by the hills along the Point San Pablo Peninsula. Portions of the Refinery's Quarry Tank Farm are visible from the west, but are limited due to the lack of publicly accessible viewpoints, the steep change in topography between the viewer and the Tank Farm (the Tank Farm being about 150 feet higher in elevation from the nearest viewpoints), and the location of the San Francisco Bay in this area. Portions of the Quarry Tank Farm are visible to eastbound travelers on the lower deck of the Richmond/San Rafael Bridge (I-580), but only for brief periods at freeway speeds, and these views are partially obscured by the overhead roadway deck of westbound I-580.

With the Proposed Project, existing views would be altered with the addition of new or replacement equipment, including stacks, tanks, pipelines, and other Refinery structures. The existing and proposed project features and their heights as seen from the south are labeled in Figure 4.1-2a. From this vantage point, as discussed in greater detail below, various ground-level equipment and facilities would be constructed in the midst of existing, similar facilities. They would be designed to match the appearance and character of existing surrounding Refinery equipment. The most prominent addition to the Refinery's 'skyline' would be the proposed Continuous Catalytic Regeneration (CCR) Reformer Replacement stack, approximately 300 feet tall and about 16 feet diameter, the adjacent CCR structure, approximately 285 feet tall and 40 feet by 50 feet square and the Hydrogen Plant flare, approximately 195 feet tall. Visible in six of the seven views used in the assessment of visual impacts, these project components would be more conspicuous because they would be taller than the existing structures and thus could be perceived as a change from existing conditions (see Figures 4.1-2 through 4.1-7). However, these

project components still would be consistent with the character of the existing Refinery and the general setting.

Figure 4.1-2 shows the Proposed Project area from the south. As shown on Figure 4.1-1, *View point Location Map*, this photograph was taken from I-580 (westbound), a slightly elevated viewpoint in Richmond. This viewpoint represents a relatively short-range view of the Refinery as viewed from a heavily-traveled freeway. Brief glimpses of the Refinery are available while driving westbound on I-580 at freeway speeds, lasting from one to two seconds in length. In the foreground, as indicated in Figure 4.1-2, the rail yards of the Santa Fe Intermodal Facility are visible, with wide expanses of pavement, railroad tracks, fencing, and open storage yards. In the middle ground, views of the Refinery's large, low-rise industrial buildings are visible, as well as about 22 tall and narrow structures that are stacks, flares or other components of the Refinery process area. The existing stacks range in height from approximately 125 to 237 feet. At least four steel lattice towers that support high voltage electrical transmission lines can also be seen. The mid-ground views from this vantage point also reveal about 15 Refinery tanks on the southeastern slopes of the hill formed by the Point San Pablo Peninsula, to the left of the shot. Limited views of the hills in the distance are available from this viewpoint.

With the Proposed Project, existing views would be altered with the addition of new or replacement equipment, including stacks, tanks, pipelines, and other Refinery structures. As shown in the simulation, the most prominent addition to the Refinery's 'skyline' from this viewpoint would be the proposed CCR Reformer Replacement stack and the adjacent CCR structure. The new Hydrogen Plant flare would also be visible between the Crude Unit Stacks and Crude Unit Vacuum Column. These new features would be contained within the existing Refinery process areas, and would be a visible new addition to the existing stacks that are located in this area from middle ground views. To provide a 'worst-case' simulation of these proposed components, they were both rendered in a dark color to contrast with the sky and other Refinery components in the immediate vicinity. The CCR structure would be an open, lattice-work structure with a high degree of transparency. While these Proposed Project features would be taller than the other Refinery stacks in the immediate vicinity, they would represent an incremental change from existing conditions.

Figure 4.1-3 shows the Proposed Project area from the east. As shown on Figure 4.1-1, *View point Location Map*, this photograph was taken from Castro Street at a railroad overpass. This slightly elevated viewpoint represents a short-range view of the Refinery as viewed from a nearby public roadway. Short-range views of the Refinery from this location are generally obstructed by the landscaped berm to the west of Castro Street, which effectively screens most of the Refinery's process areas from view as one travels north or south on Castro Street. Short range westerly views of the Refinery are only available intermittently through gaps in existing vegetation and then only briefly (less than one second) as one travels by automobile at arterial speeds on this portion of Castro Street, as shown in Figure 4.1-3. Westerly views from this location reveal roadside landscaping along Castro Street, with the Refinery's paved yards and fencing in the immediate foreground. The Refinery's process area is visible in middle ground views, with about 32 tall stacks or stack-like-structures, about 8 tanks, and other industrial facilities and equipment.

Numerous overhead power lines and a steel lattice tower supporting a high voltage electrical transmission line are also in view. Distant views are limited to the elevated slopes of the southernmost hills along the Point San Pablo Peninsula.

With the Proposed Project, views would be altered with the addition of new or replacement equipment, including stacks, tanks, pipelines, and other Refinery structures. As shown in the simulation, the most prominent addition to the Refinery's 'skyline' from this viewpoint would be the proposed CCR Reformer Replacement Stack and the adjacent CCR structure. These new features would be contained within the existing Refinery process areas, and would be a visible new addition to the existing stacks that are located in this area from middle ground views. As discussed above, both of these new facilities were rendered in a dark color to contrast with the sky and other Refinery components in the immediate vicinity to provide a 'worst-case' simulation of these proposed components. From this vantage point, the CCR structure, which would be an open, lattice-work structure with a high degree of transparency, would appear level with the top of the existing transmission line tower toward the right of the photograph. While these Proposed Project features would be somewhat taller than the other Refinery stacks in the immediate vicinity, it would represent an incremental change from existing conditions.

Figure 4.1-4 shows the Proposed Project area from the south. As shown on Figure 4.1-1, *Viewpoint Location Map*, this photograph was taken from Crest Avenue, an elevated viewpoint in a residential portion of the Point Richmond community. This viewpoint represents a mid-range view of the Refinery as viewed from a residential neighborhood. In the foreground, hillside vegetation and single family homes are visible. In mid-range views, the large, 7-story Chevron Technology Center office building at Redwood Way and Castro Street is clearly visible in the center of the view, with the Refinery process areas appearing immediately behind and above this building, with about 35 tall and narrow stacks and stack-like structures and white spherical tanks. About 8 steel lattice towers that support high voltage electrical transmission lines also can be seen. The middle ground views from this vantage point also reveal about 16 Refinery tanks on the southeastern slopes of the hill formed by the Point San Pablo Peninsula to the left of the view shown in the photograph, as well as many of the large, low-rise industrial buildings associated with the Refinery. In general, the Refinery appears as an intensely developed industrial lowland set against a hillside lined with tanks and intermittent vegetation. Beyond the Refinery, the West Contra Costa Sanitary Landfill is seen as a series of low hills. In the distance, views of the Bay and gently rolling hills beyond can be seen.

With the Proposed Project, views would be altered with the addition of new or replacement equipment, including stacks, tanks, pipelines, and other Refinery structures. As shown in the simulation, the most prominent addition to the Refinery's 'skyline' from this viewpoint would be the proposed CCR Reformer Replacement Stack and the adjacent CCR structure. Further to the right, the 195-foot Hydrogen Plant Flare would also be visible. These new features would be contained within the existing Refinery process areas, and would be a visible new addition to the existing stacks that are located in this middle ground view. While these Proposed Project features would be somewhat taller than the other Refinery stacks in the immediate vicinity, and would

intensify industrial development in this location, it would represent an incremental change from existing conditions.

Figure 4.1-5 shows the Proposed Project area from the southeast. As shown on Figure 4.1-1, *Viewpoint Location Map*, this photograph was taken from Buena Vista, another elevated viewpoint in a residential portion of the Point Richmond community. This viewpoint represents another mid-range view of the Refinery from a residential neighborhood. In the foreground, hillside vegetation, single family homes, and 2-3-story commercial buildings along East Richmond Avenue are visible. The heavily vegetated Judge George D. Carroll Community Park is also visible in the foreground. The large, 7-story Chevron Technology Center office building at Redwood Way and Castro Street is clearly visible in the center of the view. The Refinery process areas are visible right of center, with about 21 tall and narrow stacks and stack-like structures and white spherical tanks, as well as many of the Refinery's large, low-rise industrial buildings. About 8 steel lattice towers that support high voltage electrical transmission lines also can be seen. A portion of the elevated I-580 freeway is also visible in the middle ground to the far right of the view. The middle ground views from this vantage point also reveal about 32 Refinery tanks on the southeastern slopes of the hill formed by the Point San Pablo Peninsula to the left of center. In the distance, views of the gently rolling hills beyond the Refinery can be seen.

With the Proposed Project, views of the Refinery would be very similar to the simulation provided in Figure 4.1-4, with the most prominent addition to the Refinery's "skyline" from this viewpoint being the proposed CCR Reformer Replacement Stack and the CCR structure immediately next to the stack. Although they would be two structures, they would appear as one tall, slender tower visible within existing stacks and other industrial equipment that are located in this middle ground view. Further to the right, the 195-foot Hydrogen Plant Flare would also be visible. While these Proposed Project features would be somewhat taller than the other Refinery stacks in the immediate vicinity, and would intensify industrial development in this location, it would represent an incremental change from existing conditions.

Figure 4.1-6 shows the Proposed Project area from the northeast. As shown on Figure 4.1-1, *Viewpoint Location Map*, this photograph was taken from the publicly accessible Bay Trail along Wildcat Creek. This viewpoint represents a mid-range view of the Refinery as viewed from a public trail. In the foreground, wetland vegetation associated with Wildcat Creek is visible. In the mid-ground, the Refinery process areas are visible in the center, with a small, white plume of water vapor rising from the cooling water tower to the left of center of view, and about 13 tall and narrow stacks and stack-like structures clustered in the center of view. The Refinery's white, spherical tanks are clearly visible on the right hand side of this middle ground view. In the distance, views of the vegetated hills of the Point San Pablo Peninsula are visible as a backdrop to the Refinery process areas. Numerous storage tanks on the southern and eastern slopes of this hillside can be seen to the right of center in the distance, some of which are silhouetted against the ridgeline. In total, about 31 tanks of various kinds are visible. In this view, the Refinery process area appears as a relatively compact skyline of industrial equipment clustered at the foot of the Point San Pablo Peninsula hills, and surrounded by open space.

As shown in other views of the Refinery, with the Proposed Project, the most prominent addition to the Refinery's 'skyline' would be the proposed CCR Reformer Replacement Stack and the CCR structure. From this viewpoint, they would appear as a single tall, slender tower visible within existing stacks and other industrial equipment that are located in this middle ground view. Further to the right, the proposed Hydrogen Plant Flare also would be visible. The lower portions of these features would not be immediately discernable from the hillside backdrop, while the upper portions would be silhouetted against the sky, projecting above the hillside backdrop. While these Proposed Project features would be somewhat taller than the other Refinery stacks in the immediate vicinity, and would intensify industrial development in this location, it would represent an incremental change from existing conditions.

Figure 4.1-7 shows the Proposed Project area from the north. As shown on Figure 4.1-1, *View point Location Map*, this photograph was taken from the Richmond Parkway over a mile from the Refinery. This viewpoint represents a distant view of the Refinery as seen by a motorist on a major arterial roadway in north Richmond, headed in a southerly direction. In the foreground, the Richmond Parkway and roadside vegetation are visible. In the middle ground, the Richmond Parkway bridge over San Pablo Creek is visible to the right of the center, and low-rise industrial buildings are visible to the left of center. The West Contra Costa County Sanitary Landfill also can be seen in the far middle ground to the right of the Parkway. The Refinery process areas are visible in the distance, with the most prominent visual element being the plume of white water vapor rising from the cooling water tower in the approximate center of view. Most of the Refinery's stacks are not visible at this distance, and appear to blend into the hills of Point San Pablo Peninsula, which appear prominently in the background.

The most prominent addition to the Refinery's "skyline", the CCR Reformer Replacement Stack and the CCR structure, would not be immediately discernable against the backdrop of the Point San Pablo Peninsula hills. To the left of center in the simulation, only a small portion of the upper CCR Reformer Stack/CCR structure would be visible above the ridgeline from this distant viewpoint. From this viewpoint there would be little visible change between existing and Proposed Project conditions.

Figure 4.1-8 shows the Quarry Tank Farm and a portion of SP Hill Tank Farm from the west. As shown on Figure 4.1-1, *View point Location Map*, this photograph was taken from the Richmond/San Rafael Bridge. This viewpoint represents a relatively short-range view of the Quarry and SP Hill Tank Farms as viewed from the upper level of the heavily-traveled bridge. This view would not be available to motorists as the upper level of the bridge serves westbound traffic, opposite the Quarry Tank Field. Eastbound motorists, on the lower deck of the bridge, could glimpse views of the Quarry Tank Field for brief periods at freeway speeds, although views would be partially obscured by the overhead roadway deck serving westbound traffic.

In the foreground, glimpses of bridge infrastructure, including overhead lighting and railing, and glimpses of the San Pablo Bay waters are visible. The northwesterly-trending Point San Pablo Peninsula ridgeline is prominent in this view, extending up to an elevation of approximately 380 feet above msl. Vegetation is concentrated along the ridgeline, at the lower terrace and below

towards the Bay waters, and along the northwestern slope. Terracing along the western slope also supports some vegetation. The vegetation partially obstructs some views of the Refinery tanks. The visible Refinery tanks (about 19) are clustered, and situated along the southern slope of the ridge, closest to I-580, with a few tanks also located along the lowest terrace.

With the Proposed Project, views would be altered by the addition of two new tanks. As shown in the simulation, proposed new tanks visible in this view would be located south of the existing tanks near I-580, although at a higher elevation, and to the north of the existing tanks, within the lower terrace. New tanks would be similar in color, shape and size to existing tanks and would result in little visible change between existing and Proposed Project conditions.

4.1.2.3 Regulatory Setting

Richmond General Plan

The following policies contained in the City of Richmond General Plan Land Use Element pertain to the proposed Project:

Policy LU-O.2: Encourage local industries to develop their own plans for improving the appearance of their facilities, where possible, and for integrating their properties into the City as a whole.

Policy LU-B.5: Require sufficient visual open space and/or landscaped screening between industrial operations and adjacent residential or recreational activities in order to create adequate buffers.

In addition, the following Open Space and Conservation Element guideline for the West Shoreline is applicable to the Proposed Project:

Urge that the tank farm areas on San Pablo Peninsula, whose secondary function is as open space, to retain the natural topographic features and vegetation as much as possible.

Richmond Municipal Code

The following code, in particular, applies to this Proposed Project with respect to visual concerns:

15.04.930 Design Review – Describes the design review process.

4.1.3 Aesthetics, Visual Quality, Light and Glare Significance Criteria and Methodology

Significance Criteria

California Environmental Quality Act (CEQA) *Guidelines* Appendix G states that a project would have a significant visual impact 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; and
- d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area.

The significance determination in visual analyses is based on consideration of: 1) the extent of change related to project visibility from key public vantage points; 2) the degree of visual contrast and compatibility in scale and character between project elements and the existing surroundings; and 3) project conformance with public policies regarding visual and urban design quality. The methodology employed for assessing aesthetic impacts includes consideration of the viewshed and development of computer-generated visual simulations.

This EIR also considers visual assessment standards used by the U.S. Department of Transportation Federal Highway Administration. These standards characterize the project in the existing environment by defining two levels of project aesthetics: *relational* and *environmental*. Relational aesthetics focus on the visual relationships of the project with distinct elements of its surroundings. Environmental aesthetics analyze the visual environment of an area, of which the project is a part, and considers the effect of the project on the total visual quality of the area. While not constituting significance criteria, these standards are included in the discussions.

Additionally, for purpose of this analysis, the project would constitute a significant visual impact if it will:

- Create a water vapor plume that would be a visual obstruction to motorists or pedestrians; or,
- Cause a substantial increase of plume formation during the year.

CEQA Guidelines Appendix G topics that will not be discussed further in this EIR

Review and comparison of the Proposed Project to the environmental setting clearly shows that the Proposed Project would create no impacts related to the following environmental topics listed in CEQA Guidelines Appendix G.

a. Would the Proposed Project have a substantial adverse effect on a scenic vista.

The Proposed Project consists of the addition of process units to distributed locations within the matrix of the existing Refinery. As discussed in 4.1.2.2 *Public View Locations and Corridors*, the vistas proximate to the Proposed Project are not affected in any negative way, because with the exception of San Pablo Bay (a scenic waterway), the Proposed Project would not be visible from any scenic vistas. When viewed from San Pablo Bay the Proposed Project would be visible but would be perceived as insubstantially more dense industrial facility. Thus, the Proposed Project would have no impact on scenic vistas.

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

Development of the Proposed Project would occur entirely within the developed portion of the Refinery property and would not affect any known scenic resource. No impact would occur.

4.1.4 Project Aesthetics, Visual Quality, Light and Glare Impacts

Impact 4.1-1: The Renewal Project would add new equipment and facilities in developed, industrial portions of the Refinery. These new facilities, which would be visible from public view corridors, could potentially alter but would not degrade the visual character of the setting. As the new equipment would represent a relatively minor incremental visual change compared to the size and extent of existing Refinery equipment, this would be a less-than-significant visual and aesthetic impact.

The Proposed Project would occur entirely within the active, developed area of the Refinery, a site intended for heavy industrial uses. As discussed in Section 3, *Project Description*, the Renewal Project would involve construction or modification of several process units and support equipment; the proposed new and modified units would be very similar in nature, size, and appearance to the numerous existing Refinery facilities that would surround them.

Overall, the Proposed Project would add approximately 40 new structures ranging in height between 10 and 300 feet above ground level. Most of the Proposed Project equipment and facilities would be obscured by or indistinguishable from the existing Refinery equipment. The following discussion focuses on only those units and tanks that could be prominent when observed from locations outside of the Refinery.

The Proposed Project's tallest new components would be the CCR Reformer Replacement Stack (300 feet tall and 16 feet in diameter), and the CCR structure (285 feet tall and with a 40-foot by 50-foot square base), immediately next to the stack. The proposed CCR Reformer Replacement Stack and CCR structure would be located in the existing Reformer area in the central portion of the main process area. They would be visible from publicly accessible areas in the vicinity, including short-range and mid-range views, as shown in Figures 4.1-2 through -6, and would appear as a single structure surrounded by numerous existing tall and narrow stacks. The proposed 300-foot stack and structure would be somewhat taller and larger than the other stacks in the immediate vicinity including the 237-foot Crude Unit Stacks which are the tallest existing structures.

These proposed CCR Reformer Stack/CCR structure is indistinguishable from the existing setting in more distant or long-range views, as shown in Figure 4.1-7, and is not visible from the viewpoint presented in Figure 4.1-8. The CCR structure would be an open lattice-work structure. Final color selection of the stack/structure would occur in consultation with the City of Richmond

to minimize the visual contrast between these new structures and their surroundings. The new equipment would slightly change the already heavily industrialized appearance of the Refinery property, but would represent a relatively minor incremental visual change compared to the size and extent of existing Refinery equipment. The most visually prominent of the Proposed Project features would not be substantially out of scale compared with the overall size and scale of the industrial facility as a whole.

As demonstrated in the simulations, the Project would not have a substantial adverse effect on a scenic vista, would not substantially degrade the existing visual character or quality of the site and its surroundings, nor would it substantially damage scenic resources. The Project would be constructed and operated entirely within the existing process areas at the Refinery.

The replacement tanks would be built in existing tank fields or process areas in consultation with the City of Richmond regarding specific siting and color selection. The replacement tanks to be constructed on north-south hills, which form the Point San Pablo Peninsula would be of similar dimension, location, and color as existing tanks. This in-kind replacement of tanks would not be noticeable after completion of the replacement project, but would have temporary visual effects during deconstruction/reconstruction efforts, as these tanks are removed and replaced. Lighter-colored areas of excavated soils would be visible against the backdrop of the hillsides during construction, as would partially-completed and/or unpainted tanks. As the replacement tanks would be no larger or more numerous than the tanks which exist on the hillside currently, and would be painted the same brownish color to blend in with the hillside and native vegetation upon completion, no long-term or lasting visual changes to this area would occur. Similarly, the excavated soils surrounding the tanks would be regraded and revegetated, and would appear the same as existing conditions upon completion of the project.

The Proposed Project would also involve constructing 8 new tanks in existing tank fields or process areas in consultation with the City of Richmond regarding specific siting and color selection. The largest tank, Tank T-3108, would be a new floating-roof storage tank in the existing Quarry Tank Field just north of I-580 and the San Rafael Bridge Toll Plaza. The tank would be 290 feet in diameter and 64 feet high, and would be located immediately north of the existing tank. While larger than the other tanks in the immediate area, it would be constructed in an area that is already disturbed from quarry activities, and would be mostly obscured from publicly accessible northern and eastern views of the Quarry Tank Field from Western Drive and I-580 by the existing intervening tanks. Within the Main Tank Field, three new tanks would be constructed, one with a 115-foot diameter and height of 60 feet, and two with 150-foot diameter and 65-foot height. Tank T-4004, a fixed-roof storage tank to be constructed in the SP Hill Tank Field, would be located to the south of existing tanks, just north of I-580. Tank T-4004 would be constructed in a disturbed area within a cluster of existing tanks. Three new tanks would be constructed within the Pole Yard Tank Field. New tanks in this area would vary in size, with the smallest 80 feet in diameter and 40 feet high, and the largest 150 feet in diameter and 70 feet high.

New tanks within the Main Tank Field and Pole Yard Tank Field would not be visible from public vantage points along I-580, adjacent nearby roads or the Bay Trail because of topography and existing tanks and vegetation, which would screen public views. As shown in Figure 4.1-8, new tanks in the Quarry Tank Field (Tank T-3108) and one tank within the SP Hill Tank Field (Tank T-4004) would be visible from the Richmond/San Rafael Bridge viewpoint. These new tanks would incrementally change the visual environment. However, the new tanks would not result in a substantial adverse effect to the site's visual quality because they would be located in an area that includes an existing concentration of tanks that in general, would be similar in terms of size and color and would be buffered by existing landscaped screening. The new tanks would not obstruct or otherwise affect scenic vistas in the area, and would not be located in an area that is visible from other publicly accessible viewpoints along the Point San Pablo shoreline. Although the exact location of the other new tanks have not been identified¹, they would be located within the existing tank fields as identified in Chapter 3, *Project Description* or process areas, and would not be immediately discernable to off-site viewers as large, new structure, primarily due to the intervening tanks and other equipment. As such, the proposed new tanks would have no impacts to visual or aesthetic resources.

New tanks would result in an incremental visual change on the project site, however, because new tanks would be similar to existing tanks in terms of size and color and general location, they would not result in a substantial adverse effect to the site's visual quality. Therefore, this portion of the Proposed Project would have a less-than-significant impact on scenic vistas.

In summary, the proposed new Refinery equipment would not obstruct scenic vistas or substantially degrade the character of the area, would be constructed in already industrialized areas on the Refinery property, and would be of the same materials and painted to match the Refinery's existing color-scheme in consultation with the City of Richmond to minimize the visual contrast between these new equipment and their surroundings. Because the proposed development would occur within the existing Refinery footprint, further development would visually relate to the existing Refinery structures and would not substantially obstruct predominant visual elements of the area that include the hills, the Bay, and the vast expanses of the adjacent open or lightly developed areas. The *relational aesthetic* would be consistent, as would the *environmental aesthetic*. Thus, effects related to altering existing viewsheds would be less than significant.

Mitigation: None required.

Impact 4.1-2: Proposed Project operations could cause increases in the frequency and/or magnitude of flaring events at the Refinery. This impact would be less than significant.

¹ The replacement tanks and new tanks would be built in existing Tank Fields or process areas in consultation with the City of Richmond regarding specific siting and color selection. Pursuant to the City of Richmond's Zoning Ordinance, Chevron must obtain conditional use permits from the City to ensure that the replacement tanks and new tanks will be designated, located, and operated compatibly with adjoining land uses.

As stated in Section 4.3, *Air Quality*, flaring occurs because of over-pressurization in Refinery processes and is an unforeseeable and unscheduled event. Flaring can also occur during shutdown for maintenance of some process equipment. Flaring is undertaken as a protective measure to prevent uncontrolled release of combustible and toxic gases to the atmosphere. The Refinery reported 268 occasions where flare gasses flowed to a flare in 2005 and 325 occasions in 2006. Of these flare events, only 26 in 2005 and 15 in 2006 required additional reporting to the BAAQMD. Most flaring events were minor in duration and size, and would have likely been imperceptible to the public.

The Proposed Project would have minimal effect on flaring at the Refinery. All Project facilities and equipment are being designed such that they would not add any load to the Refinery flare in the event of a Refinery-wide power failure, which is the limiting design case for the Refinery flares and related facilities. Because the Proposed Project would predominately replace or upgrade existing facilities, it is expected to cause minimal or no increase in relief system gas recovery load or flaring events. In addition, the Proposed Project improvements are anticipated to reduce the likelihood of flaring due to planned unit shutdown and startup activities, potential upset caused by a loss of power from PG&E, and potential shut down due to mechanical breakdown of the existing Sulfur Recovery Units (SRUs).

The new Hydrogen Plant Proposed Project would include installation of one new flare approximately 195 feet tall. The new flare from the Hydrogen Plant would be used for startup service and for temporary upset situations related to the feed system. The new flare would be elevated and would be located in the eastern portion of the Refinery, in the general vicinity of other Refinery flares. The new flare would also be naturally aspirated and have precursor organic compound destruction efficiency greater than 98%. The flare would use natural gas as the pilot fuel. Although the pilot would run continuously, the flare itself would operate only during startup or during periods of emergency plant upset or breakdown. The visual impact of flaring related to operations of the Hydrogen Plant either from startup or feed system overpressure situations is not expected to be significant.

Finally, BAAQMD regulations should further reduce flaring over time. BAAQMD Regulation 12, Rule 11 requires refineries to accurately monitor the flow and composition of vent gases sent to and combusted by a flare². In addition Chevron is required to identify reasons for significant flaring events (greater than one million standard cubic feet in a 24 hour period) and take corrective actions to prevent them. In addition, the Regulation 12, Rule 12 (adopted July 20, 2005), requires Chevron to prepare and implement a Flare Minimization Plan (as further detailed in Section 4.3, *Air Quality*). This document would evaluate measures to prevent future flaring and would include a schedule for the expeditious implementation of all feasible prevention measures. As a result, no significant visual impacts related to flaring are anticipated under Proposed Project conditions.

Mitigation: None required.

² Monthly reports are submitted 30 days after the end of the month and include monitoring data for each flare subject to the Reg. 12-11 flare monitoring requirements (see <http://www.baaqmd.gov/enf/flares/>)

Impact 4.1-3: Operation of the Proposed Project could create water vapor plumes visible to surrounding residents and motorists. Steam would be generated as a part of the Proposed Project and used in the proposed process units. The formation of visible water vapor plumes from Refinery process units is a function of varying local meteorological conditions; including air temperature, wind speed and atmospheric humidity, as well as variation in the actual Refinery process itself. This impact would be less than significant.

The new Hydrogen Plant would include installation of one new cooling tower approximately 45 feet tall and the new CoGen unit would include installation of one new cooling tower approximately 70-feet tall, including the pipe rack upon which it is mounted. Plumes from the proposed cooling towers would only be visible under specific meteorological conditions when existing plume activity would also be visible. Thus the frequency of plume activity would not increase under project conditions. In addition, water vapor plumes become visible in atmospheric conditions that cause fog and high humidity thus minimizing contrast and prominence of plumes. Finally, plume activity would not be obvious from the closest publicly accessible roadway; Castro Street, due to the relatively far distance (about 1.2 miles and 0.5 miles) from the new cooling towers. Based on the above, the addition of new visible plumes rising above these cooling towers under Proposed Project implementation would be a less-than-significant impact and effects related to vapor plume emissions would be less than significant.

Mitigation: None required.

Impact 4.1-4: The Proposed Project's new facilities could introduce new lighting on the Refinery site. Because the increases in site lighting would be a relatively small addition to the existing lighting at the Refinery, this impact would be less than significant.

The Refinery currently illuminates facilities in order for operations to continue throughout the night. Safety and security lighting could be installed internally around new equipment and at the perimeter near new equipment.

Construction of the Proposed Project would primarily take place during the day. There are no plans to work a night shift to construct the Proposed Project. However, in the event that weather or other factors significantly impact the project construction schedule, Chevron may decide some work activities will be necessary at night. Because there are cost increase and logistics issues raised by performing work at night, plus additional worker safety considerations and precautions that must be taken, the decision to work at night is a significant one, and Chevron would only undertake work at night if absolutely necessary, and for only as long as necessary and in consultation with the City. Work would be limited to ensure minimal noise generation and lighting/glare potential. In the event that such night work would be performed for the Proposed Project, there would potentially be a minor and temporary increase in night lighting at the Refinery facility during the construction period. This would be due to the lighting necessary to continue construction during the night hours, which would most likely involve area flood lighting near construction sites and laydown areas. Night lighting of this kind would be considered a temporary disturbance to adjacent residential areas such as the Atchison Village, Iron Triangle

and Shields-Reid neighborhoods, portions of which are approximately 0.25 miles to the east of the Refinery site, as well as Point Richmond, immediately south of the Refinery. However, in addition to the fact that the facility already has night lighting because it operates round the clock, nighttime work shifts (and temporary increases in night lighting) are common during Refinery maintenance turnarounds, which occur regularly. For these reasons, the temporary increase in night lighting is not considered significant.

Structures that would be illuminated would be within existing areas of the Refinery, would be surrounded by existing lighted equipment and would not affect adjacent residential or industrial uses. New equipment lighting would be directed appropriately to avoid disturbance to motorists. Area, or flood lighting, is not proposed as part of the long-term operation of this Proposed Project. Although the Proposed Project would increase the amount of lighting in the Refinery area, the increase would not be substantial and would not affect adjacent uses. This impact would be considered less than significant.

The Proposed Project proposes structures that would not include large areas of highly reflective material that would produce glare. Therefore the Proposed Project would not affect the amount of day time glare in the area.

Mitigation: None required.

References

- City of Richmond, *City of Richmond General Plan Land Use Element*, 1994
- City of Richmond, *City of Richmond General Plan Open Space and Conservation Element*, 1994.
- City of Richmond, *Municipal Code - Chapter 15.04 ZONING*. 2006,
<http://bpc.iserver.net/codes/richmond/index.htm>, access on-line April 27, 2007

4.2 Agricultural Resources

Construction and operation of the Proposed Project would result in no impacts to agricultural resources.

No mitigation would be required.

4.2.1 Introduction

The Proposed Project would be constructed entirely within the confines of the existing Refinery, which has occupied the site for over one hundred years. The no changes to lands outside of the current boundaries of the Refinery are proposed.

4.2.2 Setting

4.2.2.1 Existing Conditions

Richmond's agriculture primarily consists of commercial nurseries where the products are grown above ground in planters and are not directly dependent on prime agricultural soils (City of Richmond, 1994). According to the California Department of Conservation's Farmland Mapping and Monitoring Program, the project site is not located on *Prime Farmland*, *Unique Farmland*, or *Farmland of Statewide Importance* (California Department of Conservation, 2004). There are no active agricultural operations within the vicinity of the project site except for greenhouse nurseries located near the Richmond Parkway.

4.2.2.2 Regulatory Framework

Farmland Mapping and Monitoring Program

The California Department of Conservation, under the Division of Land Resource Protection, has set up the Farmland Mapping and Monitoring Program (FMMP), which monitors the conversion of the state's farmland to and from agricultural use. The map series identifies eight classifications and uses a minimum mapping unit size of 10 acres. The program also produces a biannual report on the amount of land converted from agricultural to non-agricultural use. The program maintains an inventory of state agricultural land and updates its Important Farmland Series Maps every two years. The FMMP is an informational service only and does not constitute state regulation of local land use decisions (California Department of Conservation, 2005). Four categories of farmland are designated by the FMMP: [1] *Prime Farmland*, [2] *Farmland of Statewide Importance*, [3] *Unique Farmland*, and [4] *Farmland of Local Importance*. All of the above categories of farmland are considered valuable and any conversion of land within these categories is typically considered to be an adverse impact. As indicated on the 2002 FMMP Map, the project site is designated as *Urban and Built-Up Land*. (California Department of Conservation, 2005).

City of Richmond General Plan

The City of Richmond's Open Space Element contains the following goals and policies related to agriculture resources:

Goal OSC-R: Keep, at least as an interim measure, the agricultural use of lands such as commercial nurseries and grassland (grazing).

Policy OSC-R.1: Encourage continuation of commercial nurseries as an agricultural use in the Planning Area, at least as an interim use. This includes, but is not limited to, the area between Parchester and North Richmond which will provide important open space until it is more intensively developed.

Policy OSC-R.2: Permit an owner of grazing land, who wishes to retain the land for grazing purposes, to place it in the Agricultural Preserve Program and thus avoid payments to urban taxing districts.

(City of Richmond, 1994)

4.2.3 Agricultural Resources Significance Criteria and Methodology

Significance Criteria

California Environmental Quality Act (CEQA) *Guidelines* Appendix G states that a project would have a significant agricultural resource-related impact 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; or
- c) Involve other changes in the existing environment, which due to their location or nature, could result in conversion of farmland to non-agricultural use.

CEQA Guidelines Appendix G topics that will not be discussed further in this EIR

Review and comparison of the Proposed Project to the environmental setting clearly shows that the Proposed Project would create no impacts related to the following environmental topics listed in CEQA Guidelines Appendix G.

- a. **Potential of the Proposed Project to convert prime farmland, unique farmland, or farmland of statewide importance to non-agricultural use.**

The Proposed Project would be located entirely within the developed area of the Refinery. The Refinery, which is a heavy industrial use, has operated on this site for over one hundred years. The City Zoning Map and the General Plan Land Use Element Maps

designate the site for heavy industrial use. Thus, the Proposed Project would have no impact on important farmland.

b. Potential of the Proposed Project to Conflict with existing agricultural zoning, or a Williamson Act contract?

The Refinery property is zoned for heavy industrial uses and is not covered by a Williamson Act contract. Thus, implementation of the Proposed Project would not interact with or conflict with existing agricultural zoning or a Williamson Act contract. The Proposed Project would have no impact.

c. Potential of the Proposed Project to involve other changes in the existing environment, which due to their location or nature, could result in conversion of farmland to non-agricultural use.

The Proposed Project would be constructed and operated entirely within the developed area of the Refinery. The Proposed Project site does not contain farmland and there are no aspects of the Proposed Project that would affect any identified agricultural land offsite. Thus, implementation of the Proposed Project would not result in conversion of farmland, onsite or offsite, to a non-agricultural use. The Proposed Project would have no impact.

4.2.4 Agricultural Resource Impacts and Mitigation Measures

Most of the Richmond Refinery site is designated by the Richmond General Plan as *Heavy Industry*. Components of the Proposed Project would be developed and implemented within the boundaries of the existing Refinery. The Refinery has been in operation since 1902 and thus, any development on this site would not result in the conversion of existing agricultural land to non-agricultural use.

Although there are some greenhouse nurseries located within one mile of the Refinery's boundaries, these agricultural operations are not dependent on prime agricultural soils and are not designated as agricultural lands by the City of Richmond's General Plan. These nursery operations have been operating in light industrial areas and would not be adversely impacted by any of the proposed activities under the Proposed Project. Thus, the Proposed Project would result in no impacts to agriculture resources.

References – Agricultural Resources

California Department of Conservation, *Important Farmland in California*, available online at http://www.consrv.ca.gov/DLRP/fmmp/images/fmmp2002_300.pdf, August 2004.

California Department of Conservation, Farmland Mapping and Monitoring Program (FMMP), <http://www.consrv.ca.gov/DLRP/fmmp/>, accessed October 14, 2005.

City of Richmond, Richmond General Plan, Volume One, *Open Space Element*, August 1994.

4.3 Air Quality

There would be a significant and unavoidable impact resulting from emissions of volatile organic compounds from the Proposed Project.

- Activities associated with Proposed Project construction would generate short-term emissions of criteria pollutants, including suspended and inhalable particulate matter and equipment exhaust emissions, during the term of Proposed Project construction. This would be a significant impact that would be mitigated to a less than significant level.
- Operational activities associated with the implementation of the Proposed Project would increase air pollutant emissions of volatile organic compounds by potentially significant quantities. This impact would be significant and unavoidable.
- Operational impacts from other (non-volatile organic compounds) criteria pollutant emissions would be less than significant.
- Depending on the phasing of the commencement of operations of Proposed Project components, operational impacts from particulate matter emissions could result. A mitigation measure is provided to ensure that the commencement of operations is phased to mitigate this to a less than significant level.
- Operational activities associated with the implementation of the Proposed Project could lead to increases in odorous emissions. This would be a less than significant impact.
- Proposed Project activities could result in an increase in greenhouse gas emissions from the Refinery.

4.3.1 Introduction

This section evaluates the potential impacts of the Proposed Project on regional and local air quality from both stationary and mobile sources of air emissions. Development of this section was based on a review of existing documentation of air quality conditions in the region, air quality regulations from the US Environmental Protection Agency (EPA), the California Air Resources Board (CARB), and the Bay Area Air Quality Management District (BAAQMD), and information provided in association of the Renewal Project.

Air quality depends upon both the rate and location of pollutant emissions under the influence of meteorological conditions and topographic features that affect the movement and dispersal of

pollutants. Atmospheric conditions such as wind speed, wind direction, atmospheric stability, and air temperature gradients interact with the physical features of the landscape to determine the movement and dispersal of air pollutants and consequently affect air quality.

4.3.2 Setting

This setting description provides an overview of region-specific information related to climate, meteorology and air pollution potential, regulatory context followed by a discussion of plans, policies, and regulations; and existing air quality conditions pertaining to the project area. From a regulatory standpoint, the air pollutants of concern in the project area are ozone (and its precursors, volatile organic compounds [VOC] and nitrogen oxides [NO_x]), carbon monoxide (CO), particulate matter (PM), and greenhouse gases. Although sulfur dioxide (SO₂) levels are well within regulatory standards, since the Refinery is a source of SO₂ emissions, local levels of SO₂ are also of concern.

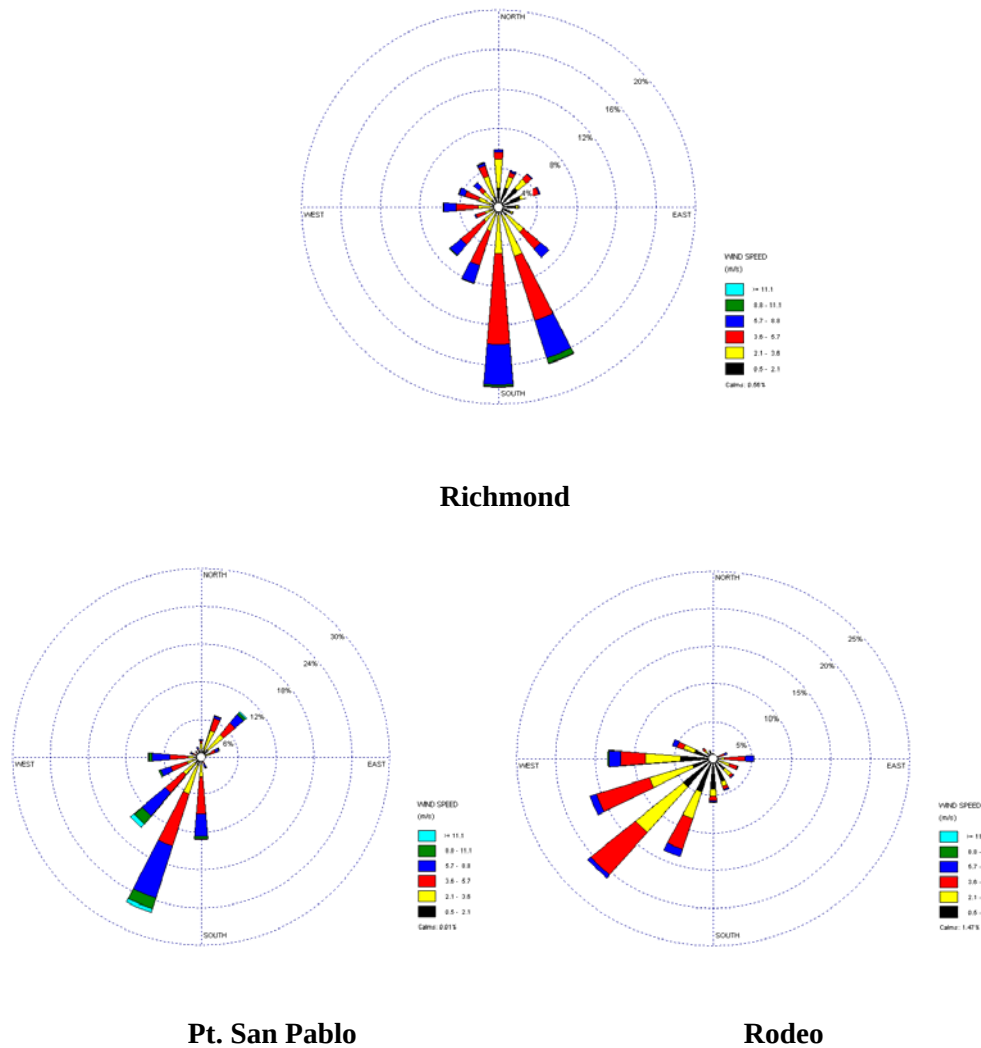
4.3.2.1 Climate and Meteorology

The Refinery is located in the western portion of the City of Richmond, at 841 Chevron Way (see Figure 3-1). The Refinery and Proposed Project site is located in the Northern Alameda and West Contra Costa County climatological subregion of the Bay Area. This subregion, which stretches from Richmond to San Leandro, is bounded on the west by the San Francisco Bay and on the east by the Oakland-Berkeley Hills. In this subregion, marine air traveling through the Golden Gate, as well as across San Francisco, is a dominant weather factor. The Oakland – Berkeley Hills cause the westerly flow of air to split off to the north and south of Oakland, which causes diminished wind speeds.

Farther to the north, the Carquinez Strait is the only sea-level gap between San Francisco Bay and the Central Valley. The prevailing winds in the region are from the southwest; however, due to the heavy influence of topographic features in the project area, winds in Richmond are predominately from the south-southeast. During the summer and fall months, high pressure offshore coupled with low pressure in the Central Valley causes marine air to flow eastward through the Carquinez Strait. Figure 4.3-1 displays the windroses for Richmond, Point San Pablo, and Rodeo during 2001 through 2003.

The wind is strongest in the afternoon. Wind speeds may be strong locally in areas where air is channeled through a narrow opening, such as the Carquinez Strait. Afternoon wind speeds of 15 to 20 mph are common throughout the strait region. Annual average wind speeds are 8 mph in Martinez, and 9 to 10 mph further east.

The air flowing in from the coast to the Central Valley, called the sea breeze, begins developing at or near ground level along the coast in late morning or early afternoon. As the day progresses, the sea breeze layer deepens and increases in velocity while spreading inland. The depth of the sea breeze depends in large part upon the height and strength of the inversion. If the inversion is low and strong, and hence stable, the flow of the sea breeze will be inhibited and stagnant conditions are likely to result.



SOURCE: BAAQMD, 2005

Figure 4.3-1
Wind Roses for Richmond, Point San Pablo, and Rodeo
2001–2003

The climate of the greater San Francisco Bay Area, including Richmond, is a Mediterranean-type climate characterized by warm, dry summers and mild, wet winters. The climate is determined largely by a high-pressure system often present over the eastern Pacific Ocean. In winter, the Pacific high-pressure system shifts southward, allowing storms to pass through the region. The mean annual rainfall in Richmond, for the period between 1950 and 2005, is approximately 23 inches (WRCC, 2005).

4.3.2.2 Air Pollution Potential

During summer and fall, air emissions generated within the Bay Area 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, and secondary particulates, such as sulfates and nitrates. Low wind speed contributes to the buildup of air pollution because it allows more pollutants to be accumulated in the air mass. Light winds occur most frequently during periods of low sun (fall and winter, and early morning) and at night.

The air pollution potential is lowest for those regions closest to the Bay, due largely to good ventilation and lower influx of pollutants from upwind sources. The occurrence of light winds in the evenings and early mornings occasionally results in elevated pollutant levels.

4.3.3 Existing Air Quality Conditions

BAAQMD operates a regional monitoring network that measures the ambient concentrations of the six criteria pollutants. Existing and probable future general levels of air quality in the Proposed Project area can generally be inferred from ambient air quality measurements conducted by BAAQMD at its monitoring stations. The major pollutants of concern in the San Francisco Bay Area are ozone, PM₁₀, PM_{2.5}, CO, NO₂, and SO₂, which are monitored at a number of locations. Within Contra Costa County, the BAAQMD operates or receives data from seven monitoring stations in the local area. The seven monitoring stations are as follows:

- Bethel Island – monitors ozone, PM₁₀, CO, NO₂, and SO₂
- Concord – monitors ozone, PM₁₀, PM_{2.5}, CO, NO₂, and SO₂
- Crockett – monitors SO₂
- Martinez – monitors SO₂
- Pittsburg – monitors ozone, PM₁₀, CO, NO₂, and SO₂
- Richmond – monitors SO₂
- San Pablo – monitors ozone, CO, NO₂, and SO₂

Background ambient concentrations of pollutants are determined by pollutant emissions in a given area, and wind patterns and meteorological conditions for that area. As a result, background concentrations can vary among different locations within an area. However, areas located close together and exposed to similar wind conditions can be expected to have similar background pollutant concentrations. The closest and most representative monitoring stations to the Proposed Project site are Richmond and San Pablo, but because these stations do not monitor for PM₁₀ and PM_{2.5}, the nearest monitoring station with PM₁₀ and PM_{2.5} (Concord) was used. Table 4.3-1 shows a six-year (2001-2006) summary of maximum concentration monitoring data collected from the Richmond (SO₂), San Pablo (ozone, CO, and NO₂), and Concord (PM₁₀, PM_{2.5}) stations, compared with Ambient Air Quality Standards (AAQS). The monitoring data show that the ozone California AAQS was exceeded once and that PM₁₀, and PM_{2.5} periodically exceeded the AAQS.

SO₂ and hydrogen sulfide (H₂S) concentrations are monitored at a number of stations at and around the Refinery. Table 4.3-2 summarizes these data from Castro Street, Golden Gate, and Gertrude Street monitoring sites, for 2001 through 2006. The data shows three episodes where the

**TABLE 4.3-1
AIR QUALITY DATA SUMMARY (2001–2006) FOR THE PROJECT AREA**

Pollutant	Standard	Monitoring Data by Year					
		2001	2002	2003	2004	2005	2006
Ozone*							
Highest 1 Hour Average (ppm)	0.09 ^a	---	0.07	0.09	<u>0.11</u>	0.07	0.06
Days over State Standard		---	0	0	1	0	0
Highest 8 Hour Average (ppm)	0.08 ^b	---	0.05	0.07	0.07	0.06	0.05
Days over National Standard		---	0	0	0	0	0
Carbon Monoxide							
Highest 8 Hour Average (ppm)	9.0 ^a	---	1.8	1.8	1.8	1.3	1.3
Days over State Standard		---	0	0	0	0	0
Nitrogen Dioxide*							
Highest 1 Hour Average (ppm)	0.25 ^a	---	0.05	0.07	0.06	0.05	0.06
Days over State Standard		---	0	0	0	0	0
Annual Average (ppm)	0.053 ^b	---	---	0.013	0.013	0.012	0.012
Sulfur Dioxide							
Highest 24 Hour Average (ppm)	0.04 ^a	0.007	0.006	0.005	0.007	0.006	0.006
Days over State Standard		0	0	0	0	0	0
Days over National Standard		0	0	0	0	0	0
Annual Average (ppm)	0.030 ^b	0.001	0.001	0.001	0.002	0.001	0.002
Particulate Matter (PM ₁₀) ^c							
Highest 24 Hour Average (µg/m ³)	50 ^a	<u>112</u>	<u>66</u>	34	<u>51</u>	31	---
Days over State Standard		3	3	0	1	0	---
Annual Average (µg/m ³)	20 ^a	<u>21.5</u>	<u>21.7</u>	16.4	18.1	13.3	---
Particulate Matter (PM _{2.5}) [*]							
Highest 24 Hour Average (µg/m ³)	65 ^b	<u>104</u>	<u>77</u>	50	<u>74</u>	49	---
Days over National Standard		4	4	0	1	0	---
Annual Average (µg/m ³)	12 ^a	<u>12.9</u>	<u>13.7</u>	9.7	11.5	---	---

^a State Standard

^b Federal Standard

^c Data for the years 2001 through 2004 is from the San Pablo station. Data was not available from San Pablo for 2005 or 2006, so data from Concord was used for 2005. No data is available from Concord for 2006.

ppm = parts per million; µg/m³ = micrograms per cubic meter

NOTES: *The CARB approved a new State 8-hour ozone standard of 0.07 on May 17, 2006 and approved new State 1-hour and annual NO₂ standards of 0.18 ppm and 0.03, respectively on February 22, 2007 and USEPA approved a new Federal 24-hour PM_{2.5} Standard of 35 µg/m³ on September 21, 2006. The old standards are presented in the table because they are the ones that CARB used to determine the amount of days over the standards. Values in **bold and underlined** are in excess of applicable standard; --- indicates there was insufficient (or no) data available to determine the value.

SOURCE: CARB, 2007b.

**TABLE 4.3-2
AIR QUALITY DATA SUMMARY (2001–2006) FROM FACILITY AREA**

Pollutant	Site	Standard	2001	2002	2003	2004	2005	2006
Sulfur Dioxide								
Highest 1-hour Average (ppb)	Castro Street	250 ^a	91	59	123	82	80	64
	Golden Gate	250 ^a	55	48	114	64	40	86
	Gertrude Street	250 ^a	41	125	129	93	70	39
Highest 3-hour Average (ppb)	Castro Street	500 ^b	73	47	83	77	62	53
	Golden Gate	500 ^b	44	46	92	31	34	45
	Gertrude Street	500 ^b	34	54	111	52	38	34
Highest 24-hour Average (ppb)	Castro Street	40 ^a	31	20	37	25	25	20
	Golden Gate	40 ^a	15	29	<u>83</u>	19	13	10
	Gertrude Street	40 ^a	29	15	<u>54</u>	19	12	15
Annual Average (ppb)	Castro Street	30 ^b	3.5	3.1	6.5	4.4	5	7
	Golden Gate	30 ^b	1.9	1.4	2.4	2.9	2	3
	Gertrude Street	30 ^b	1.2	1.9	2.3	3.4	4	6
Hydrogen Sulfide								
Highest 1-hour Average (ppb)	Castro Street	30 ^a	19	9	<u>75</u>	22	8	9
	Golden Gate	30 ^a	20	19	22	20	18	20
	Gertrude Street	30 ^a	20	10	26	17	22	22

^a State Standard. Generally, state standards are not to be exceeded.

^b Federal Standard. Generally, national standards are not to be exceeded more than once per year.

ppb = parts per billion.

NOTE: Values in bold and underlined are in excess of applicable standard.

SOURCE: Chevron Richmond, Ambient Monitoring Data for 2001–2006.

hourly H₂S or daily SO₂ concentration equal or exceed the ambient air quality standards. Exceedances of the H₂S standard on August 9, 2003, at the Castro Street monitoring station were due to Isomax flare activity.

For the purposes of air quality, public health and noise analyses, sensitive receptors are generally defined as land uses with population concentrations that would be particularly susceptible to disturbance from dust, noise, vibration, air pollutant concentrations, or other disruptions associated with project construction and/or operation. These receptors generally include schools, day care centers, libraries, hospitals, residential care centers, parks, and churches. Some receptors are considered 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 relatively sensitive to poor air quality because children, elderly people and the infirmed are more susceptible to respiratory distress and other air quality-related health problems than is 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 recreation places a high demand on the human respiratory system.

Since the 1970s, Chevron has been relocating petroleum processing units northward, away from the community located near the southern and eastern boundaries of the property and treats the resulting vacant land areas near the Refinery's southern and eastern perimeter as a buffer area from off-site uses. The five neighborhoods that have portions of the neighborhood within a one-mile radius of the Refinery are Shields-Reid (North Richmond), Iron Triangle, Atchison Village, Point Richmond, and Santa Fe. The following is a listing of sensitive land uses within a mile and a half of the individual Proposed Project sites:

- Atchison Park, the closest sensitive land use to the Proposed Project site, is approximately 5,200 feet or 1 mile from the project site;
- Washington Park and Washington Elementary School are approximately 5,700 feet or 1.1 miles away;
- Richmond Municipal Natatorium is approximately 5,000 feet or 0.9 mile away; and Peres Elementary School is approximately 6,000 feet or 1.1 miles from the project site.

Additional land use information is presented and discussed in more detail in Section 4.9, *Land Use*.

Existing Emissions Inventory

A summary of the total criteria pollutant emissions resulting from existing operations at the Refinery is presented in Table 4.3-3. The estimated percentages of emissions in Contra Costa County and the Bay Area are also shown in order to allow comparison of existing emission levels.

**TABLE 4.3-3
CRITERIA POLLUTANT EMISSIONS FOR THE CHEVRON RICHMOND REFINERY**

Pollutant	Refinery Emission Rates (tpy)^a	Refinery Emission Rates (tpd)^a	Percent of Bay Area Emission Rates^b	Percent of Contra Costa County Emission Rates^b
Reactive Organic Gases (ROG)	1,811	4.96	1.28	7.39
Carbon Monoxide (CO)	563	1.54	0.07	0.44
Oxides of Nitrogen (NO _x)	1,160	3.18	0.58	3.36
Oxides of Sulfur (SO _x)	1,500	4.11	7.61	13.92
Particulate Matter (PM)	248	0.68	0.18	1.21

^a Based on 2005 data for Chevron Richmond

^b Based on 2005 data for the Bay Area and Contra Costa County

SOURCE: Bay Area Air Quality Management District, 2007a and California Almanac of Emissions and Air Quality, <http://www.arb.ca.gov/ei/emissiondata.htm>.

Background on Greenhouse Gas Emissions and Climate Change

Some gases in the atmosphere affect the Earth's heat balance by absorbing infrared radiation. These gases can prevent the escape of heat in much the same way as glass in a greenhouse. This is often referred to as the "greenhouse effect," and it is responsible for maintaining a habitable climate. On Earth the gases believed to be most responsible for global warming are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Enhancement of the greenhouse effect can occur when concentrations of these gases exceed the natural concentrations in the atmosphere. Of these gases, carbon dioxide (CO₂) and methane are emitted in the greatest quantities from human activities. Emissions of CO₂ are largely by-products of fossil fuel combustion, whereas methane results from off-gassing associated with agricultural practices and landfills. There is international scientific consensus that human-caused increases in greenhouse gases (GHGs) has and will continue to contribute to global warming, although there is much uncertainty concerning the magnitude and rate of the warming.

Some of the potential resulting 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, 2006a). 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):

- 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 Energy Commission estimated that in 2004, California produced 492 million gross metric tons of CO₂-equivalent greenhouse gas emissions (CEC, 2006). The CEC found that transportation is the source of 41 percent of the state's GHG emissions; followed by electricity generation at 22 percent and industrial sources at 21 percent (oil refining is not separately listed but rather is included within the larger industrial category).

In the Bay Area, the BAAQMD recently published the Source Inventory of Greenhouse Gas Emissions (BAAQMD, 2006c), which identifies and quantifies direct emissions generated from sources within the BAAQMD. This report shows that an estimated 78 million gross metric tons of CO₂-equivalent greenhouse gas emissions were generated in the Bay Area in 2002. The majority of GHG emissions in the Bay Area come from Transportation (50.6 percent) followed by

Industrial/Commercial (25.7 percent). Domestic sources (e.g., home water heaters, furnaces, etc.) account for 10.9 percent of the Bay Area's GHG emissions, followed by Power Plants at 7.2 percent. Oil Refining currently accounts for approximately 5.6 percent of the total Bay Area GHG emissions.

4.3.4 Regulatory Setting

Air quality within the air basin is addressed through the efforts of various federal, state, regional, and local government agencies. These agencies work jointly, as well as individually, to improve air quality through legislation, regulations, planning, policy-making, education, and a variety of programs. The air pollutants of concern and agencies primarily responsible for regulating the air quality within the air basin and the pertinent regulations are further discussed in this section.

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, the EPA has identified criteria pollutants and established National Ambient Air Quality Standards (NAAQS or national standards) to protect public health and welfare. NAAQS have been established for ozone, CO, NO₂, SO₂, particulate matter equal to or less than 10 microns (PM₁₀), particulate matter less than 2.5 microns (PM_{2.5}), and lead (Pb). These pollutants are called "criteria" air pollutants because standards have been established for each of them to meet specific public health and welfare criteria.

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 (CAAQS or state standards). Table 4.3-4 presents both national and state ambient air quality standards and provides a brief discussion of the related health effects and principal sources for each pollutant. California has also established state ambient air quality standards for sulfates, hydrogen sulfide, and vinyl chloride.

Ozone

Ozone is a respiratory irritant and an oxidant that increases susceptibility to respiratory infections and 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 volatile organic gases (VOC) and nitrogen oxides (NO_x). VOC 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 VOC 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

TABLE 4.3-4
STATE AND NATIONAL CRITERIA AIR POLLUTANT STANDARDS, EFFECTS, AND SOURCES

Pollutant	Averaging Time	State Standard	National Standard	Pollutant Health and Atmospheric Effects	Major Pollutant Sources
Ozone	1 Hour 8 Hour	0.09 ppm 0.070 ppm	--- 0.08 ppm	High concentrations can directly affect lungs, causing irritation. Long-term exposure may cause damage to lung tissue.	Formed when reactive organic gases and NO _x react in the presence of sunlight. Major sources include on-road motor vehicles, solvent evaporation, and commercial/industrial mobile equipment.
Carbon Monoxide	1 Hour 8 Hour	20 ppm 9 ppm	35 ppm 9 ppm	Classified as a chemical asphyxiant, CO interferes with the transfer of fresh oxygen to the blood and deprives sensitive tissues of oxygen.	Internal combustion engines, primarily gasoline-powered motor vehicles.
Nitrogen Dioxide	1 Hour Annual	0.18 ppm 0.03 ppm	— 0.053 ppm	Irritating to eyes and respiratory tract. Colors atmosphere reddish-brown.	Motor vehicles, petroleum-refining operations, industrial sources, aircraft, ships, and railroads.
Sulfur Dioxide	1 Hour 3 Hour 24 Hour Annual	0.25 ppm — 0.04 ppm —	— 0.5 ppm 0.14 ppm 0.030 ppm	Irritates upper respiratory tract; injurious to lung tissue. Can yellow the leaves of plants, destructive to marble, iron, and steel. Limits visibility and reduces sunlight.	Fuel combustion, chemical plants, sulfur recovery plants, and metal processing.
Respirable Particulate Matter (PM ₁₀)	24 Hour Annual	50 µg/m ³ 20 µg/m ³	150 µg/m ³ 50 µg/m ³	May irritate eyes and respiratory tract, decreases in lung capacity, cancer and increased mortality. Produces haze and limits visibility.	Dust and fume-producing industrial and agricultural operations, combustion, atmospheric photochemical reactions, and natural activities (e.g. wind-raised dust and ocean sprays).
Fine Particulate Matter (PM _{2.5})	24 Hour Annual	— 12 µg/m ³	35 µg/m ³ 15 µg/m ³	Increases respiratory disease, lung damage, cancer, and premature death. Reduces visibility and results in surface soiling.	Fuel combustion in motor vehicles, equipment, and industrial sources; residential and agricultural burning; Also, formed from photochemical reactions of other pollutants, including NO _x , SO ₂ , and organics.
Lead	Monthly Quarterly	1.5 µg/m ³ —	— 1.5 µg/m ³	Disturbs gastrointestinal system, and causes anemia, kidney disease, and neuromuscular and neurological dysfunction.	Present source: lead smelters, battery manufacturing & recycling facilities. Past source: combustion of leaded gasoline.

Notes: ppm =parts per million; µg/m³ = micrograms per cubic meter.

SOURCES: California Air Resources Board (CARB), 2004 and 2006. *Ambient Air Quality Standards webpage*, <http://www.arb.ca.gov/research/aaqs/aaqs.htm>, updated May 18, 2004; and *Ambient Air Quality Standards chart*, <http://www.arb.ca.gov/aqs/aaqs2.pdf>, updated May 17, 2006

combine with regional subsidence inversions to create conditions conducive to the formation and accumulation of secondary photochemical compounds, like ozone.

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

PM₁₀ and PM_{2.5} consist of particulate matter that is 10 microns or less in diameter and 2.5 microns or less in diameter, respectively. PM₁₀ and PM_{2.5} represent fractions of particulate matter that can be inhaled into the 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. Particulates also can damage materials and reduce visibility.

Hydrogen Sulfide

Hydrogen sulfide (H₂S) is found in nature around some hot springs, geothermal sources, and oil fields (sour gas). It is also produced by anaerobic decomposition, and is sometimes called swamp gas. The human nose can detect H₂S at concentrations well below toxic levels. Heavier than air, this gas is considered noxious and unpleasant. At higher levels it desensitizes the nose, and can be fatal because it blocks oxygen uptake by the blood. Mainly a health threat to industrial workers, H₂S is usually regulated to eliminate nuisance for nearby residents or property owners. California has established state ambient air quality standard for H₂S of 0.03 ppm (42 µg/m³) for a 60-minute average.

Other Criteria Pollutants

SO₂ is a combustion product of sulfur or sulfur-containing fuels such as coal, which are restricted in the Bay Area. SO₂ is also a precursor to the formation of atmospheric sulfate, particulate matter (PM₁₀ and PM_{2.5}), and contributes to potential atmospheric sulfuric acid formation that could precipitate downwind as acid rain. The maximum SO₂ concentrations recorded in the Proposed

Project area were well below federal and state standards. The Bay Area is likewise in attainment status with both federal and state SO₂ standards.

Ambient lead concentrations meet both the federal and state standards in the Bay Area and the Proposed Project area. Lead has a range of adverse neurotoxin health effects, and was formerly released into the atmosphere primarily via leaded gasoline. The phase-out of leaded gasoline in California resulted in decreasing levels of atmospheric lead.

Odors

While offensive, odors rarely cause any physical harm, but they still can be very unpleasant leading to considerable distress among the public and often generating citizen complaints to local governments and the BAAQMD. The occurrence and severity of odor problems depends on numerous factors, including the nature, frequency and intensity of the source, wind speed and direction, and the sensitivity of the receptor(s). Substances present in refinery air emissions, such as H₂S, SO₂, methyl mercaptan, other total reduced sulfur compounds, benzene compounds, naphthalene, and toluene, among others, are known to cause unpleasant odors.

BAAQMD Regulation 7 places general limitations on odorous substances, and specific emission limitations on certain odorous compounds such as mercaptans and phenolic compounds (BAAQMD, 1982). The regulation applies when and if the BAAQMD receives validated odor complaints from 10 or more complainants in a 90-day period. During the years 2002 through May of 2005, a total of seven odor complaints were received by Chevron related to the Refinery (Chevron, 2006). The BAAQMD has not received any odor complaints related to Chevron's Richmond Refinery from 2002 through July, 2006 (BAAQMD, 2006b).

In addition, BAAQMD Regulation 9, Rule 2 requires ground level H₂S emissions during a 24-hour period to be limited to 0.06 ppm or less for a three-minute average, or 0.03 ppm or less for a 60-minute average (BAAQMD, 1999a). The state has also established air quality standards to be used by industry as guidelines. Between 2000 and 2005, the maximum one-hour concentration of H₂S measured near the Refinery was 75 ppb (at the Castro Street site); there were a total of three consecutive hours at the Castro Street site during August 9, 2003 where the one-hour concentration was equal to the H₂S standard of 30 ppb.

Regulatory Agencies

EPA is responsible for implementing the myriad of programs established under the federal Clean Air Act, 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.

CARB is responsible for establishing and reviewing the state standards, compiling the California SIP, securing approval of that plan from EPA, and identifying toxic air contaminants. CARB also regulates mobile sources of emissions in California, such as construction equipment, trucks, and automobiles, oversees the activities of California's air quality management districts, which are

organized at the county or regional level, and is currently developing regulations for controlling greenhouse gas emissions. 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 Clean Air Act and California Clean Air Act.

The California Energy Commission (CEC) has the statutory responsibility for licensing thermal power plants 50 MW and larger and the plants related facilities such as transmission lines, fuel supply lines, water pipelines, etc. The CEC offers a Small Power Plant Exemption (SPPE) permit process. The SPPE is available for projects between 50 MW and 100 MW, provided the project does not create an unmitigated significant impact on environmental resources. The CEC completes an Initial Study (mitigated negative declaration) and, if approved, the project developer would be responsible for securing local, state, and federal permits to construct and operate the facility.

The regional air quality plans prepared by county or regional air quality districts throughout the state are compiled by the CARB to form the SIP. The local air districts also have the responsibility and authority to adopt transportation control and emission reduction programs for indirect and area-wide emission sources.

BAAQMD is the regional agency with jurisdiction over the nine-county region located in the San Francisco Bay Area Air Basin. Association of Bay Area Governments (ABAG) and 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.

The management of air quality in the Air Basin is the responsibility of the BAAQMD. The BAAQMD is responsible for bringing and/or maintaining air quality in the Air Basin within federal and state air quality standards. Specifically, the BAAQMD has the responsibility to monitor ambient air pollutant levels throughout the Air Basin and to develop and implement attainment strategies to ensure that future emissions will be within federal and state standards.

In December of 1999, the BAAQMD prepared its *CEQA Guidelines – Assessing the Air Quality Impacts of Projects and Plans*, as 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 *CEQA Guidelines* is an advisory document and local jurisdictions are not required to utilize the methodology outlined therein. This document describes the criteria that the BAAQMD uses when reviewing and commenting on the adequacy of environmental documents, such as this EIR. It recommends thresholds for use in determining whether 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. This EIR was prepared following the recommendations of the BAAQMD *CEQA Guidelines*.

Air Quality Plans, Policies and Regulations

California Air Resources Board

In August 1998, the CARB identified particulate emissions from diesel-fueled engines (diesel particulate matter or DPM) as TACs. The CARB developed the *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles* and the *Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines* and approved these documents on September 28, 2000. These documents propose to reduce diesel particulate emissions, with the goal to reduce emissions and the associated health risk by 75% in 2010 and by 85% in 2020, and to require the use of state-of-the-art catalyzed diesel particulate filters and ultra low sulfur diesel fuel.

In December 2000, the EPA promulgated regulations requiring that the sulfur content in motor vehicle diesel fuel be reduced to less than 15 ppm by June 1, 2006. Control of DPM emissions focuses on two strategies: reducing the amount of sulfur in diesel fuel and developing filters for operating diesel engines to reduce the amount of particulate matter that is emitted. Secondly, the EPA finalized a comprehensive national emissions control program, the 2007 Highway Diesel (HD 2007) program, which regulates highway heavy-duty vehicles and diesel fuel as a single system. Under the HD 2007 program, the EPA established new emission standards that would significantly reduce PM and NO_x from highway heavy-duty vehicles.

In May 2003, the EPA proposed new emission standards for nonroad diesel engines and sulfur reductions in nonroad diesel fuel that would dramatically reduce emissions attributed to nonroad diesel engines. These standards would affect emissions from construction equipment, mining equipment, locomotives, and marine diesels. As these emission standards (applying solely to mobile equipment) have only been proposed at this time, their benefits were not accounted for in this analysis.

As proposed, the new engine standards for onroad trucks would take effect in 2008. The EPA estimates that PM would be reduced 95%, NO_x would be reduced 90%, and SO_x would be virtually eliminated from nonroad diesel engine sources. Sulfur in nonroad diesel fuel would be reduced 99% from existing levels. In June 2007, the interim cap of sulfur content for fuel for nonroad sources would be 500 ppm. In June 2010, sulfur would be limited to 15 ppm (ultra low sulfur fuel). The Tier 1 emission standards for nonroad diesel engines were set in 1994 and affect engines greater than 50 horsepower (hp). The Tier 2 and Tier 3 standards were set in 1998 and affected engines less than and greater than 50 hp. The new standards would affect engines ranging from 3 to 3,000 hp. Again, the EPA is proposing a “tiered” method of implementing the standard based on the engine capacity of the equipment.

Current regulations apply emission standards to engines manufactured from 1987 through 2003 for heavy-duty diesel truck and bus engines. Applicable to the 1994 and following year standards, sulfur content in the certification fuel has been reduced to 500 ppm. In October 1997, the EPA adopted new emission standards for 2004 (and later) heavy-duty diesel truck and bus engines. These standards reflect the provisions of the Statement of Principles signed in 1995 by the EPA, CARB, and the manufacturers of heavy-duty diesel engines. The goal is to reduce NO_x emissions

from highway heavy-duty engines to levels approximately 2 grams per brake horsepower-hour (g/bhp-hr) beginning in 2004.¹ These current emission standards applying to heavy-duty diesel truck and bus engines were accounted for in this analysis.

Plans and Policies

As required by the federal Clean Air Act and the California Clean Air Act, air basins or portions thereof have been classified as either “attainment” or “nonattainment” for each criteria air pollutant, based on whether or not the standards have been achieved. Nonattainment areas are also required to prepare air quality plans that include strategies for achieving attainment.

The San Francisco Bay Area Air Basin is in attainment of both the NAAQS and the CAAQS for NO₂, SO₂, CO, and lead. The Bay Area Air Basin is nonattainment for ozone for both the NAAQS and CAAQS. The Bay Area Air Basin is nonattainment of the CAAQS for PM₁₀ and PM_{2.5}, but is in attainment of the NAAQS for PM₁₀ and PM_{2.5}. Table 4.3-5 displays the current attainment status.

Air quality plans developed to meet federal requirements are referred to as SIPs. The federal Clean Air Act and the California Clean Air Act require plans to be developed for areas designated as nonattainment (with the exception of areas designated as nonattainment for the state PM₁₀ standard). Plans are also required under federal law for areas designated as “maintenance” for national standards. Such plans include strategies for attaining the standards. Currently, there are three plans for the Bay Area:

- Ozone Attainment Plan for the 1-Hour National Ozone Standard (ABAG, 1999) developed to meet federal ozone air quality planning requirements;
- Carbon Monoxide Maintenance Plan (ABAG, 1994) developed to ensure continued attainment of the national CO standard; and
- Bay Area 2005 Ozone Strategy (BAAQMD, 2006a), which was adopted by the BAAQMD Board of Directors on January 4, 2006, reviews the region's progress over the years in reducing ozone levels, describes current conditions, and charts a course for future actions to further reduce ozone and ozone precursor levels in the Bay Area.

On January 4, 2006, the BAAQMD adopted the Bay Area 2005 Ozone Strategy (BAAQMD, 2006a). The Bay Area 2005 Ozone Strategy reviews the region's progress over the years in reducing ozone levels, describes current conditions, and charts a course for future actions to further reduce ozone levels in the Bay Area. The control strategy is a central element of the Bay Area 2005 Ozone Strategy. The control strategy outlines a set of control measures to further reduce ozone precursor emissions in order to reduce ozone levels in the Bay Area and to reduce transport of pollution to downwind regions. The control strategy includes stationary source measures, mobile source measures and transportation control measures.

1 Further information on current regulations that apply to heavy-duty trucks and on-site nonroad equipment can be found at www.dieselnet.com/.

**TABLE 4.3-5
ATTAINMENT STATUS OF THE BAY AREA FOR
THE STATE AND NATIONAL AMBIENT AIR QUALITY STANDARDS**

Pollutant	Averaging Time	Attainment Status	
		State Standards ^a	National Standards ^b
Ozone	8 Hour	Unclassified ^c	Nonattainment
	1 Hour	Nonattainment	— ^d
Carbon Monoxide	8 Hour	Attainment	Attainment
	1 Hour	Attainment	Attainment
Nitrogen Dioxide	Annual	—	Attainment
	1 Hour	Attainment	—
Sulfur Dioxide	Annual	—	Attainment
	24 Hour	Attainment	Attainment
	1 Hour	Attainment	—
Respirable Particulate Matter	Annual	Nonattainment	Attainment
	24 Hour	Nonattainment	Unclassified
Fine Particulate Matter	Annual	Nonattainment	Attainment
	24 Hour	—	Attainment
Lead	Quarter	—	Attainment
	Month	Attainment	—

- ^a California standards for ozone, CO (except Lake Tahoe), SO₂ (1-hour and 24-hour), NO_x, and PM₁₀ are values that are not to be exceeded.
- ^b National standards other than for ozone, particulates, and those based on annual averages or annual arithmetic means are not to be exceeded more than once a year.
- ^c This standard was approved by the Air Resources Board on April 28, 2005 and became effective on May 17, 1006.
- ^d The National 1-hour ozone standard was revoked by USEPA on June 15, 2005.

SOURCE: BAAQMD, 2006, Ambient Air Quality Standards and Bay Area Attainment Status,
http://www.baaqmd.gov/pln/air_quality/ambient_air_quality.htm, updated May 18, 2006

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 the California Air Resources Board (CARB) to establish a statewide GHG emission cap for 2020 based on 1990 emission levels. AB 32 requires CARB to adopt regulations by January 1, 2008 that will 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 that will be developed. Under AB 32, CARB also is required to adopt, by January 1, 2008, a statewide GHG emissions limit equivalent to the statewide greenhouse gas emissions levels in 1990, which must be achieved by 2020. By January 1, 2011, CARB is required to adopt rules and regulations (which shall become operative January 1, 2012), to achieve the maximum technologically feasible and cost-effective greenhouse gas 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. The Refinery, including the Proposed Project, will be subject to AB 32, and will be required to comply with all applicable final rules, regulations, emissions limitations, emissions reduction measures or market-based compliance mechanisms adopted under AB 32.

Monitoring and Reporting of Greenhouse Gas Emissions

Pursuant to SB 527, signed into law on October 13, 2001, the California Climate Action Registry (“Registry”) was formed. According to its website, the Registry is a non-profit voluntary registry for GHG emissions. The purpose of the Registry is to help companies and organizations with operations in the state to establish GHG emissions baselines against which any future GHG emission reduction requirements may be applied. AB 32 requires CARB to incorporate the standards and protocols developed by the Registry into the state’s new mandatory GHG emissions reporting program to the maximum extent feasible. AB 32 states that entities that join the Registry prior to December 31, 2006 and report their emissions according to the Registry’s rules and timeframe “shall not be required to significantly alter their reporting or verification program except as necessary to ensure that reporting is complete and verifiable.”

The Registry encourages voluntary actions to increase energy efficiency and decrease GHG emissions. Using any year from 1990 forward as a base year, participants can record their GHG emissions inventory. The state of California, in turn, will offer its best efforts to ensure that participants receive appropriate consideration for early actions in the event of any future state, federal, or international GHG regulatory scheme. Registry participants include businesses, non-profit organizations, municipalities, state agencies, and other entities.

The Registry has developed a General Protocol and additional industry-specific protocols which give guidance on how to inventory GHG emissions for participation in the Registry: what to measure, how to measure, the back-up data required, and certification requirements. When organizations become participants, they agree to register their GHG emissions for all operations in California, and are encouraged to report nationwide. Both gross emissions and efficiency metrics will be recorded. The Registry requires the inclusion of all direct GHG emissions, along with indirect GHG emissions from electricity use. However, the Registry clearly recognizes that the indirect GHG emissions represent double-counting with respect to direct emissions from electricity producers. Therefore, the Registry requires indirect and direct emissions to be reported separately (see www.climateregistry.org).

As a first step in the AB 32 compliance process, Chevron has joined the Registry and has stated its commitment to inventory and report emissions of greenhouse gases according to the Registry’s General Reporting Protocol. Baseline CO₂ emissions associated with the existing Refinery combustion sources that would be affected by the Proposed Project are estimated to be 1,731,000 metric tons per year.² Baseline CO₂ emissions were estimated using the three-year average firing rates for affected, existing Refinery combustion sources. The baseline period used was January 1, 2004 through December 31, 2006.

² One metric ton roughly equals 1.1 tons.

Federal Regulations for Criteria Pollutants

Standards of Performance for New Stationary Sources

Section 111 of the Clean Air Act, “Standards of Performance of New Stationary Sources,” requires EPA to establish federal emission standards for source categories which cause or contribute significantly to air pollution. These standards are intended to promote use of the best air pollution control technologies, taking into account the cost of such technology and any other non-air quality, health, and environmental impact and energy requirements. The EPA has established New Source Performance Standards (NSPS) for several source categories. Some New Source Performance Standards apply to the proposed facility (40 CFR 60). These include New Source Performance Standards for petroleum refinery equipment. The New Source Performance Standards program is implemented by the BAAQMD.

Prevention of Significant Deterioration

Prevention of Significant Deterioration (PSD) regulations were first promulgated by the EPA (40 CFR 52) to prevent air quality degradation in those areas where criteria air pollutant concentrations are below the ambient standards (i.e., attainment areas). Currently, the PSD regulations are implemented by the EPA; which also administer PSD review for new sources that emit criteria pollutants for which the area is currently designated attainment. EPA revoked BAAQMD’s PSD delegation, effective March 3, 2003 due to changes in state law that prohibited implementation in California of EPA’s New Source Review Reforms. Exceedance of a PSD trigger level requires a demonstration by dispersion modeling that the emissions will not interfere with the attainment or maintenance of any NAAQS at the point of maximum impact and will not cause an exceedance of a PSD increment.

The Refinery is defined as a “major source” for the purposes of the federal PSD program. PSD requirements apply if increased emissions resulting from proposed modifications to a major source exceed PSD threshold levels for a major modification to a major source. Table 4.3-6 summarizes the pollutant emission changes due to the project as related to the PSD thresholds for a major modification to a major source. Emissions increases of the proposed project would not exceed the PSD major modification threshold levels.

Title V Federal Operating Permit (Title V)

Title V of the 1990 Clean Air Act Amendments requires all major sources and some minor sources of air pollution to obtain an operating permit. A Title V permit grants a source permission to operate. The permit includes all air pollution requirements that apply to the source, including emissions limits and monitoring, record keeping, and reporting requirements. It also requires that the source report its compliance status with respect to permit conditions to the permitting authority. Under Title V of the Clean Air Act, any source that emits or has the potential to emit 100 tons per year or more of any criteria air pollutant is a major source and must obtain a Title V operating permit. Title V permits in the Bay Area are issued by the BAAQMD.

**TABLE 4.3-6
NET EMISSIONS COMPARISON FOR PSD APPLICABILITY**

Pollutant (tons per year)	NO_x	SO₂	CO	PM	VOC
Hydrogen Plant Replacement	-10.4	-52.4	61.1	-12.7	-2.1
Power Plant Replacement	-13.5	1.7	30.2	14.8	0.9
Catalytic Reformer Replacement	-46.2	3.0	21.4	6.7	5.9
Hydrogen Purity Improvements	-3.7	26.0	-17.1	3.2	5.4
Storage Tanks	---	---	---	---	16.2
Central Control Room	NA	NA	NA	NA	NA
Maintenance Facilities	NA	NA	NA	NA	NA
Total Project Net Emissions	-74.0	-21.8	95.6	12.0	10.1
PSD Threshold	40	40	100	15	40
Exceeds PSD Threshold?	No	No	No	No	No

SOURCE: Chevron, 2007a. Revised Emission Estimates for *Authority to Construct and Permit to Operate Application for Chevron Richmond Renewal Project*, submitted February 26, 2007 (Table X.b) and Chevron, 2007d. Chevron Renewal Project Storage Tanks VOC Emissions Estimate, Revised and Updated January 30, 2007.

In the Bay Area, Title V requirements are implemented by Regulation 2 Rule 6 of the BAAQMD *Rules and Regulations*. The Refinery is subject to the Operating Permit requirements of Title V of the federal Clean Air Act, and BAAQMD Regulation 2, Rule 6, Major Facility Review, because it is a major facility as defined by BAAQMD Regulation 2-6-212. It is a major facility because it has the “potential to emit,” as defined by BAAQMD Regulation 2-6-218, of more than 100 tons per year of a regulated air pollutant. Major Facility Operating permits (Title V permits) must meet specifications contained in 40 CFR Part 70 as contained in BAAQMD Regulation 2, Rule 6. The permits contain all applicable requirements (as defined in BAAQMD Regulation 2-6-202), monitoring requirements, record keeping requirements, and reporting requirements.

Following construction and startup of Renewal Project facilities and equipment, the throughput and emissions of all other Refinery upstream and downstream units will remain within their current Title V permitted throughput and capacity limits. Consequently, any changes resulting from the Renewal Project on those other upstream and downstream units would not qualify as modifications under the provisions in BAAQMD Rule 2-1-234.

BAAQMD Rules and Regulations

The regional agency primarily responsible for developing air quality plans for Contra Costa County is the BAAQMD. BAAQMD is the agency with permit and regulatory authority over most types of stationary emission sources in the Bay Area. BAAQMD exercises regulatory authority through its *Rules and Regulations*. Both federal and state ozone plans rely heavily upon stationary source control measures set forth in BAAQMD’s *Rules and Regulations*. In contrast to the ozone plans, the *CO Maintenance Plan* relies heavily on mobile source control measures.

New Source Review

The New Source Review regulations apply to the following criteria pollutants: nitric oxides (NO_x), precursor organic compounds (POC), sulfur dioxide (SO₂), carbon monoxide (CO), and particulate matter less than 10 microns (PM₁₀), as well as non-precursor organic pollutants, and apply to all new and modified stationary sources, which are subject to the requirements of this District's best available control technology. The New Source Review regulations also include PSD rules for NO_x, VOC, SO₂, CO, and PM₁₀, and if PSD is triggered, there are additional restrictions on asbestos, beryllium, mercury, fluorides, sulfuric acid mist, hydrogen sulfide, total reduced sulfur, and total reduced sulfur compounds. The purpose of the New Source Review regulations is to incorporate a "no net increase" program required by the California Clean Air Act and implement federal permitting requirements. The regulation is also designed to ensure that the emission sources will not cause or interfere with the attainment or maintenance of ambient air quality standards.

New Source Review applies to all new and modified sources requiring an Authority to Construct. The purpose of this rule is to provide for the review of new and modified sources and provide mechanisms, including the use of Best Available Control Technology (BACT), Best Available Control Technology for Toxics (TBACT) and emission offsets by which authorities to construct such sources could be granted. This regulation is also designed to ensure that the emission sources will not cause or interfere with the attainment or maintenance of ambient air quality standards. Because the San Francisco Bay Area Air Basin is currently a nonattainment area for state ozone and PM₁₀ standards, some requirements under BAAQMD's policy are more stringent than federal policy.

For sources that require an authority to construct or a permit to operate, if emissions from a new source or increase in emissions from a modified source has the potential to emit 10 pounds or more per highest day of POC, non-precursor organic compounds (NPOC), NO_x, SO₂, PM₁₀, or CO, BACT is required to be applied to any of the above pollutant emissions meeting the required criterion.

Emissions offsets are required for new NO_x and VOC emissions in accordance with Regulation 2-2-302 (facilities which emit more than 15 tons/year). Offsets are also required for PM₁₀ and SO₂ emissions in accordance with Regulation 3-2-303, since the Refinery is a major source (emits more than 100 tons/year) for both of these criteria pollutants. BAAQMD regulations do not require that increases in CO emissions be offset.

For a facility such as Chevron Richmond with NO_x and VOC emissions exceeding 35 tons per year on a facility-wide basis, the BAAQMD New Source Review regulation requires emission offsets at a ratio of 1.15 to 1.0 for emissions from any new or modified source minus onsite contemporaneous emission reductions. Any planned major facility that would constitute a new or modified emissions source with a cumulative increase since April 5, 1991 of more than 100 tons per year of PM or SO₂, must provide offsets at either a 1.0 to 1.0 ratio or another ratio approved by the BAAQMD.

While there is no threshold for providing offsets for CO emissions, dispersion modeling requirements are specified for facilities with a cumulative increase of CO emissions in excess of 100 tons per year since the PSD baseline date of July 17, 1991. Modeling must show that the proposed project would not interfere with attainment or maintenance of the state CO standards. However, since the net emission of CO is less than 100 tons per year, the CO modeling requirement is not applicable to this project.

The emissions estimates in this section show the Proposed Project's emission reductions and increases relative to the project's contemporaneous emissions reductions. For the purpose of meeting BAAQMD regulatory requirements to offset new emissions from new Proposed Project facilities and equipment, and changes to existing facilities, Chevron proposes to use existing (banked) emission reduction credits (ERCs). The emissions reductions realized by shut down of facilities and equipment being replaced by the Proposed Project would then be banked as new ERCs. Chevron would supplement the existing banked ERCs with these new ERCs as necessary to provide all required emissions offsets.

Other Applicable BAAQMD Regulations

In addition to BACT, emissions offsets and major source review requirements previously discussed above, and numerous other BAAQMD regulations apply to the construction and operation of the Proposed Project. The regulations are contained in the *Bay Area Air Quality Management District Rules and Regulations, Volumes 1 and 2*.

BAAQMD Regulation 12, Rule 11 (adopted June 3, 2003) requires refineries to accurately monitor the flow and composition of vent gases sent to and combusted by a flare.³ In addition Chevron is required to identify reasons for significant flaring events (greater than 500,000 standard cubic feet in a 24 hour period) and take corrective actions to prevent them. In addition, the Regulation 12, Rule 12 (amended April 5, 2006) required Chevron to prepare and implement a Flare Minimization Plan (FMP) on or before August 1, 2006. The FMP defines a series of measures intended to reduce flaring to the extent that is feasible without compromising safety and necessary Refinery operations and practices. The key tools utilized are planning to minimize flaring, coupled with evaluation of the cause of any flaring events that do occur. The FMP also examines the costs and benefits of potential equipment modifications to increase flare gas recovery (Chevron, 2007c). The BAAQMD has recently (March 2007) released the FMP for public review and comment.

City of Richmond General Plan

As part of the Open Space and Conservation Element of the General Plan, the City of Richmond has adopted certain goals and policies intended to improve air quality in the City. These are:

Goal OSC-P: Preserve the air quality so that air pollution levels do not threaten public health and safety. This will apply not only to the local area, but to potential sources of pollution originating in though not impacting the City of Richmond.

³ Monthly reports are submitted 30 days after the end of the month and include monitoring data for each flare subject to the Reg. 12-11 flare monitoring requirements (see <http://www.baaqmd.gov/enf/flares/>)

Existing and proposed programs and actions designed to meet the policies of Goal OSC-P include the following:

1. City will require individual developers to closely coordinate with the BAAQMD in implementing applicable new stationary source control measures as proposed in the most recent CAP, while conforming with existing BAAQMD stationary source regulations and requirements and complying with BAAQMD rules and regulations regarding indirect sources.
2. City will develop an ordinance requiring fireplaces in all new residential units to be of the EPA-certified type, which would reduce woodsmoke particulate emissions by up to 70-80 percent when compared with ordinary fireplaces.
3. City will continue to coordinate with the Air District in planning future growth, designating land uses for future development, implementing regional transportation plans and trip reduction measures, and controlling stationary source emissions.

Policy OSC-P.1: Only approve projects that will comply with applicable regulations and will not exceed air quality standards.

Policy OSC-P.2: New developments should not subject residents to objectionable odors or other nuisances (e.g., dust).

Policy OSC-P.3: Ensure that developers and businesses work with regional, state and federal agencies to meet air quality standards.

Contra Costa County General Plan

As part of the Conservation Element of the General Plan, Contra Costa County has adopted certain goals intended to improve air quality in the County. These are:

- To meet Federal Air Quality Standards for all pollutants.
- To continue to support federal, state and regional efforts to reduce air pollution in order to protect human and environmental health.
- To restore air quality in the area to a more healthful level.
- To reduce the percentage of Average Daily Traffic trips occurring at peak hours.

The Conservation Element also contains the following policies applicable to the proposed project.

- When there is a finding that a proposed project might significantly affect air quality, appropriate mitigation measures shall be imposed.
- Proposed projects shall be reviewed for their potential to generate hazardous air pollutants.

4.3.4 Significance Criteria and Methodology

Significance Criteria

Based on Appendix G of the *CEQA Guidelines*, a project may be deemed to have a significant effect on the environment with respect to air quality if it would result in:

- a) Conflict with or obstruct implementation of the applicable air quality plan;
- b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
- c) Result in a cumulatively considerable net increase of any nonattainment pollutant (including releasing emissions that 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.

For project-level impact analysis, BAAQMD provides various thresholds and tests of significance that can be used to determine whether a project would conflict with or obstruct implementation of the air quality plan, violate any air quality standard or contribute substantially to an existing or projected air quality violation or expose sensitive receptors to substantial pollutant concentrations. The Proposed Project's impact on sensitive receptors due to exposure to toxic air contaminant emissions is discussed in Section 4.12, *Public Health*.

BAAQMD's CEQA Guidelines established quantitative thresholds of significance for emissions, including:

- Total emissions of ROG, NO_x, and PM₁₀ emissions from project operations exceed 80 pounds per day and/or 15 tons per year.
- A significant impact would occur if the project would contribute to CO concentrations exceeding the state ambient air quality standard of 9 ppm averaged over 8 hours and 20 ppm for 1 hour. Also, pursuant to BAAQMD significance criteria guidelines (BAAQMD, 1999b), localized CO concentrations should be estimated if:
 - 1) Vehicle emissions of CO would exceed 550 lb/day;
 - 2) Project traffic would impact intersections or roadway links operating at Level of Service (LOS) D, E, or F or would cause a decrease in LOS to D, E, or F; or
 - 3) Project traffic would increase traffic volumes on nearby roadways by 10% or more, unless the increase in traffic volume is less than 100 vehicles per hour.
- The BAAQMD Guidelines do not contain quantitative odor significance thresholds. However, the Guidelines include the "creation of objectionable odors" on a list of effects that are considered significant.

According to the BAAQMD CEQA Guidelines, a project's contribution to cumulative impacts should be considered significant if the project's impact individually would be significant (i.e. exceeds the BAAQMD's quantitative thresholds). For a project that would not result in a significant impact individually, the project's contribution to any cumulative impact would be considered less than significant if the project is consistent with the local General Plan and the

local General Plan is consistent with the applicable regional air quality plan. In this case, the applicable regional air quality plan would be the Bay Area 2005 Ozone Strategy. The Federal 1-hour ozone plan is not applicable because the national 1-hour standard was invalidated by the U.S. Court of Appeals for the District of Columbia on December 21, 2006, although USEPA requested rehearing on March 22, 2007, and the CO plan is not applicable because the Bay Area is currently not in nonattainment status for CO.

For the analysis of odor impacts, an exceedance of the standards in the applicable BAAQMD *Rules and Regulations* would be considered to be a significant impact. For analysis of H₂S emissions, per BAAQMD Regulation 9, Rule 2, a 60-minute average of 30 ppb would be considered the significance threshold.

With regard to greenhouse gases, the state of California has provided no guidance for significance thresholds for assessing the impact of greenhouse gas emissions on climate change and global warming concerns. Further, the BAAQMD has stated that EIR analyses “may not conclude with a significance determination nor require mitigation measures since the District has not yet established thresholds for greenhouse gas emissions” (BAAQMD, 2006d). See Section 4.3.6 for more information about greenhouse gas emissions associated with the Proposed Project.

CEQA Guidelines Appendix G topics that will not be discussed further in this EIR

Review and comparison of the setting circumstances and Proposed Project characteristics with significance criteria stated above, clearly show that there would be a potential for impacts to occur under each of the significance criteria stated above. Therefore, aspects of each will be discussed in the text that follows.

Methodology

Chevron Richmond has prepared a BAAQMD Permit Application for the new Hydrogen Plant, new Catalytic Reformer, new Cogeneration Unit, and Hydrogen Purity Improvements. Although applications have not been submitted for the storage tanks that are included in the Proposed Project, the estimated emissions for the storage tanks are included in this analysis. Environmental Science Associates (the City’s consultant) and the BAAQMD have peer reviewed this document and concurs with the assumptions, methodology, and calculations used in the estimation of project emissions. This EIR describes the methods and data used to calculate emissions. The implementation of the Proposed Project would lead to a change in emissions from the stationary sources as well as from mobile sources. Emission changes were estimated for all sources affected by the Proposed Project, including stationary and mobile sources. The detailed emission calculations for on-site stationary sources were submitted to the BAAQMD with the application for the Authority to Construct and Permit to Operate, dated June 17, 2005 with subsequent revisions through February 2007.

Air Quality Baseline

In order to determine an impact, the emissions resulting from the project are compared to a 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. In the case of air emissions, typically a one-year average based on the previous year's operation is used. Refinery-wide stationary source emissions have been estimated for a one-year period (2005) that would represent the one-year baseline condition. Table 4.3-7 presents the estimated facility-wide baseline emissions.

**TABLE 4.3-7
ESTIMATED BASELINE EMISSIONS
(average emissions in tons per year)**

NO _x	SO ₂	PM	ROG	CO
1,160	1,500	248	1,811	563

Notes: Emissions are based on 2005 data for Chevron Richmond.

SOURCE: Bay Area Air Quality Management District, 2007a.

4.3.5 Air Quality Impacts and Mitigation Measures

Impact 4.3-1: Activities associated with Proposed Project construction would generate short-term emissions of criteria pollutants, including suspended and inhalable particulate matter and equipment exhaust emissions, during the term of construction. This would be a significant impact that would be mitigated to a less than significant level by Mitigation Measures 4.3-1a and 4.3-1b.

The Proposed Project elements (Catalytic Reformer Replacement, Power Plant Replacement, Hydrogen Plant Replacement, Hydrogen Purity Improvements, storage tanks, Central Control Room, and new Maintenance Facilities) would replace various existing older Refinery facilities. Following construction and startup of the Proposed Project components, the replaced facilities would be decommissioned and eventually dismantled. There are no specific plans or schedule for dismantling these facilities and their demolition *is not* included in the Proposed Project (see Section 3.5.6, *Decommissioning, Demolition and Dismantling* for additional information). However, *decommissioning* of facilities is considered as part of the Proposed Project. As there may be a transition period between full operation of the new and shutdown of the old facilities where both are operating simultaneously. Mitigation Measure 4.3-3, discussed below, will ensure that the combined emissions of new and old facilities will not exceed present or future permitted levels.

All construction would take place well within the Refinery boundaries. Any required staging, fabrication, or laydown areas would also be within Refinery boundaries. Chevron estimates that grading and filling activities would require up to 110,000 cubic yards of clean fill to be imported and there would be up to 500 cubic yards of graded/excavated soil that would need to be transported offsite for disposal. Project construction is expected to last for approximately 60

months. Emission levels for construction activities would vary depending on the number and type of equipment, duration of use, operation schedules, and the number of construction workers. Some aspects of the construction plan or sequence may change slightly as the plan is finalized. See Section 3.5, *Construction of Project Components*, for a detailed discussion of construction activities.

Construction-related emissions would occur at individual project construction sites and be relatively short term, within the construction period, but could still cause adverse effects on the local air quality. Proposed Project construction could generate substantial amounts of dust (including PM₁₀ and PM_{2.5}) primarily from “fugitive” sources (i.e., emissions released through means other than through a stack or tailpipe) and also other criteria air pollutants primarily from operation of heavy equipment construction machinery (primarily diesel operated) and construction worker automobile trips (primarily gasoline operated). Staggered shifts would reduce the number of workers arriving and departing the work site at the same time, and reduce the load on the street and highway system in the Refinery vicinity, as well as reducing emissions from those trips. The peak workforce would result in 1,595 daily vehicle trips. Chevron estimates that a peak of 86 truck trips per day would occur during construction. Section 4.16, *Transportation and Traffic*, documents the construction truck and worker automobile trips as a result of the construction period.

Construction-related dust emissions would vary from day to day, depending on the level and type of activity, silt content of the soil, and the weather. In the absence of mitigation, construction activities may result in significant quantities of dust, and as a result, site visibility and PM₁₀ concentrations may be adversely affected on a temporary and intermittent basis during the construction period. The BAAQMD approach to analyses of construction impacts is to emphasize implementation of effective and comprehensive control measures rather than detailed quantification of emissions. Nonetheless, worst-case construction emissions associated with the Proposed Project have been estimated and are presented in Table 4.3-8. The District considers a project’s construction-related impacts to be less than significant if the required dust-control measures are implemented. Without these control measures, the impact would generally be considered to be significant.

Criteria pollutant emissions of VOC and NO_x from these emission sources would incrementally add to the regional atmospheric loading of ozone precursors during project construction. BAAQMD CEQA Guidelines recognize that construction equipment emits ozone precursors, but for the purposes of CEQA analyses, the guidelines indicate that such emissions are included in the emissions inventory that is the basis for regional air quality plans. Therefore, the construction emissions presented in Table 4.3-8 would be consistent with emission inventory estimates and are not expected to impede attainment or maintenance of ozone standards in the Bay Area (BAAQMD, 1999b).

Construction-related emissions are generally short-term in duration. In the BAAQMD Guidelines, PM₁₀ is the pollutant of greatest concern with respect to construction activities (BAAQMD,

1999b). As a result, the approach to CEQA analyses of construction impacts is to emphasize implementation of effective and comprehensive control measures, rather than detailed

**TABLE 4.3-8
WORST-CASE PROJECT CONSTRUCTION EMISSIONS**

Project Construction	Unmitigated Criteria Pollutant Emissions (Lbs/Day)					
	VOC	NO _x	CO	SO ₂	PM ₁₀	PM _{2.5}
Onsite Fugitive Dust	---	---	---	---	80	17
Total Off Road Emissions – 4 th Quarter 2008	170	1,103	1,391	---	43	40
On Road Emissions – 2008	6	83	47	0.16	2	2
Total Emissions	176	1,186	1,438	0.16	125	59

NOTES: Equipment emissions calculated using the Urbemis 8.7 model. The last quarter of 2007 was chosen as the worst case scenario because of the most overlapping earth moving construction activities and the amount of proposed construction equipment at the site during that period as identified by Chevron (Estimated Construction Equipment Counts Table, April 18, 2007). Many of the construction phases overlapped during this quarter. For the onsite fugitive dust worst case scenario, 8 acres were assumed to be disturbed during the peak day of activity using the URBEMIS factor of 10 pounds/acre disturbed. A 20,000 cubic yard import of soil was assumed because a total of 100,000 cubic yards were to be imported over 5 quarters. Assumed usage hours for each piece of equipment were four hours a day, except for the cranes which were assumed to work two hours a day. See Appendix D for the Urbemis output sheet and construction equipment assumptions. PM_{2.5} emissions were estimated using methodology developed by the South Coast Air Quality Management District (SCAQMD, 2006).

quantification of emissions. The BAAQMD has identified a set of feasible PM₁₀ control measures for construction activities. As identified in Mitigation Measure 4.3-1a, Chevron Richmond shall implement the basic control measures identified by the BAAQMD, plus the listed BAAQMD Enhanced and Optional control measures because of the large scope of proposed construction activities.

In some cases, minor modifications have been made to the basic control measures to strengthen the intent of the measures. One of the BAAQMD's enhanced control measures that requires replanting of vegetation in disturbed areas as quickly as possible would not be applicable to the Proposed Project because construction of the Proposed Project would not result in the removal of vegetation; therefore, this enhanced control measure is not included in Mitigation Measure 4.3-1a. Also, one of the BAAQMD's optional control measures, to install wind breaks at the windward side of construction areas, was not determined to be necessary as mitigation given the moderate scope and phased scheduling of the ground disturbance that would be associated with the Proposed Project components. The BAAQMD considers that the basic control measures (based on the size of this project) would reduce the emissions from construction activities to a less-than-significant impact.

Mitigation Measure 4.3-1a: During construction, Chevron Richmond shall require the construction contractor to implement the following dust control procedures to maintain project construction-related impacts at acceptable levels.

Construction contractors shall implement the following dust abatement program to reduce the contribution of Proposed Project construction to local PM₁₀ concentrations. Elements of

this program (in compliance with BAAQMD *CEQA Guidelines*) shall be implemented on days in which the ground is not otherwise damp and shall include the following:

- Water all active construction areas at least twice daily.
- At all times, cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard.
- Pave, gravel-cover, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.
- Sweep daily (with water sweepers) all paved access roads, parking areas and staging areas at construction sites.
- Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.
- Dry mechanical pavement sweeping shall not be allowed.

The following control measures shall be implemented on construction sites greater than four acres in size:

- Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas and previously graded areas inactive for ten days or more.
- Enclose, cover, water twice daily or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.)
- Limit traffic speeds on unpaved roads to 15 mph.
- Install sandbags or other erosion control measures to prevent silt runoff to public roadways.
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph.
- Limit the area subject to excavation, grading and other construction activity at any one time.
- Install wheel-washers for all exiting trucks, or wash off the tires or tracks of all trucks and equipment leaving the site.
- Mitigation Measure 4.3-1a shall be included in the construction bid documents and contracts.

Mitigation Measure 4.3-1b: To mitigate equipment exhaust emissions, Chevron Richmond shall require its construction contractors to comply with the following requirements:

- All diesel-fueled engines used for construction shall be fueled only with ultra-low sulfur diesel, which contains no more than 15 ppm sulfur.
- All construction diesel engines that have a rating of 100 hp or more shall meet, at a minimum, the Tier 2 California Emission Standards for Off-Road Compression-Ignition Engines as specified in California Code of Regulations, Title 13, section 2423(b)(1) unless it is certified by the construction contractor that such engine is not

available for a particular item of equipment. In the event a Tier 2 engine is not available for any off-road engine larger than 100 hp, that engine shall be a Tier 1 engine. In the event a Tier 1 or Tier 2 engine is not available for any off-road engine larger than 100 hp, that engine shall be equipped with a CARB Level 3-verified diesel emission control device (e.g., catalyzed diesel particulate filter), unless the engine manufacturer or the construction contractor certifies that the use of such devices is not practical for specific engine types. In the event that a CARB Level 3 verified diesel emission control device is not practical for the specific engine type, then the engine shall be equipped with a CARB Level 1- or 2-verified control device (e.g., diesel oxidation catalyst), unless the engine manufacturer or the construction contractor certifies that such devices are not available for the engine in question. For purposes of this condition, the use of such devices is “not practical” if, among other reasons:

- (1) There is no available diesel emission control device that has been verified/certified by either the California Air Resources Board or U.S. Environmental Protection Agency for the engine in question; or
 - (2) The construction equipment is intended to be on-site for ten (10) days or less.
 - (3) This requirement may be waived if the construction contractor can demonstrate that it has made a good faith effort to comply with this requirement and that compliance is not possible.
- The use of a diesel emission control device may be terminated immediately if one of the following conditions exists, provided that the City is informed within ten (10) working days of the termination:
 1. The use of the diesel emission control device is excessively reducing normal availability of the construction equipment due to increased downtime for maintenance, and/or reduced power output due to an excessive increase in backpressure.
 2. The diesel emission control device is causing or is reasonably expected to cause significant engine damage.
 3. The diesel emission control device is causing or is reasonably expected to cause a significant risk to workers or the public.
 4. Any other seriously detrimental cause which has the approval of the City prior to the termination being implemented.
 - Construction equipment shall be properly tuned and maintained in accordance with manufacturers' specifications.
 - Best management construction practices shall be used to avoid (or limit) unnecessary emissions (e.g., trucks and vehicles in loading and unloading queues would turn their engines off when not in use, and to the extent practical, all diesel heavy construction equipment shall not remain running at idle for more than five minutes)

- Use alternative fueled equipment when feasible (such as ULSD, CNG, biodiesel, water emulsion fuel, and electric). The construction contracts shall require each contractor and subcontractor to consider this measure and adopt it for their work unless they can demonstrate to Chevron the inapplicability or infeasibility of the measure to their specific work, or can provide mitigation measures with equivalent or better effectiveness. Chevron shall report this information to the City as part of the Mitigation Monitoring Reporting and Compliance Program.
- Use on-site power when feasible to reduce reliance on portable generators. The construction contracts shall require each contractor and subcontractor to consider this measure and adopt it for their work unless they can demonstrate to Chevron the inapplicability or infeasibility of the measure to their specific work, or can provide mitigation measures with equivalent or better effectiveness. Chevron shall report this information to the City as part of the Mitigation Monitoring Reporting and Compliance Program.
- Mitigation Measure 4.3-1b shall be included in the construction bid documents and contracts.

Mitigation Measure 4.3-1c: To mitigate on-road vehicle exhaust emissions, Chevron Richmond shall require its construction contractors to comply with the following requirements:

- Construction worker commuters shall be encouraged to carpool or employ other means to reduce trip generation.
- Shifts shall be staggered to reduce the number of workers arriving and departing the work site at the same time.
- A substantial portion of the construction workforce shall be allowed to avoid the morning and afternoon peak traffic periods.

Significance after Mitigation: Less than Significant

Impact 4.3-2: Operational activities associated with the implementation of the Proposed Project could increase air pollutant emissions. Operational emissions from the Proposed Project would be less than significant with the exception of project-related VOC pollutant emissions, which would be significant and unavoidable.

Chevron proposes to replace and upgrade existing manufacturing facilities at the Refinery to improve reliability, efficiency, and the ability to provide gasoline for local markets using the wide range of sources of crude oil presently being processed at the Refinery. No increases in Refinery consumption of crude oil are planned, although upgrades would expand the Refinery's options for using a wider range of crude oils. The Proposed Project consists of a number of component projects for which Chevron seeks approval from the City of Richmond.

Operating Point Source Emissions

The Proposed Project includes the modification, replacement, and installation of a number of operating emission point sources, including hydrogen reformer furnaces, cooling water towers, duct burners, reformer furnaces, sulfur loading racks, TKN⁴ and polymer feed furnaces, and stack gas heaters. BAAQMD Regulation 9, Rule 10 limits the emissions of nitrogen oxides from existing boilers, steam generators, and process heaters in petroleum refineries to a maximum Refinery-wide average emission rate of 0.033 pounds of NO_x emissions per million British thermal units (BTUs) of fuel burned. The rule does not allow new heaters and boilers to be considered in the Refinery-wide average. When the existing Hydrogen Plant furnaces and Power Plant boilers (which currently operate below the Refinery-wide average emission limit and serve to offset the emissions from the five uncontrolled furnaces) are removed from service, the Refinery would be able to meet the Refinery-wide average emission limit because the burners in the five furnaces would be replaced with low-NO_x burners. See Tables 4.3-9 and 4.3-10 for the NO_x reductions that would result due to Regulation 9, Rule 10 compliance.

Operating Flare Emissions

The Refinery operates and maintains the Flare Relief System and Flare Gas Recovery System for environmentally safe management of process gases during unit startup, shutdown, and emergency upset conditions pursuant to the Refinery's FMP, described above. The Flare Relief System is a network of piping that routes process unit gas discharges to the Flare Gas Recovery System or Refinery flares. The Flare Gas Recovery system collects and recycles process gases from the Flare Relief System in order to minimize or prevent flaring events. Flaring does not occur during normal Refinery operations.

Processing plant equipment is protected by safety relief valves that open automatically to prevent the equipment from exceeding the design pressure in the event of a plant upset or fire. Flare Gas Recovery System compressors operate to minimize or eliminate the amount of gas that is actually burned in the flare. The flares provide for safe disposal of any flammable gases that cannot be recovered. Except for unit startup, shutdown, or major plant upset such as a Refinery wide power outage, process gases are recovered, rather than flared. A gas lit pilot burns continuously to ensure there is always a source of ignition at the flare tips. These systems act as a safety device for mitigation of relief events during unit startup, shutdown, and upset conditions.

Because the Proposed Project would predominately replace or upgrade existing facilities (e.g., Hydrogen Plant Replacement, Catalytic Reformer Replacement, Power Plant Replacement, Hydrogen Purity Improvements, new and replacement storage tanks, Central Control Room, Maintenance Facilities), it is estimated that the Proposed Project would cause minimal or no increase in relief system gas recovery load or flaring events. All Proposed Project facilities and equipment are being designed such that they would not add any load to the Refinery flare in the event of a Refinery-wide power failure, which is the limiting design case for the Refinery flares and related facilities (relief and blowdown systems). Additionally, two unit compressors (K-242/252) would be converted for use as spares in the Flare Gas Recovery System and would

⁴ TKN is a trade name of a process used at the Refinery.

increase system reliability. A summary of Proposed Project relief considerations is provided below.

Catalytic Reformer Replacement

The new Continuous Catalytic Regeneration (CCR) Reformer would replace two older reformer units (No. 4 Rheniformer and No. 5 Rheniformer). In the event of a Refinery-wide power failure, the *relief load* from the new CCR Reformer is estimated to be less than the combined relief load from the two older reformers, thus resulting in a lower total Refinery relief load. The likelihood of flaring due to planned unit shutdown and startup activities would also be reduced because the new CCR Reformer is designed to operate for 5 years between planned outages. The older reformers are typically shutdown every 12 months for catalyst regeneration.

Power Plant Replacement

The new Cogeneration Plant would replace the older No. 1 Power Plant and supplement energy supplied by two other existing cogeneration plants within the Refinery. These cogeneration facilities do not process petroleum feedstocks and therefore do not significantly contribute to the Refinery flare load during a Refinery-wide power failure. Additionally, in replacing the older No. 1 Power Plant, the new Cogeneration Plant would provide an additional source of reliable electrical power that would reduce the likelihood of an upset being caused by a loss of power from PG&E and resultant flaring.

Hydrogen Purity Improvements

The scope of work for the Hydrogen Purity Improvement portion of the Proposed Project consists primarily of new storage tank installations, new equipment, and modifications to existing equipment. As a result, this element of the Proposed Project would not significantly contribute to the Refinery flare load during a Refinery-wide power failure. The Hydrogen Purity Improvements also include installation of a new Acid Gas Scrubber that would reduce the likelihood of flaring if the existing Sulfur Recovery Units (SRUs) shut down due to mechanical breakdown.

Hydrogen Plant Replacement

The new Hydrogen Plant would replace the older existing hydrogen plant (A-train and B-train) within the Refinery. Plant location constraints and relief gas composition require the New Hydrogen Plant to include installation of a new dedicated hydrogen flare in lieu of utilizing the existing South Isomax area flare. The new Hydrogen Plant flare would be utilized during plant startup, shutdown and temporary upset conditions. No flaring would take place during normal operations. Because the older Hydrogen Plant would be decommissioned as part of the Proposed Project, the net impact of new Hydrogen Plant flaring during startup, shutdown or upset conditions is estimated to be insignificant.

The new 195-ft. tall Hydrogen Plant flare would be located within the new Hydrogen Plant site. The new flare would be naturally aspirated and would be designed to have

precursor organic compounds destruction efficiency greater than 98%. Hydrogen Plant flare gas composition is approximately 73% hydrogen, 4% carbon monoxide, 16% carbon dioxide, 6% methane, 1% nitrogen, and 0.2% water. The flare would use natural gas as the pilot fuel and nitrogen as purge gas. Although the pilot would run continuously, the flare itself would operate only during Hydrogen Plant startup and shutdown or during periods of emergency plant upset. Pilot operation would not significantly add to net plant emissions.

Other Components

The remaining Proposed Project components: New and Replacement Storage Tanks, new Control Room, and new Maintenance Facilities have no associated links to any flare.

Operating Fugitive VOC Emissions

Fugitive emissions are generated when process liquids or gases leak from storage tanks, valves, flanges, connectors, pumps, and other devices. Due to the nature of the materials used at the Refinery, these leaks can contain a high percentage of VOCs. The amount of VOCs that are emitted is determined by the number of components that could leak, the type of material in the piping, and the effectiveness of the leak detection and repair programs in place at the Refinery.

New units and process equipment associated with the Proposed Project would emit fugitive VOC emissions from various components including storage tank seals, valves, flanges, connectors (e.g., flanges, couplings), pumps and compressors. Replacement equipment at existing units is expected to have approximately the same number of fugitive components. Additionally, piping changes within and between existing units are not expected to significantly affect the fugitive component count. The total Proposed Project VOC fugitive emissions are estimated to increase by amounts greater than BAAQMD significance thresholds, primarily due to the proposed new and replacement tank component (See Tables 4.3-9 and -10). This impact would be significant.

Operating Mobile Source Emissions

Emissions from motor vehicles can occur as a result of the following types of activities: 1) routine product transport and delivery of materials to the site by truck; 2) personnel commuting; 3) product transport by marine vessels (i.e., tugboats, barges and marine freighters), and 4) product transport via rail cars. Calculations of the emissions are based on the number of trips, distance of travel, and meteorological factors, coupled with accepted emission factors through the use of the CARB EMFAC2007 emissions model or other accepted methods.

The Proposed Project would increase the permanent Refinery workforce by 10 employees. Given that the total volume of crude oil being processed would not change, material transport by marine vessels and/or railroad are not expected to change. Sulfur trucks would increase by 10 trucks/day (i.e., one-way 20 trips) starting in 2008 and liquid oxygen truck deliveries would increase by seven trucks/day (i.e., one-way 14 trips) (Wilbur Smith Associates, 2007). See Tables 4.3-9 and -10 for estimated Proposed Project emissions that would be associated with these mobile sources.

TABLE 4.3-9
TOTAL NET PROJECT DAILY EMISSIONS (pounds per day)

Source	NO _x	SO ₂	CO	PM ^a	VOC
Hydrogen Plant Replacement	-57	-287	335	-70	-11
Power Plant Replacement	-74	9	166	81	5
Catalytic Reformer Replacement	-253	16	117	37	32
Hydrogen Purity Improvements	-20	142	-93	18	29
New and Replacement Storage Tanks	---	---	---	---	89
Central Control Room	NA	NA	NA	NA	NA
Maintenance Facilities	NA	NA	NA	NA	NA
Reg. 9-10 NO _x Reductions	-247	---	---	---	---
Mobile Emissions ^b	42	<1	26	4	2
Total Net Emissions	-609	-120	551	70	146
Threshold	80	-	-	80	80

^a Particulate matter emissions are assumed to be less than one micrometer in diameter. Therefore, PM also represents PM₁₀ and PM_{2.5} emissions.

^b Each sulfur truck round trip was assumed to be approximately 117 miles from Stockton, Martinez, and Fresno and each oxygen round trip was assumed to be approximately 5 miles within Richmond with ambient temperature of 60 F, relative humidity of 50%, and average vehicle speed of 35 using speeds of 15 and 55 mph.

SOURCES: Chevron, 2007a. Revised Emission Estimates for Authority to Construct and Permit to Operate Application for Chevron Richmond Renewal Project, submitted April 18, 2007 (Tables X.a). Chevron Renewal Project Storage Tanks VOC Emissions Estimate, Revised and Updated April 23, 2007. See Appendix D for the point source emission sheets, storage tank emission calculations, and mobile source calculations.

The operational total increase in localized estimated vehicle CO emissions is 26 pounds per day, compared to a significance criterion of 550 lbs/day. As discussed in Section 4.16, *Transportation and Traffic*, impacts on intersections or roadway links at Level of Service (LOS) D, E, or F would be mitigated to less than significant levels and would not cause LOS to decline to D, E, or F. Therefore, the localized impacts of motor vehicle CO emissions associated with the Project would not be considered significant and further analysis is not required.

The CARB has declared that Diesel Particulate Matter (DPM) from diesel engine exhaust is a TAC. Additionally, the California Office of Environmental Health Hazard Assessment has determined that chronic exposure to DPM can cause carcinogenic and non-carcinogenic health effects. However, the total increases in regional estimated vehicle (from material transport) DPM emissions for the Proposed Project would be 4 pounds per day or 0.2 tons per year, a quantity that would not be substantial. Also, as mentioned above, the EPA and CARB have implemented several programs (such as the use of control technologies and idling reduction) that would further reduce the DPM emissions in the future.⁵ The impact of the Proposed Project due to TAC emissions is discussed in Chapter 4.12, *Public Health*.

⁵ The most current information regarding ARB programs to reduce emissions from diesel engines is available at CARB's website at <http://www.arb.ca.gov/diesel/dieselrrp.htm> and <http://www.arb.ca.gov/toxics/idling/idling.htm>.

TABLE 4.3-10
TOTAL NET PROJECT ANNUAL EMISSIONS (tons per year)

Source	NO _x	SO ₂	CO	PM ^a	VOC
Hydrogen Plant Replacement	-10.4	-52.4	61.1	-12.7	-2.1
Power Plant Replacement	-13.5	1.7	30.2	14.8	0.9
Catalytic Reformer Replacement	-46.2	3.0	21.4	6.7	5.9
Hydrogen Purity Improvements	-3.7	26.0	-17.1	3.2	5.4
New and Replacement Storage Tanks	---	---	---	---	16.2
Central Control Room	NA	NA	NA	NA	NA
Maintenance Facilities	NA	NA	NA	NA	NA
Reg. 9-10 NO _x Reductions	-45.1	---	---	---	---
Mobile Emissions	7.7	<0.1	4.8	0.2	0.4
Total Net Emissions ^b	-111.2	-21.7	100.4	12.2	26.7
Threshold	15	-	-	15	15

^a Particulate matter emissions are assumed to be less than one micrometer in diameter. Therefore, PM also represents PM₁₀ and PM_{2.5} emissions.

^b Each sulfur truck round trip was assumed to be approximately 117 miles from Stockton, Martinez, and Fresno and each oxygen round trip was assumed to be approximately 5 miles within Richmond with ambient temperature of 60 F, relative humidity of 50%, and average vehicle speed of 35 using speeds of 15 and 55 mph.

SOURCE: Chevron, 2007a. Revised Emission Estimates for Authority to Construct and Permit to Operate Application for Chevron Richmond Renewal Project, submitted April 18, 2007 (Table X.b). Chevron Renewal Project Storage Tanks VOC Emissions Estimate, Revised and Updated April 23, 2007. See Appendix D for the point source emission sheets, storage tank emission calculations, and mobile source calculations.

Operating Compliance with Applicable Air Quality and Local Plans

The air quality plan applicable to the project area is the Bay Area 2005 Ozone Strategy (Strategy) that was prepared to address air quality issues for the Bay Area region. The Proposed Project would be inconsistent with the Strategy if it would result in population and/or employment growth that exceeds the growth estimates included in the Strategy or if it would not comply with rules and regulations that have been developed as part of the Strategy. The Proposed Project would not lead to population growth and would have an increase in only 10 long-term staff at the project site.

The Proposed Project would comply with all applicable rules and regulations that have been developed as part of the Strategy and City of Richmond and Contra Costa general plans and, as noted below, would follow the BAAQMD CEQA mitigation recommendations. Therefore, the Proposed Project would not impact or obstruct the implementation of the applicable air quality plan.

Summary

Total emissions of NO_x, SO₂, CO, PM, and ROG (as VOC) from Proposed Project operations (daily and annual) and the significance thresholds established by the BAAQMD are presented in Tables 4.3-9 and 4.3-10. These summaries include the Proposed Project operations on-site

stationary source emissions as well as the mobile source (off-site motor vehicle activities) emissions, and compares them to the thresholds of significance. Through the addition of air pollution controls and other concurrent process changes, the net effect of the Proposed Project would be to make substantive reductions of NO_x and SO₂ emissions compared to existing conditions and the net increase of CO and PM emissions would be below the significance thresholds. However, total VOC emissions would be above the BAAQMD significance thresholds. Chevron does not have any available additional contemporaneous emission reduction offsets that could be used to mitigate this significant impact. Therefore, Proposed Project operational emissions of VOC would be significant and unavoidable and emissions of NO_x, SO₂, CO, and PM pollutants would be less than significant.

Mitigation Measure: None available. Because Chevron does not have any available additional contemporaneous VOC emission reduction offsets that could be used to mitigate this significant impact. Therefore, there are no feasible mitigation measures that could reduce this impact to a less than significant level.

Significance after Mitigation: Significant and Unavoidable.

Impact 4.3-3: Alternate phasing of the Proposed Project components could lead to temporary increases in PM emissions greater than significance thresholds. This impact would be reduced to less than significant with implementation of mitigation.

The Proposed Project consists of a number of components. The five main components include Hydrogen Plant Replacement, Power Plant Replacement, Catalytic Reformer Replacement, Hydrogen Purity Improvements, and New and Replacement Storage Tanks. The proposed schedule has two of the five components (Hydrogen Plant Replacement and Hydrogen Purity) beginning construction simultaneously upon completion of the permitting process (fourth quarter 2007). The Catalytic Reformer Replacement component is proposed to start construction in the third quarter of 2008, the Power Plant Replacement component is proposed to start construction in the fourth quarter of 2008, and the first tank construction would start in the second quarter of 2008.

There would be a potential for the Proposed Project to temporarily result in operational emissions greater than the net emissions disclosed in Tables 4.3-9 and 4.3-10 if certain components of the Proposed Project that increase air emissions (i.e., Power Plant Replacement, Catalytic Reformer Replacement, Hydrogen Purity Improvements, and/or New and Replacement Storage Tanks) were to begin operation before the Hydrogen Plant Replacement component, which would provide offsetting emission reductions. The Hydrogen Plant Replacement project would involve the shutdown of existing hydrogen and PSA system, and shutdown of this older, inefficient equipment would reduce emissions at the Refinery. The new Hydrogen Plant would provide important SO_x, PM, and VOC emissions reductions to offset the emission increases that would occur for all of the other Proposed Project components. For example, if the Power Plant Replacement component were to be put into operation before the Hydrogen Plant Replacement

component, the Proposed Project would temporarily result in operational emissions of PM over the BAAQMD's significance threshold of 80 pounds per day.

Therefore, the order of component startups of the new units would not be a concern as long as the new Hydrogen Plant begins operations before or at the same time as the other Proposed Project components. Chevron has discussed this issue with the BAAQMD and has proposed permit conditions that require one of the new Hydrogen Plant trains to begin operations before the Power Plant, Catalytic Reformer, and Hydrogen Purity Improvements start up. It should be noted that Chevron has not yet started the permit process for the New and Replacement Storage Tanks components of the Proposed Project.

Another area of concern would be emissions that would occur during that period of time in which an old unit operates at the same time as the initial commissioning period of its replacement unit. A period of simultaneous operation is needed to minimize impacts on Refinery operations if the new units need to shut down quickly. However, to prevent the Refinery from taking advantage of the brief period of doubled capacity of these units, Chevron is proposing BAAQMD permit conditions that would limit the combined throughput of the old and replacement units to present or future permitted levels. As of the date that this EIR was released, BAAQMD had not yet formally accepted Chevron's proposed permit conditions. Therefore, the following mitigation measure would be imposed by the City of Richmond to ensure that operational phasing of the Proposed Project components occurs as proposed by Chevron.

Mitigation Measure 4.3-3: Chevron shall commence operations of at least one of the new hydrogen trains before operations of the Power Plant, Catalytic Reformer, Hydrogen Purity Improvements, and the New and Replacement Storage Tanks are initiated to ensure that the offsetting emissions reductions associated with the new hydrogen plant are achieved. This shall not preclude the dual operations of the old and new hydrogen plants, or the dual operations of any of the Proposed Project components, as long as the combined throughput of the old and replacement units remain within present or future permitted levels when operated simultaneously during initial commissioning of the replacement units.

Chevron shall prepare periodic reports to the City and shall provide at least 30 days notice on the completion of construction and change in operational status for the new and old Hydrogen Plants, the Power Plant, the Catalytic Reformer, the Hydrogen Purity Improvements, and the New and Replacement Storage Tanks.

Significance after Mitigation: Less than Significant for NO_x, SO₂, CO, and PM. Emissions of VOC would continue to be significant and unavoidable.

Impact 4.3-4: Operational activities associated with the implementation of the Proposed Project could lead to increases in odorous emissions. This would be a less than significant impact.

Chevron proposes to replace and upgrade existing manufacturing facilities at the Refinery to improve the ability to provide gasoline for local markets using the wide range of sources of crude oil presently being processed at the Refinery. No increases in Refinery consumption of crude oil are planned, although upgrades would expand the Refinery's options for using a wider range of crude oils, including the ability to process crude oils with higher sulfur contents. This processing would result in the presence of more Hydrogen Sulfide (H_2S) at the Refinery. H_2S is a sulfur-based odorous compound that can be objectionable at low concentrations in the air.

Within the Hydrogen Purity Improvements, the new Amine Absorber would reduce the concentration of H_2S in the FCC Feed Hydrotreater recycle hydrogen stream, resulting in reduced fugitive emissions of H_2S . The new Amine Regenerator would be located at the SRUs, and the H_2S would be transferred to the SRU area in rich amine solution. In addition, this portion of the project would reduce the flow rate and H_2S content of bleed streams from the high-pressure hydrotreaters. However, there could also be some additional equipment to handle the H_2S feed to the Sulfur Recovery Units. For these reasons, there could be a small increase in fugitive H_2S emissions associated with the Hydrogen Purity Improvements. This increase would be less than BAAQMD H_2S thresholds.

However, odorous emissions associated with storage tanks and other projects within the Proposed Project are expected to be similar to or less than emissions under current conditions. Overall, Chevron anticipates no significant increase in odorous emissions from the Proposed Project and H_2S emissions would be below BAAQMD standards (i.e., 60 ppb for three consecutive minutes and/or 30 ppb for 60 consecutive minutes)(Chevron, 2007a). Between 2000 and 2005, the maximum one-hour concentration of H_2S measured near the Refinery was 75 ppb (at the Castro Street site); there were a total of three consecutive hours at the Castro Street site during August 9, 2003 when the one-hour concentration was equal to the H_2S standard of 30 ppb. Since August 9, 2003, H_2S concentrations associated with the Refinery have not exceeded the one-hour threshold. H_2S concentrations after the Proposed Project would continue to be below applicable thresholds.

Thus, the Proposed Project would not be expected to cause an increase in the Refinery's potential to frequently expose substantial numbers of people to objectionable odors and the odor impact of the Proposed Project would be less than significant.

Mitigation: None required.

4.3.6 Project-Related Greenhouse Gas Emissions

At the present time, there are no rules or regulations in place from the CARB, State Clearinghouse, or other resource agency applicable to the Proposed Project that define a "significant" source of GHG emissions, and there are no applicable facility-specific GHG emission limits or caps. The BAAQMD has noted in its recent comments on a similar refinery project that the BAAQMD has not yet established thresholds for greenhouse gas emissions (BAAQMD, 2007b). And, as of the time of this writing, no air districts within California have

established emission thresholds for determining the significance of GHGs from industrial projects.

Also, while the goal of AB 32 is to reduce in-state GHG emissions to 1990 levels by the year 2020, there is no clear metric that would determine if a single project advances toward or away from this goal. Because global warming is a global issue, a pound of GHGs emitted in California would presumably have the same effect, individually and cumulatively, as a pound of GHGs emitted anywhere else in the world. Whether a single project may or may not result in new GHG emissions would need to consider any change in world-wide GHG emissions that may occur as a result of the project. For example, California is currently importing a substantial portion of its clean fuels from out-of-state refineries. The Proposed Project, while it may increase its direct GHG emissions to produce more California clean fuels, would also likely eliminate GHG emissions associated with the current and projected transportation of clean fuels into California from out-of-state refineries.

An analysis of the Proposed Project's GHG emissions has been developed. The emissions shown in Table 4.3-11 are calculated according to the protocol established by the Registry, and will be reported to the Registry consistently with that protocol. Additionally, the American Petroleum Institute (API) Compendium of Greenhouse Gas (GHG) Emissions Methodologies for the Oil and Gas Industry is used.

Carbon Dioxide

When considering the change in greenhouse gas (carbon dioxide or CO₂) emissions for facilities included in the proposed Renewal Project (with new units projected utilization to be the same as the existing units they would replace) the Proposed Project shows a net reduction in CO₂ emissions of approximately 219,000 metric tons/year. When considering the maximum potential emissions, the Proposed Project shows a net increase in CO₂ emissions of approximately 898,000 metric tons/year. See Table 4.3-11 annual CO₂ emissions that would be associated with the Proposed Project.

Other GHG Emissions

Other GHG emissions (i.e., methane) that would be generated by the Proposed Project are expected to be minimal.

Conclusions

Under CEQA, the purpose of an environmental impact report is to identify the significant environmental effects of a project (if any), to identify alternatives to the project, and to indicate the manner in which those significant effects can be mitigated or avoided. (Public Resources Code § 21002.1(a).) "Significant effect" is defined under CEQA as "a substantial or potentially substantial, adverse change in the environment." (Public Resources Code § 21068.)

TABLE 4.3-11
PROPOSED PROJECT ANNUAL CO₂ EMISSIONS (METRIC TONS PER YEAR)^a

Refinery Sources	Baseline ^b	Expected Utilization ^c		Maximum Potential ^d	
		Post-Project	Change	Post-Project	Change
Hydrogen Plant Replacement	1,264,000	921,000	-343,000	1,962,000	698,000
Power Plant Replacement	173,000	250,000	77,000	274,000	101,000
Catalytic Reformer Replacement	242,000	286,000	44,000	296,000	54,000
Hydrogen Purity Improvements	11,000	13,000	2,000	55,000	44,000
Mobile Emissions ^e	41,000	42,000	1,000	42,000	1,000
Total Emissions from Project Sources ^f	1,731,000	1,512,000	-219,000	2,629,000	898,000

SOURCE: Chevron, 2007b. See Appendix D for the greenhouse gas emission calculations.

- ^a CO₂ emissions were calculated assuming complete conversion of hydrocarbons to CO₂, and emissions are reported in metric tons CO₂/yr (not CO₂-equivalent which includes CH₄, N₂O). Utilization factors were calculated for existing units based on three-year average actual firing rates, and comparing these to permitted levels. Future (post-Renewal Project) CO₂ emissions were estimated using the same utilization rate as the existing combustion sources.
- ^b Actual baseline CO₂ emissions were estimated for facilities and equipment that would be shut down as a result of the Proposed Project. The baseline period used was January 1, 2004 through December 31, 2006.
- ^c The expected utilization compares the actual baseline CO₂ emissions to the estimated CO₂ emissions at the expected future utilization rate. Actual baseline CO₂ emissions were estimated for facilities and equipment that will be shut down as a result of the Renewal Project. The baseline period used was January 1, 2004 through December 31, 2006. Baseline CO₂ emissions were estimated using the three-year average firing rates for affected, existing Refinery combustion sources.
- ^d The maximum potential is provided for informational purposes only. It compares actual baseline CO₂ emissions to the maximum post-project potential emissions. It is not physically possible for Refinery facilities to operate at these maximum post-project potential rates. Refinery operations are kept below these rates by process unit turnarounds other maintenance, and variations in product demand and normal operation.
- ^e CO₂ emissions from truck and commuter auto trips were determined based on the Road Emission Factor Model (EMFAC 2007) developed by the California Air Resources Board and daily vehicle traffic data at the Refinery obtained by the project traffic engineer.
- ^f There would be no indirect emissions associated with electrical use because the Proposed Project would enable the Refinery to self-generate all of the electricity needed for normal operations. Thus, the Refinery would not use electrical power from PG&E.

The state of California has not provided guidance as to significance thresholds for assessing the impact of greenhouse gas emissions on climate change and global warming concerns. Nothing in the CEQA guidelines has yet addressed this issue. The BAAQMD has acknowledged the lack of clear guidance or established methodology to evaluate the impacts of GHGs, noting its understanding that EIR analyses “may not conclude with a significance determination nor require mitigation measures since the District has not yet established thresholds for greenhouse gas emissions.” (BAAQMD, 2006d).

It is not possible to draw conclusions about the significance of Proposed Project impacts on global warming in the absence of established thresholds, and therefore any conclusion about these impacts or their mitigation is premature. In such circumstances, the CEQA Guidelines instruct that the lead agency “should note its conclusion and terminate discussion of the impact.” Guidelines, § 15145. Consequently, aside from noting that the Proposed Project must comply with the rules and regulations ultimately adopted to address GHG emissions, this EIR does not state conclusions about the extent of any impacts or potential mitigation.

References – Air Quality

- Association of Bay Area Governments, Bay Area Air Quality Management District, Metropolitan Transportation Commission, *Proposed Final San Francisco Bay Area Redesignation Request and Maintenance Plan for the National Carbon Monoxide Standard*, July 1994.
- Association of Bay Area Governments, Bay Area Air Quality Management District, Metropolitan Transportation Commission, *San Francisco Bay Area Ozone Attainment Plan for the 1-Hour National Ozone Standard*, June 1999.
- Bay Area Air Quality Management District. 1982. *Regulation 7, Odorous Substances*, last amended March 17, 1982.
- Bay Area Air Quality Management District. 1999a. *Regulation 9 – Inorganic Gaseous Pollutants, Rule 2 – Hydrogen Sulfide*, last amended October 6, 1999.
- Bay Area Air Quality Management District. 1999b. *BAAQMD CEQA Guidelines – Assessing the Air Quality Impacts of Projects and Plans*, December 1999.
- Bay Area Air Quality Management District, *Rules and Regulations, Volumes 1 and 2*
- Bay Area Air Quality Management District (BAAQMD). 2005. BAAQMD Meteorological Data website (<http://www.baaqmd.gov/tec/data/>) Accessed in 2005.
- Bay Area Air Quality Management District, 2006, Ambient Air Quality Standards and Bay Area Attainment Status, http://www.baaqmd.gov/pln/air_quality/ambient_air_quality.htm.
- Bay Area Air Quality Management District. 2006a, *Bay Area 2005 Ozone Strategy*, Adopted January 4, 2006.
- Bay Area Air Quality Management District. 2006b, *Electronic mail from BAAQMD Public Records*, August 3, 2006.
- Bay Area Air Quality Management District, 2006c. *Source Inventory of Bay Area Greenhouse Gas Emissions*. November 2006. Table E-2.
- Bay Area Air Quality Management District, 2007a. Electronic mail communication from James Tomich, BAAQMD, March 20, 2007.
- Bay Area Air Quality Management District. 2006d. Electronic mail communication comments on the Chevron Renewal Project Administrative Draft Environmental Impact Report. December 20, 2006.
- California Air Resources Board. 1998. *California Starts up “Smog Check” for Diesel Trucks and Buses*, June 3, 1998.
- California Air Resources Board (CARB), 2004. *Ambient Air Quality Standards*, <http://www.arb.ca.gov/research/aaqs/aaqs.htm>, updated May 18, 2004.
- California Air Resources Board, 2006a. Climate Change website (<http://www.arb.ca.gov/cc/120106workshop/intropres12106.pdf>) accessed December 1, 2006.
- California Air Resources Board, 2006b. Personal communication with Chuck Shulock by K. Faubion, Attorney for the City of Pittsburg, December 4, 2006).

- California Air Resources Board, 2007 *California Almanac of Emissions and Air Quality*, updated October 5, 2006. <http://www.arb.ca.gov/ei/emissiondata.htm>
- California Air Resources Board. 2007b. Air Quality Data Statistics website. Accessed website (<http://www.arb.ca.gov/adam/welcome.html>) March 5 and April 2, 2007.
- California Energy Commission (CEC), 2006. *Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004*. December 2006.
- South Coast Air Quality Management District (SCAQMD). 2006. Final – Methodology to Calculate Particulate Matter (PM) 2.5 and PM2.5 Significance Thresholds, October 2006.
- Chevron Products Company (Chevron), 2006. Personal communication (e-mail) from Robert Johnston of the Chevron Richmond Refinery, July 31, 2006.
- Chevron. 2007a, *Authority to Construct and Permit to Operate Application for Chevron Richmond Renewal Project*, June 17, 2005 and supplements. Final supplement received April 18, 2007.
- Chevron. 2007b. Chevron Renewal Project, Greenhouse Gas Emissions Estimate, revised on March 13, 2007.
- Chevron. 2007c. *Flare Minimization Plan*, Chevron Products Company – Richmond Refinery revised March 20, 2007.
- Chevron , 2007d. Chevron Renewal Project Storage Tanks VOC Emissions Estimate, Revised and Updated April 23, 2007.
- Western Regional Climate Center, (WRCC), 2005. <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?carchm+sfo>, accessed July 27, 2006.
- Intergovernmental Panel on Climate Change (IPCC), 2001. Climate Change 2001: Working Group I: The Scientific Basis, Section F.5, Table 4; <http://www.grida.no/climate/ipcc%5Ftar/wg1/032.htm#f5>, accessed February 26, 2007.
- Wilbur Smith Associates, *Revised Traffic Impact Analysis for Chevron Renewal Project EIR*, February 22, 2007.

4.4 Biological Resources

The effects related to Biological Resources of the implementation of the Proposed Project would be less than significant.

- Proposed sites for Proposed Project components are within currently developed areas of the operating Refinery that do not provide potential habitat for special status species. Proposed Project components are separated from the San Pablo Bay and salt marsh features by the Refinery operational area and from the San Francisco Bay by Interstate 580. Placement and construction of project components will have no impact on biological resources.
- Potential impacts to special status fisheries could result if additional wastewater or pollutant discharges into the Bay were to occur. The State Implementation Plan and the San Francisco Bay Basin Plan regulate such discharges through NPDES permits, a principal tool used in protection of aquatic sensitive species and other “beneficial uses” of State water resources.
- Potential impacts to special status fisheries could occur with additional water discharges from other non-refinery industrial projects, together with cumulative refinery projects.
- Continued compliance with the discharge requirements of the Refinery’s NPDES permit would reduce potential biological impacts of increased pollutant discharge to less-than-significant levels.

4.4.1 Introduction

This section assesses the potential for the Proposed Project to result in significant adverse environmental impacts to biological resources. The analysis first defines the range of biological resources potentially exposed to effects. Habitats within the Proposed Project area are described in detail as observed on site. In order to identify biological resources within the Project vicinity, available sources of information were reviewed for an approximate five-mile radius surrounding the site. These sources include databases of special status species maintained by federal and state agencies and private sector organizations, biological resource reports, planning documents and wildlife survey results for adjacent areas. The analysis then determines whether and of the Proposed Project components will have a significant impact on biological resources identified by these sources.

4.4.2 Setting

4.4.2.1 Regional and Local Setting

Regional Setting

The Chevron Refinery is located in the City of Richmond in western Contra Costa County (See Figure 3-1). It is found on the San Pablo Peninsula, a feature that at its western extremity (Point San Pablo), combined with opposing Point San Pedro in Marin County, frame the San Pablo Strait, separating San Francisco and San Pablo Bays. These bays are both part of the San Francisco Bay Estuary, the largest estuary on the Pacific Coast of the United States.

This Refinery is located in the Bay Area-Delta Bioregion (as defined by the State's Natural Communities Conservation Program). This Bioregion comprises a variety of natural communities, which range from salt marshes to chaparral to oak woodlands. The high diversity of vegetation found in Contra Costa County is a result of topographic and micro-climate diversity and, combined with the rapid pace of development in the region, has resulted in a high degree of endangerment for local flora and fauna.

Local Setting

The Refinery, covering approximately 2,900 acres, occupies most of the San Pablo Peninsula. The majority of Refinery operations occur in the southeastern portion of this area, while less developed scrub and wooded land covers much of the northwest extension of Refinery lands, and salt marsh and treatment marsh dominate the northeastern area. Within the southern area containing most Refinery operations, storage tanks and other facilities are located on the southeast to northeast slopes of Potrero Hills/San Pablo Peninsula Ridge and processing operations extend into the adjacent lowlands extending beyond the hill's base. Proposed Project components are restricted to and are found throughout this portion of the Refinery (See Figure 3-3). Further reference to the Project Area will be inclusive of this portion of the refinery containing all project components.

The southern boundary of the Proposed Project area is bounded by San Francisco Bay and some residential areas in the southeast. All project components except one (replacement of Tank T-1504) are separated from these features by Interstate-580 (I-580). To the east, the Proposed Project area does not extend beyond Castro Street and is separated from residential areas further east by operational Refinery area, light industry and other uses. To the west and northwest, the Project Area is bounded primarily by open space extending up the San Pablo Peninsula. To the north and northeast of the Project Area are San Pablo Bay and salt marsh areas. Proposed Project components are separated from the bay and salt marsh features by Refinery operational area, much of this comprising the Refinery's water treatment and bioremediation facilities.

4.4.2.2 Existing Site Environment

The habitats within and adjacent to the Proposed Project area were visited and described; "special status" (see below) plants and animals associated with these habitats were researched and

described. All records of these organisms were identified in an approximately 5 mile radius of the Proposed Project area.

An ESA biologist conducted site evaluations on May 25 and November 7, 2005 (for Methods see “Special Status Species” below). This site visit focused on evaluating habitat in the Proposed Project area. Habitat terms in the following analysis are derived from the California Wildlife Habitat Relationships System (“WHR”; CDFG, 2002) and the List of California Terrestrial Natural Communities recognized by the California Natural Diversity Database (CDFG, 2003).

Habitats Within and in the Vicinity of the Project Area

Habitats occurring within the Proposed Project area consist of the following: Barren, Urban, Eucalyptus\Monterey Pine Groves, Coastal Scrub, and Annual Grassland/Ruderal. Generally, these habitats are degraded or are, in the case of the tree groves, the results of former landscaping and naturalization of tree grove plantings.

These habitats continue north of the Proposed Project area, dominating the northern portion of San Pablo Peninsula. Towards the northern extremity of the peninsula (generally north of the Point San Pablo Yacht Harbor; approximately ½ mile north of the northernmost project component), are small areas of Coast Live Oak Woodland, Willow Scrub, Fresh/Brackish Water Marsh, and Northern Coastal Salt Marsh (LSA, 2005). Remnant patches of Coastal Terrace Prairie occur near Point Molate and in the hills above the yacht harbor. These natural areas will not be affected by project components and are sufficiently buffered from them by degraded habitat and distance, and thus are not considered in detail in the following discussion.

North from the base of the peninsula is a relatively extensive area of Northern Coastal Salt Marsh. This marsh area, for the most part owned by Chevron, is separated from the Proposed Project area by the terminus of Wildcat Creek, San Pablo Canal, and the extensive Refinery water treatment facilities, including treatment marsh areas. This habitat will also not be affected by project components and is sufficiently buffered from them by Refinery operational areas, thus will not be considered in detail in the following discussion.

Barren

The most abundant “habitat” type in the Refinery area can be classified as barren using the WHR system. This includes areas with buildings or pavement with less than 2% total herbaceous vegetative cover or less than 10% tree or shrub cover (CDFG, 2002). The developed areas of the operating refinery have, for the most part, been cleared of vegetation and are maintained this way for fire prevention purposes. Scattered ruderal plant species (non-native weedy vegetation) such as ripgut brome (*Bromus diandrus*), wild oat (*Avena* sp.), prickly ox tongue (*Picris echioides*), and wild radish (*Raphanus sativus*) are found occasionally in gravel road shoulders and similar areas.

The barren areas of operating Refinery structures, roadways, and paved surfaces provide little to no habitat for plants or animals. While in theory some urban-adapted birds and other animals could make use of structures for roosts or other purposes, the high and constant amount of

disturbance involved with operations, in addition to the large continuous areas lacking in vegetation and associated food resources, and the numerous barriers to movement are likely to dissuade even occasional use by wildlife.

Urban

Urban habitat generally consists of planted vegetation that includes tree groves, street strips, and other landscaped features in an urban setting. While individual landscaped areas can be of limited habitat value, the overall mosaic can provide habitat of some value to common urban-adapted species such as rock dove (*Columba livia*), mourning dove (*Zenaida macroura*), house sparrow (*Passer domesticus*) and European starling (*Sturnus vulgaris*).

In the Proposed Project area, urban habitat is restricted mainly to strip planting along Castro Street and a few other areas, such as along Channel Street. These areas are probably too limited and isolated to be expected to support wildlife typically found in this setting, although they may provide for occasional use.

Eucalyptus\Monterey Pine Groves

Eucalyptus habitats (Eucalyptus naturalized forest), introduced to California in 1856 and planted or naturalized throughout the state, usually form dense stands and are often monotypic in composition. The most common dominant is blue gum although other species in the genus may be mixed in or may dominate. The understory is often sparse, due in large part to the prolific accumulation of bark and leaf litter with growth-suppressing properties. Nonnative annual grasses, with an assortment of common weedy species such as mustard (*Brassica* spp.) and thistle (e.g. *Centaurea* spp.), may occur in the understory. Native shrubs such as coyote brush (*Baccharis pilularis*), chamise (*Adenostoma fasciculatum*), and California sage (*Artemisia californica*) may occur in the understory in areas where eucalyptus groves have established in native scrub habitat.

Eucalyptus trees and groves can serve as roosts, perches and nest sites for raptors such as red-tailed hawk (*Buteo jamaicensis*) and other birds, including American crow (*Corvus brachyrhynchos*) and barn owl (*Tyto alba*). Developed stands of eucalyptus have potential to serve as overwintering sites for monarch butterflies (*Danaus plexippus*).

In the Proposed Project area, a relatively extensive mixed grove of gum trees and Monterey pine cover much of the northeast face of Tank Farm Hill, generally traversing the Main Tank Field from south to north and also in places along the northeast side of the Main Tank Field. This vegetation type is also found between the Quarry Tank Field and I-580, and in places along the northeast slope of Potero Ridge bordering the northwest extent of the lowland Refinery operating area.

Monterey pines occur along with blue gum in many of these areas and in some places form relatively monotypic groves. Monterey pines are also not native to the region and those that are present are derived from plantings in the past. Wildlife habitat values presented by these may be similar to the blue gum (e.g. roost and nest sites) although generally these trees allow for greater

understory development and corresponding potential for habitat usage by mammals such as mule deer (*Odocoileus hemionus*), raccoon (*Procyon lotor*), and gray fox (*Urocyon cinereoargenteus*).

Birds commonly found in coastal scrub habitat listed below would be expected to be found in understory habitat in these groves.

Coastal Scrub

Coastal scrub in the region of the Proposed Project area comprises coyote brush scrub and California sagebrush scrub. Typically, these plant communities consist of low to medium-sized shrubs, ranging in cover from patchy assemblages to dense, relatively impenetrable continuous cover. An understory ranging from a perennial/subshrub layer to annual grasses and herbs usually is present.

Plant species composition varies regionally and locally (e.g. per differences in exposure). In the area of San Pablo Peninsula dominants include coyote brush, poison oak, toyon (*Heteromeles arbutifolia*), California sagebrush, sticky monkeyflower (*Mimulus aurantiacus*). Invasive shrub species include French broom (*Genista monspessulana*) and pampus grass (*Cortaderia selloana*).

Common wildlife expected in this habitat type includes western fence lizard (*Sceloporus occidentalis*) and a large variety of birds including California quail (*Callipepla californica*), Anna's hummingbird (*Calypte anna*), western scrub jay (*Aphelocoma californica*), Bewick's wren (*Thryomanes bewickii*), and California towhee (*Pipilo crissalis*).

Within the Proposed Project area coastal scrub is present in degraded patches in the areas of tank fields, in the same general areas as noted above for eucalyptus/Monterey pines. Patches that occur are dominated by coyote brush, although pampas grass is a common associate and dominates some patches. Nonnative grassland species usually comprise the understory.

California sagebrush scrub is found near to the Proposed Project area, occurring as the minor component of a patchwork with coyote brush scrub and non-native grassland on the southwest-facing slopes of the Portrero Hills, north of the Quarry Tank Field area and north of the Proposed Project area through to Point San Pablo.

Non-native Grassland/Ruderal Vegetation

This community type comprises a dense to sparse cover of introduced, naturalized grasses associated with numerous species of annual and perennial forbs. The presence of this assemblage of non-native grasses (of Mediterranean and South African origin) is a consequence of permanent alterations to the once widely distributed, pristine perennial bunchgrass grasslands of California. The conversion of native perennial grassland into non-native, predominantly annual species has resulted from a combination of: 1) invasion by alien plant species, 2) changes in the species composition of grazing animals, 3) cultivation, and 4) fire regime.

The dominant grasses grow actively during winter and spring, remain dormant during summer and early fall, and persist only as seed until conditions are favorable for germination. California

annual grassland is common below 3,000 feet throughout most of California, except for the north coastal and desert regions (Holland, 1986).

Common species of the nonnative annual grassland occurring in the Proposed Project area include wild oats, ripgut brome, and Italian ryegrass (*Lolium multiflorum*) and a large assortment of weedy non-native species including mustard (*Brassica* spp.), wild radish, fennel (*Foeniculum vulgare*) and many others. Much of the area within the Proposed Project area where these species occur is very disturbed and generally dominated by the weedy, non-native species. These areas are better considered as covered with ruderal vegetation, generally not considered a plant community type.

Grasslands can provide refuge for reptiles and amphibians such as western fence lizard, southern alligator lizard (*Elgaria multicarinata*), and Pacific chorus frog (*Pseudacris regilla*), and birds including mourning dove and western meadowlark (*Sturnella neglecta*). Grasslands also can be important foraging grounds for aerial and ground-foraging insect eaters such as Myotis bat species and pallid bat (*Antrozous pallidus*). Mammals such as Botta's pocket gopher (*Thomomys bottae*), California ground squirrel (*Spermophilus beecheyi*), and black-tailed jackrabbit (*Lepus californicus*) may forage within annual grasslands. Small rodents attract raptors (birds of prey), including red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), and white-tailed kite (*Elanus leucurus*).

In the Proposed Project area, grassland/ruderal vegetation is found in the tank field areas and in the same general areas as noted for the eucalyptus/Monterey pine groves and coastal scrub. Basically, these areas consist of the tank fields and habitat adjacent to the northern portion of the Proposed Project area. Within the Proposed Project area tank fields, roads and buffer areas adjacent to tanks are generally barren. (The entire Quarry Tank Field is barren with some ruderal vegetation.) Ruderal vegetation covers often extensive areas of the ground adjacent to roads and tank buffers. Patches of grassland occur in these areas and then along with tree groves and scrub in the larger vegetated areas away from tank clusters.

Contra Costa General Plan Significant Ecological Areas

The Contra Costa General Plan (Contra Costa County, 1996) designated Significant Ecological Areas throughout the County. Significant Ecological Areas in general proximity to the Proposed Project vicinity include (numbering corresponds to General Plan listing)¹:

1. Point Pinole. Tidal and freshwater marshes, mudflat, grassland, eucalyptus plantation, and fishing pier which extends ¼ mile into San Pablo Bay. Valuable for migrating waterfowl and shorebirds. Habitat for soft-haired bird's beak, California clapper rail and salt marsh harvest mouse, possibly for black rail, Samuel's song sparrow and white-tailed kite. The eucalyptus plantation serves as resting place for migrating monarch butterflies (about 5 miles north of project area).

¹ While the Proposed Project area is entirely within the City of Richmond and not subject to the Contra Costa County General Plan, these designated areas identify important concentrations and/or habitat for special status species in the project vicinity. Consideration of the Significant Ecological Areas provides a useful context within which to evaluate potential effects to biological resources in areas surrounding the Proposed Project.

2. San Pablo Creek and Wildcat Creek Marshes. This area of marsh is located adjacent to and north of the Refinery. Numerous special status species have been recorded in these marshes (see special status species discussion below).
3. Brooks Island. Tidal marsh, scrub/brushland and coastal prairie grassland. Important stop for migrating waterfowl including Canada goose. Supports a population of California vole with apparent unique genetic features (approximately 3 miles south-southeast of the project area).
4. Hoffman Marsh. Tidal marsh habitat for migrating waterfowl and shorebirds, possibly for California clapper rail and salt marsh harvest mouse. (approximately 4 miles southeast of the project area)
5. San Pablo Ridge. The grassland areas on clay and clay loam soils on San Pablo Ridge support a population of Santa Cruz tarweed which was transplanted from a hillside in Pinole (approximately 4 miles east of the project area).
6. Wildcat creek Canyon. Grassy hillside with riparian woodland along Wildcat Creek. Habitat for ornate shrew, western pond turtle, northern brown skink and possibly for Alameda whipsnake (approximately 6 miles east-southeast of the project area).

Special Status Species

A number of species known to occur in the vicinity of the Proposed Project are protected pursuant to federal and/or state endangered species laws (listed species), or have been designated as species of concern by the U.S. Fish and Wildlife Service (USFWS) or species of special concern by the California Department of Fish and Game (CDFG). In addition, Section 15380(b) of the California Environmental Quality Act (CEQA) Guidelines provides a definition of rare, endangered, or threatened species that are not included in any listing. Species recognized under these terms are collectively referred to as “special status species.”

ESA compiled a list of special status plant and animal species potentially occurring in the general Proposed Project vicinity based on information from the USFWS (USFWS, 2005), CDFG’s California Natural Diversity Data Base (CNDDB, 2005), and the California Native Plant Society’s (CNPS, 2005) Electronic Inventory of Rare and Endangered Vascular Plants. An ESA biologist conducted site habitat evaluations on May 25 and November 7, 2005. All project component locations and adjacent areas were examined. Refinery operational areas were inspected by vehicle. Vegetated areas associated with tank fields were inspected on foot. The buffer areas adjacent to the Refinery Complex were viewed from several vantage points.

Table 4.4-1 provides a focused list of the plants and animals considered in this evaluation, as well as their status, habitat requirements and potential to occur within the Proposed Project area. These are species for which suitable habitat occurs in the Proposed Project vicinity and/or for which there are occurrences documented by CNDDB, generally within a five mile radius. Appendix A provides the full listing, generated by the above sources, of species considered in this evaluation.

Special Status Plants and Wildlife

No special status plant or animal species are considered to have potential to occur in the Proposed Project area. Except for a few tank locations, Proposed Project components occur in barren operational areas of the Refinery and are surrounded by such. Tank components are also located in and surrounded by Refinery operational area (tank fields), but ground cover in tank fields includes barren ground, ruderal vegetation, degraded grassland and scrub, and eucalyptus and Monterey pine groves.

Areas in the vicinity of the Proposed Project that potentially provide habitat to special status species include the Wildcat Marsh/Chevron Treatment Marsh areas north of the Proposed Project area, vegetated portions of the San Pablo Peninsula northwest and west of the Proposed Project area, and aquatic habitat of the San Pablo and San Francisco Bays.

Wildcat Marsh and Chevron Treatment Marsh Areas

The final stretch of Wildcat Creek and its confluence with San Pablo Bay largely separates Chevron Treatment Marsh areas from the northern coastal salt marsh habitat of Wildcat Marsh. The marsh provides potential habitat for a relatively large number of special status species for the most part restricted to this habitat type. Species that have been observed in the marsh (CDFG, 2005) include the federal and State endangered salt-marsh harvest mouse (*Reithrodontomys raviventris raviventris*) and California clapper rail (*Rallus longirostris obsoletus*), the State endangered and federal species of concern California black rail (*Laterallus jamaicensis coturniculus*), the federal species of concern San Pablo song sparrow (*Melospiza melodia samuelis*), and white-tailed kite (*Elanus leucurus*), and the State species of concern northern harrier (*Circus cyaneus*), San Pablo vole (*Microtus californicus sanpabloensis*), and short-eared owl (*Asio flammeus*). The marsh provides potential habitat for soft bird's beak (*Cordylanthus mollis* ssp. *mollis*), primarily found east of Carquinez Strait. A population recorded on the north shore of Point Pinole, about five miles north of the Proposed Project area, is the most southwestern of the known occurrences of the species.

Proposed Project components in the northeast portion of the Proposed Project area are located approximately 0.4 miles from the marsh and separated from it by Refinery operational area, and further by Chevron treatment marsh areas and storage basins. The treatment marsh areas have the potential to be occasionally used by some of these species, but it is unlikely. Relatively intensive bird surveys in the treatment marsh areas between 1994-2004 yielded no sightings of special status avian species (Chevron, 2004). Occurrence of these species in the operation areas of the Refinery, including all Proposed Project component areas, is highly unlikely.

San Pablo Peninsula (Northern and Western Portions)

Certain vegetated areas of San Pablo Peninsula northwest of the project area contains potential nesting habitat for Cooper's hawk (*Accipiter cooperi*) and various other raptors. Cooper's hawk prefers dense stands of live oak, riparian deciduous or other forest habitats near water. No appropriate habitat occurs in the vicinity of the Proposed Project area although potential habitat occurs towards the northern end of the peninsula. Tall trees in the vicinity of the tank fields may provide roosting or nesting habitat for other raptors, such as red-tailed hawk.

Loggerhead shrike (*Lanius ludovicianus*), a federal and State species of concern, forages and nests in grassland and adjacent shrubs. Potential habitat for this species occurs north and west of the Proposed Project area in less disturbed portions of the peninsula.

Burrowing owl (*Athene cunicularia hypugaea*), another federal and State species of concern, are found in low, open grasslands where large rodent burrows are available for nesting. Grassland areas throughout the peninsula provide potential habitat, including the degraded grassland areas associated with the tank fields. However the species has not been recorded from San Pablo Peninsula and ESA did not observe ground squirrel activity or potential suitable burrows in the vicinity of Proposed Project components in the tank field areas.²

Groves of blue gum and eucalyptus adjacent and extending into some of the tank field areas may provide potential wintering sites Monarch butterfly (*Danaus plexippus*), although no wintering sites have been reported on the peninsula.

A nesting colony of the State species of concern (protected rookery sites) Double-crested cormorant (*Phalacrocorax auritus*) occurs on the eastern portion of the Richmond-San Rafael Bridge. Individual birds may make occasional use of Proposed Project area trees in the vicinity of the bridge's base (e.g. along the southern edge of the Quarry Tank Field) but the trees are not suitable for nesting and the areas around the trees lack in foraging habitat (ESA file information and observations).³

Bats, including the federal and State species of concern Townsend's western big-eared bat (*Corynorhinus townsendii townsendii*) and greater western mastiff bat (*Eumops perotis californicus*) may roost in abandoned buildings or in suitable trees found on the peninsula. None of the structures slated for removal provide potential roosting habitat. Trees in the vicinity of tank field areas may provide potential roosting sites.

Fragrant fritillary (*Fritillaria lilacae*) is known in the Proposed Project vicinity by a historical record from Point Richmond, about one mile south of project limits. Potential habitat may occur in undisturbed areas further north on the San Pablo Peninsula but none is found within the Proposed Project area.

All of the special status species listed above are very unlikely to occur in the Proposed Project area. Trees found along the periphery of some of tank fields may provide marginally potential nesting or roosting habitat, but no suitable trees are associated with tank areas that are Proposed Project components. The scrub and grassland habitat that does occur in tank field areas is degraded and of low potential for use by the above special status species. Scrub habitat is lacking from the areas of Proposed Project component tanks.

Special Status Species in San Pablo Bay and San Francisco Bay

² An ESA biologist conducted site evaluations on May 25 and November 7, 2005.

³ *Ibid.*

A number of special status fish species have potential to occur in the waters and brackish marshes adjacent to the Refinery. Many species of fish migrate through San Francisco Bay and San Pablo Bay waters, make use of marshes in the area for foraging and rearing habitat, and may make use of Wildcat Creek for foraging, spawning, and rearing habitat. Species that occur in the area include several runs of chinook salmon (*Oncorhynchus tshawytscha*; federal and State endangered winter run, federal and state threatened fall/late-fall run, and federal candidate spring-run), two federally threatened steelhead trout (*Oncorhynchus mykiss* and *O. mykiss irideus*), and the following federal species of special concern: green sturgeon (*Acipenser medirostris*) and longfin smelt (*Spirinchus thaleichthys*). These species are all migratory and any one species is only present in the area for relatively short periods of time during the year.

Wetlands

Wetlands are ecologically productive habitats that support a rich variety of both plant and animal life. The importance and sensitivity of wetlands has increased as a result of their value as recharge areas and filters for water supplies and widespread filling and destruction to enable urban and agricultural development. In a jurisdictional sense, there are two definitions of a wetland, one adopted by most federal agencies and a separate definition adopted by the State of California. Both are presented below.

Federal Wetland Definition

Wetlands are a subset of “waters of the United States” and receive protection under Section 404 of the Clean Water Act (CWA). The term “waters of the United States”, as defined in the Code of Federal Regulations (33 CFR 328.3[a] and [b]; and 40 CFR 230.3[s]), includes those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. In extant regulations, wetlands may be taken to be sloughs, wet meadows, or natural ponds; however, in 2001 the Supreme Court of the United States ruled⁴ that certain isolated wetlands do not fall under the jurisdiction of the CWA.

California Wetland Definition

California agencies generally rely on the CDFG definition of wetlands which is based upon that developed by Cowardin *et al.*⁵ The federal definition of wetlands described above requires three wetland identification parameters to be met, whereas the CDFG definition requires the presence of only one. Thus, identification of wetlands by CDFG consists of the presence of one of the following indicators:

- all areas that are periodically inundated or saturated, or
- in which at least seasonal dominance by hydrophytes may be documented, or
- in which hydric soils are present.

⁴ *Solid Waste Agency of Northwestern Cook County v. United States Army Corps of Engineers et al.*, January 8, 2001:

⁵ Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. US Fish and Wildlife Service, Office of Biological Services, Washington, D.C. Publ. No. FWS/OBS-79/31.

**TABLE 4.4-1
FOCUSED LIST OF SPECIAL STATUS SPECIES WITH POTENTIAL TO OCCUR IN OR NEAR THE
CHEVRON REFINERY**

Common Name <i>Scientific Name</i>	Listing Status USFWS/ CDFG/CNPS	General Habitat	Potential to Occur
Federal or State Threatened and Endangered Species			
Fish			
Tidewater goby <i>Eucyclogobius newberryi</i>	FE/CSC	Shallow waters of bays and estuaries, in lower stream reaches, in coastal stream lagoons	Low. Thought to be extirpated from San Francisco Bay (Moyle 2002)
Delta smelt <i>Hypomesus transpacificus</i> Critical Habitat designated	FT/CT	Shallow, open waters of the estuary where salinities range from 2-7 ppt. Spawn and rear in sloughs and shallow edge waters of channels in upper Delta and Sacramento River, Suisun Marsh and Bay.	Low. Generally restricted to the Sacramento-San Joaquin Delta, including the Carquinez Strait and Suisun Bay. Not found westward of Carquinez bridge, except occasionally during extremely wet years.
Coho salmon – Central California coast ESU <i>Oncorhynchus kisutch</i> Critical Habitat designated	FE/CE	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. Although within the historical range of the species, coho are currently considered extinct in the San Francisco Bay/Sacramento – San Joaquin River system.
Steelhead – Central California Coast ESU <i>Oncorhynchus mykiss irideus</i> Critical Habitat designated	FT/CSC	Unblocked Bay Area and coastal rivers and streams, requires clear, cool water and clean gravels for spawning	High. These fish are known to spawn in streams tributary to San Francisco and San Pablo Bays
Steelhead – Central Valley ESU <i>Oncorhynchus mykiss</i> Critical Habitat designated	FT/--	Spawn in the Sacramento and San Joaquin Rivers and their tributaries	High. Migrate through San Francisco, San Pablo, and Suisun Bays, as well as the Delta region to spawning grounds
Chinook salmon – Central Valley spring-run <i>Oncorhynchus tshawytscha</i>	FT/CT	Spawning and rearing restricted to a few tributaries to the Sacramento River basin.	High. Migrate through San Francisco Bay and Sacramento-San Joaquin Delta to spawning streams
Chinook salmon – Central Valley fall/late fall-run <i>Oncorhynchus tshawytscha</i>	FC/CSC	Spawning and rearing restricted to lowland reaches and tributaries to the Sacramento River basin, require clean, cold water and gravel beds for spawning	High. Migrate through San Francisco Bay and Sacramento-San Joaquin Delta to spawning grounds
Chinook salmon – winter run <i>Oncorhynchus tshawytscha</i> Critical Habitat designated	FE/CE	Spawning restricted to the Sacramento River. Require clean, cold water with gravel beds.	High. Migrate through San Francisco Bay and Sacramento-San Joaquin Delta to spawning streams
Amphibians			
California red-legged frog <i>Rana aurora draytonii</i>	FT/CSC	Breeds in stock ponds, pools, and slow moving streams with emergent vegetation; adjacent upland habitats are often used outside the breeding season.	Low. No suitable habitat in the Project Area; suitable habitat lacking on San Pablo Peninsula.

TABLE 4.4-1 (continued)
FOCUSED LIST OF SPECIAL STATUS SPECIES WITH POTENTIAL TO OCCUR IN OR NEAR THE CHEVRON REFINERY

Common Name <i>Scientific Name</i>	Listing Status USFWS/ CDFG/CNPS	General Habitat	Potential to Occur
Birds			
California black rail <i>Lateralus jamaicensis coturniculus</i>	FSC/CT 3511	Nests and forages in tidal emergent wetland with pickleweed.	Low. High potential to occur in Wildcat Marsh, where it has been recorded. Refinery operations between project components and habitat are intensive enough to effectively exclude potential for occurrence in Project Area.
California clapper rail <i>Rallus longirostris obsoletus</i>	FE/CE 3511	Nests and forages in emergent wetlands with pickleweed, cordgrass, and bulrush.	Low. High potential to occur in Wildcat Marsh, where it has been recorded. Refinery operations between project components and habitat are intensive enough to effectively exclude potential for occurrence in Project Area.
Mammals			
Salt marsh harvest mouse <i>Reithrodontomys raviventris raviventris</i>	FE/CE 3511	Saline emergent marshlands with dense pickleweed.	Low. High potential to occur in Wildcat Marsh, where it has been recorded. Refinery operations between project components and habitat are intensive enough to effectively exclude potential for occurrence in Project Area.
Plants			
Soft bird's beak <i>Cordylanthus mollis</i> ssp. <i>mollis</i>	FE/CR/List 1B	Soft-haired bird's beak is found in heavy clay soils of either coastal salt or brackish marshes of northern San Francisco Bay.	Low. Slight potential habitat in Wildcat Marsh, but species occurs mostly east of Carquinez Straits. Project Area well buffered from marsh area by refinery operational area.
Other Species of Concern			
Invertebrates			
Monarch butterfly <i>Danaus plexippus</i>	Wintering sites protected by CDFG	Eucalyptus groves used as winter roost sites.	Low. Wintering roosts are found at Point Pinole, about 5 mi north of Project Area. Eucalyptus groves at tank farm margins present potential roosting habitat. Species has not been observed on San Pablo Peninsula.
Fish			
Green sturgeon <i>Acipenser medirostris</i>	FP/--	Estuaries, lower reaches of large rivers, and salt or brackish water off river mouths, spawn in deep, fast water.	High. Known to spawn in the Sacramento River drainage, juveniles outmigrate through San Francisco Estuary. Uncommon in the in the Sacramento-San Joaquin system.

TABLE 4.4-1 (continued)
FOCUSED LIST OF SPECIAL STATUS SPECIES WITH POTENTIAL TO OCCUR IN OR NEAR THE
CHEVRON REFINERY

Common Name <i>Scientific Name</i>	Listing Status USFWS/ CDFG/CNPS	General Habitat	Potential to Occur
Fish (cont.)			
Sacramento splittail <i>Pogonichthys macrolepidotus</i>	FSC/--	Slow moving rivers, dead end sloughs, require flooded vegetation for spawning and foraging for young	Low. Spawn in freshwater in the lower Delta. Once common in San Pablo Bay and Carquinez Strait following high winter flows, now largely confined to the Delta, Suisun Bay, Suisun Marsh, Napa River, Petaluma River, and other parts of the Sacramento-San Joaquin Estuary.
Longfin smelt <i>Spirinchus thaleichthys</i>	FSC/--	Open waters of estuaries. Spawn in freshwater streams from February to April. Larval rearing habitat consists of brackish estuarine waters.	Moderate. Spawn in lower San Joaquin and Sacramento Rivers and upper Suisun Bay. Larval concentrations high in Suisun and San Pablo Bays.
Birds			
Cooper's hawk <i>Accipiter cooperi</i>	--/* (nest sites)	Nests in woodlands, primarily near riparian areas	Low. Suitable habitat not in or adjacent to Project Area. Observed on San Pablo Peninsula (LSA, 2005).
Short-eared owl <i>Asio flammeus</i>	--/CSC	Fresh water and salt marshes and swamps, lowland meadows, irrigated fields	Low. High potential to occur in Wildcat Marsh, where it has been recorded. Refinery operations between project components and habitat are intensive enough to effectively exclude potential for occurrence in Project Area.
Western burrowing owl <i>Athene cunicularia hypugaea</i>	FSC/CSC	Nests in mammal burrows in open, sloping grasslands	Low. Potential habitat in grassy areas by tank fields but no burrows or ground squirrel activity observed; not known to occur on San Pablo Peninsula.
Northern harrier <i>Circus cyaneus</i>	--/CSC	Nests on ground in shrub vegetation, usually at the edge of salt or freshwater marsh.	Low. High potential to occur in Wildcat Marsh, where it has been recorded. Refinery operations between project components and habitat are intensive enough to effectively exclude potential for occurrence in Project Area.
White-tailed kite <i>Elanus leucurus</i>	FSC/-- 3511	Nests near wet meadows and open grasslands, dense oak, willow or other large tree stands, forages over grassland and marsh habitat	Low. High potential to occur in Wildcat Marsh, where it has been recorded. Refinery operations between project components and habitat are intensive enough to effectively exclude potential for occurrence in Project Area.
Saltmarsh common yellowthroat <i>Geothlypis trichas sinuosa</i>	FSC/CSC	Breeds in moist saltmarsh habitats and willow thickets with dense, low cover.	Low. Potential habitat in Wildcat Marsh and at north end of San Pablo Peninsula, but not in Project Area.

TABLE 4.4-1 (continued)
FOCUSED LIST OF SPECIAL STATUS SPECIES WITH POTENTIAL TO OCCUR IN OR NEAR THE CHEVRON REFINERY

Common Name <i>Scientific Name</i>	Listing Status USFWS/ CDFG/CNPS	General Habitat	Potential to Occur
Birds (cont.)			
Loggerhead shrike <i>Lanius ludovicianus</i>	FSC/CSC	Nests in shrublands and forages in open grasslands	Low. High potential to occur in scrub vegetation north and west of Project Area, but shrub and grassland areas likely too degraded in tank field areas to provide adequate nesting/foraging habitat.
Alameda song sparrow <i>Melospiza melodia pusillula</i>	FSC/CSC	Endemic to San Francisco Bay Estuary. Found in pickleweed marshes, nests in low shrubs (<i>Grindelia</i> bushes) and pickleweed above high tide extent	Low. Wildcat Marsh contains potential habitat. 1940 collection from vicinity of Pt. Richmond (northern most record of species in CNDDDB).
San Pablo song sparrow <i>Melospiza melodia samuelis</i>	FSC/--	Endemic to tidal marshes of San Pablo Bay.	Low. High potential to occur in Wildcat Marsh, where it has been recorded. Refinery operations between project components and habitat are intensive enough to effectively exclude potential for occurrence in Project Area.
Double-crested cormorant <i>Phalacrocorax auritus</i>	--/CSC (Rookery sites)	Nests along coast on isolated islands or in trees along lake margins or on bridges. Forage inland on lakes, ponds, and estuaries	Moderate. Nesting colony occurs on Richmond-San Rafael Bridge. Has potential to roost in trees near southern tank locations but areas lack in foraging habitat.
Mammals			
Bats including Townsend's western big-eared bat <i>Corynorhinus townsendi townsendi</i> Greater western mastiff bat <i>Eumops perotis californicus</i> Also several <i>Myotis</i> spp.	FSC/CSC	Various habitats; roosting sites include buildings and other man-made structures and trees.	Low to Moderate. Abandoned structures in northern portion of peninsula provide potential roosting sites, but Project Area structures of marginal potential. Some trees at tank field periphery may provide potential roost sites.
San Pablo vole <i>Microtus californicus sanpabloensis</i>	--/CSC	Grassy habitats associated with salt-marshes.	Low. High potential to occur in Wildcat Marsh, where it has been recorded. Refinery operations between project components and habitat are intensive enough to effectively exclude potential for occurrence in Project Area.

TABLE 4.4-1 (continued)
FOCUSED LIST OF SPECIAL STATUS SPECIES WITH POTENTIAL TO OCCUR IN OR NEAR THE
CHEVRON REFINERY

Common Name Scientific Name	Listing Status USFWS/ CDFG/CNPS	General Habitat	Potential to Occur
Mammals (cont.)			
Salt marsh wandering shrew <i>Sorex vagrans halicoetes</i>	FSC/CSC	Salt marsh habitat 6-8 feet above sea level, with abundant pickleweed and driftwood.	Low. Wildcat Marsh presents potential habitat. Has been recorded from San Pablo Creek marsh, about 1 mi north. Refinery operations between project components and habitat are intensive enough to effectively exclude potential for occurrence in Project Area.
Plants			
Fragrant fritillary <i>Fritillaria liliacea</i>	--/--/1B	In coastal scrub, grassland, and coastal prairie, often associated with serpentine substrate.	Low. Historic record (1900) from Pt. Richmond, about 1 mile south of Project Area limits. Habitat not present in Project Area. Potential habitat (remnant prairie) in northern portions of the peninsula.

Sensitive Plant Communities

Name	Global Rank	State Rank	Occurrence
Northern coastal salt marsh	G3	S3.2	Wildcat Marsh north of Project Area is this community type.

STATUS CODES:

Federal Categories (U.S. Fish and Wildlife Service):

FE = Listed as Endangered by the Federal Government

FT = Listed as Threatened by the Federal Government

FP = Proposed for Federal Listing

FC = Candidate to be Proposed for Federal Listing

FSC = Federal Species of Concern

California Native Plant Society (CNPS)

List 1B = Plants rare, threatened, or endangered in California and elsewhere

State Categories (California Department of Fish and Game):

CE = Listed as Endangered by the State of California

CT = Listed as Threatened by the State of California

CR = Listed as Rare by the State of California

3511 = Fully Protected Species

* = Special Animals

CSC = California Species of Special Concern

**The Nature Conservancy (TNC) – Global Heritage Program rarity ranks
(for sensitive plant communities)**

G3: 21-100 viable occurrences worldwide and/or 10,000-50,000 acres

Threat Ranks

0.2: Threatened

State Rarity Ranks:

S3: 21-100 viable occurrences statewide and/or 10,000-50,000 acres

SOURCES: CNDDB, 2005; CNPS 2005 Garth and Tilden, 1986; Good, et al, 2005; Hickman, 1993; Jameson, 1988; Moyle, 2002; NMFS, 2005a, 2005b; Nur, 2002; Page and Burr, 1991; Peterson, 1990; Stebbins, 1985; USFWS, 1994, 2005.

Jurisdictional Wetlands at the Project Site

There are no jurisdictional or isolated wetlands in the Proposed Project area. Some Proposed Project components occur within 200-300 feet of the Bay (Tanks T-1504 and T-3140) and are separated from the bay by developed Refinery area. There are potentially jurisdictional drainages within the tank field areas, but none were observed in the vicinity of Proposed Project components.

4.4.2.3 Regulatory Setting

This section briefly describes federal, state and local regulations, permits, and policies pertaining to biological resources and wetlands as they may apply to the Proposed Project.

U.S. Army Corps of Engineers and U.S. Environmental Protection Agency Regulation of Waters of the United States, Including Wetlands

The Corps and US EPA regulate the discharge of dredged or fill material into waters of the United States, including wetlands, under Section 404 of the Clean Water Act. Projects that would result in the placement of dredged or fill material into waters of the United States require a Section 404 permit from the Corps. The Proposed Project activities would not result in the discharge of fill into wetland areas under jurisdiction of the Corps.

California Department of Fish and Game Streambed Alteration Agreement

The 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. These activities are regulated under the California Fish and Game Code Sections 1600-1616. 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 fisheries resources, and measures to restore degraded sites or compensate for permanent habitat losses. A Streambed Alteration Agreement may be required by CDFG for construction activities that *could* result in an accidental release into a jurisdictional area. Construction is not proposed in areas that are subject to Sections 1600-1616, nor would Proposed Project construction activities potentially affect any nearby areas subject to Sections 1600-1616.

Federal Endangered Species Act

The USFWS (jurisdiction over plants, wildlife, and resident fish) and National Marine Fisheries Service (NMFS; jurisdiction over anadromous fish and marine fish and mammals) oversee the federal Endangered Species Act (ESA). Section 7 of the Act mandates that all federal agencies consult with the USFWS and NMFS to ensure that federal agencies actions do not jeopardize the continued existence of a listed species or destroy or adversely modify critical habitat for listed species. The federal agency is required to consult with the USFWS and NMFS if it determines a “may affect” situation will occur in association with the proposed project. The federal ESA

prohibits the “take⁶” of any fish or wildlife species listed as Threatened or Endangered, including the destruction of habitat that could hinder species recovery.

Under Section 9 of the federal ESA, the take prohibition applies only to wildlife and fish species. However, Section 9 does prohibit the removal, possession, damage or destruction of any Endangered plant from federal land. Section 9 also prohibits acts to remove, cut, dig up, damage, or destroy an Endangered plant species in nonfederal areas in knowing violation of any state law or in the course of criminal trespass. Candidate species and species that are proposed or under petition for listing receive no protection under Section 9 of the federal ESA.

Section 10 of the federal ESA requires the issuance of an “incidental take” permit before any public or private action may be taken that would potentially harm, harass, injure, kill, capture, collect, or otherwise hurt (i.e., take) any individual of an Endangered or Threatened species. The permit requires preparation and implementation of a habitat conservation plan that would offset the take of individuals that may occur, incidental to implementation of the project by providing for the overall preservation of the affected species through specific mitigation measures.

Federal Migratory Bird Treaty Act

The Migratory Bird Treaty Act states that without a permit issued by the U.S. Department of the Interior, it is unlawful to pursue, hunt, take, capture, or kill any migratory bird.

California Endangered Species Act

California implemented its own Endangered Species Act (CESA) in 1984. The state act prohibits the take of Endangered and Threatened species; however, habitat destruction is not included in the state’s definition of take. Section 2090 of CESA requires state agencies to comply with endangered species protection and recovery and to promote conservation of these species. The CDFG administers the act and authorizes take through Section 2081 agreements (except for designated “fully protected species”).

Regarding rare plant species, CESA defers to the California Native Plant Protection Act of 1977, which prohibits importing of rare and endangered plants into California, taking of rare and endangered plants, and selling of rare and endangered plants. State-listed plants are protected mainly in cases where state agencies are involved in projects under CEQA. In this case, plants listed as rare under the California Native Plant Protection Act are not protected under CESA but can be protected under CEQA.

California Fish and Game Code

Section 3503.5 of the California Fish and Game Code prohibits the removal or take of raptor nests. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered take.

⁶ Take is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct.

State Lands Commission

The State Lands Commission (SLC) 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 SLC issues Land Use Leases or Land Use 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. No Proposed Project components are on lands subject to a State Land Use Lease.

Regional Water Quality Control Board

The federal Clean Water Act requires that the discharge of dredged or fill material into waters of the United States does not violate state water quality standards. Applicants for Section 404 or Section 10 permits must obtain a certification from the state.

Pursuant to the Porter-Cologne Act, each of California's nine regional boards must prepare and periodically update basin plans that set forth water quality standards for surface and groundwater, as well as actions to control nonpoint and point sources of pollution to achieve and maintain these standards. Basin plans offer an opportunity to achieve wetlands protection based on water quality standards. Water quality for the area including the Refinery is under the jurisdiction of the San Francisco Regional Water Quality Control Board (RWQCB).

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), last revised in 1995. 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 Regional Board's other activities include permitting of waste discharges, and implementing monitoring programs of pollutant effects. For more information about the State and Regional Board regulations and permits that affect the Proposed Project, see Section 4.9, *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 San Pablo Bay and a shoreline band that extends inland 100 feet from the high tide line. BCDC permits would be required for any work within either the Bay or the shoreline band. No work in these areas is proposed as part of the Proposed Project.

Contra Costa County General Plan Policies

Contra Costa County set forth a number of natural resource policies in the County's General Plan (1996) that may be pertinent to the activities in the Proposed Project vicinity. In particular, the General Plan designated Significant Ecological Areas throughout the County and a number of

policies that relate to them. Six of these areas occur in general proximity to the Proposed Project area (see 4.4.2.2 *Existing Site Environment*). Therefore, to the extent that the Proposed Project could have an effect on one or more of the County's Significant Ecological Areas, this EIR will take into account the County's pertinent General Plan policies, even though the County's General Plan does not apply to the Proposed Project, which is entirely within the City of Richmond.

Policy 8-8: Significant ecological resource areas in the County shall be identified and designated for compatible low-intensity land uses. Setback zones shall be established around the resource areas to assist in their protection.

Policy 8-10: Any development located or proposed within significant ecological areas shall ensure that the resource is protected.

Policy 8-11: The County shall utilize performance criteria and standards which seek to regulate uses in and adjacent to significant ecological resource areas.

Policy 8-17: The ecological value of wetland areas, especially the salt marshes and tidelands of the bay, shall be recognized. Existing wetlands in the County shall be identified and regulated. Restoration of degraded wetlands shall be encouraged and supported whenever possible.

Policy 8-23: Runoff of pollutants and siltation into marsh and wetland areas from outfalls serving nearby urban development shall be discouraged. Where permitted, development plans shall be designed in such a manner that no such pollutants and siltation will adversely affect the value or function of wetlands. In addition, berms, gutters or other structures should be required at the outer boundary of the buffer zones to divert runoff to sewer systems for transport out of the area.

Policy 8-25: The County shall protect marshes, wetlands, and riparian corridors from the effects of potential industrial spills.

Policy 8-91: Grading, filling, and construction activity near watercourses shall be conducted in such a manner that will minimize impacts from increased runoff, erosion, sedimentation, biochemical degradation, or pollution.

City of Richmond General Plan

The 1994 Richmond General Plan is the community's long-range planning document that contains goals and policies intended to guide development within the City. The project site is designated by the General Plan for Light Industry use. The Open Space Element of the General Plan contains the following specific goals that are applicable to the proposed project and relevant to the protection of biological resources:

OSC-B.1: Discourage filling, dredging, and/or development that would have a significant adverse impact on the biological productivity or aesthetic character of the physical features of the area.

OSC-B.2: Require mitigation measures to avoid any detrimental impacts of development on the biological productivity or aesthetic character of open water, marsh, mudflat, or tideland.

4.4.3 Significance Criteria and Discussion of No Impacts

Significance Criteria

Conclusions regarding the significance of impacts on vegetation and wildlife resources are based on criteria in the California Environmental Quality Act (CEQA). See Section 4.4.2.3, *Regulatory Setting* for additional discussion of the regulatory controls regarding this Proposed Project.

To determine the level of significance of an identified impact, the criteria outlined in the CEQA Guidelines were used. The following is a discussion of the approaches to, and definitions of, significance of impacts to biological resources, drawn from several distinct sections of the Guidelines.

- CEQA Guidelines Section 15065 directs lead agencies to find that a project may have a significant effect on the environment if it has the potential to substantially reduce the habitat of a fish and wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or reduce the number or restrict the range of an endangered, rare or threatened species.
- CEQA Guidelines Section 15206 further specifies that a project shall be deemed to be of statewide, regional, or area-wide significance if it would substantially affect sensitive wildlife habitats including, but not limited to, riparian lands, wetlands, bays, estuaries, marshes, and habitats for rare and endangered species as defined by Fish and Game Code Section 903.
- CEQA Guidelines Section 15380 further provides that a plant or animal species, even if not on one of the official lists, may be treated as “rare or endangered” if, for example, it is likely to become endangered in the foreseeable future.
- CEQA Guidelines Section 15382 includes in the definition of Significant Effect on the Environment “...a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project,” including flora or fauna.

In addition, CEQA Guidelines Appendix G states that a project would have a significant effect on the environment 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 CDFG or USFWS;
- b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFG or USFWS;
- 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) Fundamentally conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or
- f) Fundamentally conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan.

CEQA Guidelines Appendix G topics that will not be discussed further in this EIR

As discussed in Section 4.4.2.2, *Existing Environment* above, most of the Proposed Project components are located within operational areas of the Refinery that do not provide habitat for either common or special status animal and plant species. The tank fields, in which some of the Proposed Project components (i.e., the proposed replacement and new tanks) would be located, contain some degraded coastal scrub and grassland habitat in addition to eucalyptus and Monterey pine groves at their periphery. These vegetation types are expected to provide habitat to common wildlife as described in Section 4.4.2.2. Tall trees in eucalyptus or Monterey pine groves may potentially serve as roosts for special status bat species or nest sites for raptors such as red-tailed hawk. Based on field observations and review of maps, ESA has determined that the locations of the Proposed Project components within the tank fields is separated from these potential roost/nest sites by the active tank field operational areas (See Figure 3-3. Tank construction, operation, and maintenance activities associated with the Proposed Project are not expected to surpass noise or other disturbance levels already present in the tank farm areas. Thus, potential roost/nest trees will be subject to similar levels of noise and disturbance upon implementation of the Proposed Project. Therefore, no significant impacts to these biological resources by Proposed Project implementation are anticipated.

No potentially jurisdictional wetlands or other waters occur within or adjacent to Proposed Project component areas. The Proposed Project components are sufficiently separated from the nearest water features (tank farm components near San Francisco Bay near Long Wharf) by active Refinery operations, and will not be dredged, filled, or otherwise degraded by activities associated with development, construction or operation of the Proposed Project. Drainage from Proposed Project sites and surrounding areas is directed into the Refinery's stormwater drainage and treatment system. Due to these factors, it is highly unlikely that any waters or wetlands or special status species in the Proposed Project vicinity could be significantly adversely affected by the siting, construction or operation of the Proposed Project components.

Due to these factors the Proposed Project would not:

- Reduce the habitat of, affect the population level of, or reduce the number or restrict the range of, any wildlife or plant species, common or listed; or affect any plant or animal community (other than potential impacts to sensitive and special-status fish species the San Francisco flora and fauna and the San Francisco Bay estuary habitat which are considered below under Section 4.4.4, *Impacts and Mitigation Measures*);
- Substantially affect sensitive wildlife habitat;

- Cause substantial, or potentially substantial, adverse change to the flora or fauna within the area;
- Have a substantial adverse effect on any candidate, sensitive, or special-status species;
- Have a substantial adverse effect on any sensitive natural community or protected wetlands;
- Interfere with any fish or wildlife movement, or with established corridors, or impede the use of native wildlife nursery sites;
- Conflict with any local policies or ordinances protecting biological resources; or
- Conflict with any adopted habitat conservation plan, natural community conservation plan or other local, regional, or state habitat conservation plan.

As a result, there would be no impact under these biological resource criteria. The remaining criteria are discussed under impact statements in Sections 4.4.4, *Impacts and Mitigation Measures* and Section 5.2, *Cumulative Impacts*.

4.4.4 Biological Resources Impacts and Mitigation Measures

Impact 4.4-1: Potential impacts to special status fisheries could result from additional wastewater or pollutant discharges by the Proposed Project into receiving waters (San Pablo Bay and San Francisco Bay). The State Implementation Plan and the San Francisco Bay Basin Plan regulate such discharges through NPDES permits, a principal tool used in protection of aquatic sensitive species and other “beneficial uses” of State water resources. By continued compliance with the discharge requirements of the Refinery’s NPDES permit, this impact would be less than significant.

As discussed in Section 4.8, *Hydrology and Water Quality*, the Proposed Project would allow the Refinery to process a wider range of crude oils through the replacement of several process units with newer units using identical or similar technologies. This would result in a 4% to 5% increase in wastewater flow rate, and potential increases or decreases in effluent constituents.

The overall composition of crude oils processed by the Refinery has varied over time and will continue to do so, with or without implementation of the Proposed Project. The composition of a given crude oil (the types and concentrations of metals and other constituents) changes over time, as does the complement of crude oils (crude slate) processed by the Refinery. Given this ongoing fluctuation of the composition of crude oil input and the relative consistency of the composition of products, there is a resulting fluctuation in the composition of the waste stream, including that of constituents of the wastewater discharge portion of the waste stream.

Fluctuations in the quantities and proportions of constituents in the wastewater discharge for refineries in general are anticipated in the establishment of limits specified in the National Pollutant Discharge Elimination System (NPDES), which sets daily maximum limitations and monthly average limitations for toxic constituents. The Refinery has a general history of compliance that is well within discharge limits, often by an order of magnitude or more, as

discussed in Section 4.8, *Hydrology and Water Quality*. Over the course of the last permit period from 2001 through 2005, there were a total of eight violations reported. Two of the violations consisted of high pH values and were reported in the stormwater discharge and not related to wastewater treatment. One violation, reported in 2004, was related to Heptachlor Epoxide, a compound not associated with the facility and considered to be anomalous. The other violations were related to mercury and oil and grease concentrations reported in 2002 and 2003 respectively. Since that time, the facility has demonstrated full compliance with the NPDES permit.

While the Proposed Project would enable the Refinery to process a wider variety of crude slates, component crude oil characteristics are expected to be within the range of crude oils the Refinery is currently capable of processing. Dependent on the overall constituent content of a crude slate at a given time, the quantities of a given constituent could increase or decrease.

Anticipated changes in discharge constituent concentrations are summarized as follows (see Section 4.8, *Hydrology and Water Quality* for further details). Levels of nickel, vanadium, iron, cadmium, copper, and lead are not anticipated to be affected by implementation of the Proposed Project. Levels of arsenic are anticipated to decline from current levels because the use of an arsenic-containing corrosion inhibitor in a current refinery process will be eliminated with Proposed Project implementation. Future levels of selenium and mercury could vary, although crude slates anticipated to be run in the foreseeable future tend to be lower in both substances. Selenium and mercury levels in discharge are anticipated to remain in the vicinity of current levels or to decrease, but could potentially increase in the future. While it is not possible to predict specific future characteristics of crude slates, and thus specific discharge characteristics, it is anticipated that the variation of discharge characteristics will remain within the treatment capacity of the Refinery and within the current NPDES permit limits (see Section 4.8, *Hydrology and Water Quality*, for specifics regarding monitoring and limits).

Once selenium is in aquatic systems, it is readily taken up from solution by food-chain organisms and can quickly reach concentrations that are toxic to the fish and wildlife that consume them. Reproductive success in fish is sensitive to selenium toxicity and selenium is efficiently transferred in eggs from parents to offspring where it can cause edema, hemorrhaging, spinal deformities, and death. As a result of bioaccumulation, selenium toxicity in fish may occur with no additional indications of selenium poisoning in the entire aquatic system (Lemly, 1996). Seabirds are very sensitive to selenium exposure with elevated exposure being linked to impaired reproduction, delayed egg-laying, deformed embryos, and other toxicity responses (Heinz et al. 1990, Heinz and Fitzgerald 1993b, Heinz, 1996, Kennish 1997).

Mercury exhibits relatively high tendencies to bioaccumulate in plants and animals. Methylmercury, formed by methylation of mercury under conditions present in San Francisco Bay sediments, is very effectively absorbed by aquatic organisms. Methylmercury undergoes biomagnification, increasing by orders of magnitude in moving up the food chain. Although most research concerns regarding mercury toxicity focus on human consumption of fish, high levels of mercury accumulation have been linked to neurotoxicity in fish and fish-eating birds, resulting in reduced vigor and health, reproduction, and/or embryonic survival (Wiener and Spry, 1996).

Increases in a variety of contaminants may directly affect sensitive life stages of aquatic organisms or bioaccumulate and affect higher life forms. An increase in contaminants at the Proposed Project vicinity in an amount that could adversely affect special status fishes as noted earlier that live near, migrate through or feed on organisms living in the Proposed Project vicinity would be considered a significant impact.

The special status fishes noted earlier would have varying susceptibilities to the contaminants potentially increased from the Proposed Project. Different species and different life stages would have varying sensitivity to increased contaminants in San Pablo Bay and San Francisco Bay because of their use of the area (e.g., spawning or foraging, compared to migration). Generally, the more immature forms, or reproductive processes of adults, are more easily impacted by the kinds of contaminants that are potentially increased from the Proposed Project. Fish eggs and larvae are particularly susceptible to toxins such as heavy metals, organic hydrocarbons, dioxins, and polychlorinated biphenyls (PCBs). Immature forms are also more likely to feed exclusively on organisms exposed predominantly to such contaminants. As such, special status fishes that are found in the project vicinity for longer periods of time would be more susceptible to such effects than migratory species such as salmon and steelhead which occur in the Bay only briefly during limited migratory periods. Increases of contaminants in the Refinery's wastewater discharge as a result of the Proposed Project could potentially increase contaminants in San Pablo and San Francisco Bays by an amount that would potentially adversely affect sensitive aquatic organisms. In that event, impacts to susceptible special status species – i.e., longfin smelt and Sacramento splittail – could be considered, following this line of reasoning, potentially significant.

The San Francisco Bay Estuary complex receives similar, and a variety of other kinds of, contaminants from a wide variety of sources not limited to industry such as the Chevron Refinery. Water Quality regulators and fisheries agencies of the area maintain progressive investigations and analysis of these contaminants and their effects on Bay ecology. The assimilative capacity of the Bay is that amount of contamination that can be processed, diluted, or removed without causing adverse effects on water quality. As such, it can be presumed that any increases in contaminants from the Proposed Project that would cause the assimilative capacity of the Bay to be exceeded would significantly affect sensitive special status species as noted above. Conversely, as long as increases in contaminants are determined to not cause this capacity to be exceeded, the increases would not cause adverse effects on aquatic organisms, including sensitive special status fishes as noted above.

The current NPDES permit includes both numeric limitations on effluent constituents, set at levels protective of aquatic life, and a narrative toxicity requirement: "No toxic or other deleterious substances to be present in concentrations or quantities which will cause deleterious effects on aquatic biota, wildlife, or waterfowl, or which render any of these unfit for human consumption either at levels created in the receiving waters or as a result of biological concentrations." To implement this requirement, the NPDES permit for the Chevron refinery's effluent requires toxicity bioassays conducted on a monthly basis for the discharges into the Bay. The bioassays, using silversides (*Menidia beryllina*), found to be the most sensitive species to toxicity of effluent as determined in a screening phase which included other species such as

topsmelt (*Holmesimysis bahia*) and fathead minnow (*Pimephlaes promelas*), routinely determine the level of harm to these specimens and, by extension, the potential harm to fishes in the Bay. As long as the effluent does not cause death in the experimental populations above a specified level, the effluent is in compliance and is determined unlikely to significantly impact representative organisms in the aquatic environment (see Section 4.8, *Hydrology and Water Quality* for further details of bioassay test).

As described in the NPDES permit, San Pablo Bay is considered “impaired” for certain pollutants and that “water quality standards are not expected to be met after implementation of technology-based effluent limitations on point sources.” Total Maximum Daily Loads (TMDL’s) for San Pablo Bay are to be determined by the Regional Water Quality Control Board by 2010. See Section 4.8, *Hydrology and Water Quality*, for further detail and interim policies. For purposes of CEQA, the existing condition of the Bay constitutes the “baseline” or background condition against which potential project impacts must be analyzed. The State Water Resources Control Board’s list of impaired water bodies indicates that the impairment of San Pablo Bay is primarily due to nonpoint and historic sources. The only listed pollutant which is attributed in part to industrial point sources is selenium. However, selenium discharges from refineries (including the Chevron refinery) is restricted by an Individual Control Strategy established under the Clean Water Act. As noted above, the Refinery has demonstrated selenium discharge well within NPDES limits and selenium levels in Refinery discharge are expected to be proportional to anticipated reduced levels of selenium in future crude slates. However, as with all forecasts, predictability becomes less certain extending further into the future and the potential for selenium increases in crude slates remains a possibility.

Chevron is legally required to meet NPDES permit requirements. The Regional Water Board may take enforcement action under the authority of the Federal Clean Water Act and Amendments, and the Porter-Cologne Water Quality Control Act (California Water Code).

The RWQCB utilizes various methods in ensuring maintenance of water quality goals. As discussed in Section 4.8, *Hydrology and Water Quality*, “the RWQCB may require an industrial discharger to submit an Antidegradation Report, which would address mass increases of pollutants discharged and propose new treatment process units, if necessary, to maintain water quality,” and “the RWQCB would have the authority to modify (according to CFR 40 122.62(a)(1)), but not revoke and reissue (unless Chevron requests or agrees), the existing NPDES permit under certain circumstances specified in the NPDES regulations.” The purpose of the Antidegradation assessment and report is to ensure that before any changes in discharge volume or concentration are implemented under the NPDES permitting process, there is sufficient data indicating that existing water quality can be maintained. The continued involvement of the RWQCB to monitor discharges as specified in the NPDES permit will minimize potential impacts of the project.

As stated above, the NPDES permit includes both numeric toxicity limitations and a narrative toxicity requirement prohibiting “deleterious substances to be present in concentrations or quantities which would cause deleterious effects on aquatic biota, wildlife, or waterfowl.” To

implement this requirement, the NPDES permit for the Refinery's effluent requires acute and chronic toxicity bioassays for the Refinery's discharges into the Bay (see Section 4.8, *Hydrology and Water Quality*). The bioassays routinely determine the level of harm to specimens representative of the fishes and other aquatic life forms in the Bay. The Proposed Project would have a less than significant impact on biological resources partially because, among other NPDES criteria, mortality rates determined by the bioassays would be required to remain within the permit limits, and mechanisms are in place to assure this.

The pollutants subject to the NPDES permit's numeric limits and/or listed as "impairing" pollutants subject to TMDLs include bioaccumulative pollutants such as selenium and mercury. Water quality standards and permit limits for toxic pollutants are established to protect aquatic life (as well as human health) and take into account available information on bioaccumulative effects. The Refinery consistently complies with effluent limits for bioaccumulative chemicals in its NPDES permit, and would be required to continue to do so after the Project is implemented. Additionally, the impairment of San Pablo Bay is primarily due to nonpoint and historic sources. Selenium loads from oil refineries have been reduced under RWQCB mandated programs during the 1990's; continued high selenium levels found in the bay appear to be due to agricultural runoff and nonpoint sources which have not been controlled (See SFEI, 2003). Refineries in general do not contribute substantially to mercury loading into the San Francisco Bay estuary, with combined Bay Area refineries accounting for less than 0.06% of mercury input between 2000-2003 (SFBRWQCB, 2006). Nonpoint sources, particularly the erosion of mercury-enriched sediment from historical hydraulic gold mining activities in the Sierra Nevada, are the major sources of mercury in the bay. Increased discharge of these pollutants as a result of the Proposed Project, if any, would be insignificant.

As described above, to ensure the protection of aquatic life, Chevron's discharge must meet concentration, mass and toxicity limits required by its NPDES permit for pollutants that could pose toxicity to aquatic life. Nevertheless it is not possible to anticipate specific discharge characteristics due to the inability to predict specific characteristics of future crude slates, and the ability of the Refinery to process a wider variety of crude slates could result in increases in constituents in the crude slates and in the discharge. The discharge is expected to remain within the treatment capacity of the Refinery and within the current NPDES permit limits. If these NPDES permit conditions continue to be met, the levels of contaminants resulting from the Proposed Project should not have a significant effect on the more susceptible special status fishes as noted above and the concentration of pollutants discharged should not increase. Therefore, the impact of the Proposed Project on special status fish species would be less-than-significant.

The impact would be less than significant.

Mitigation: None required.

References – Biological Resources

- California Department of Fish and Game. California Wildlife Interagency Task Group. 2002. California wildlife habitat relationships system, Version 8.0 personal computer program. Sacramento, CA. Available online at <http://www.dfg.ca.gov/whdab/html/cwhr.html>
- California Department of Fish and Game. 2003. List of California Terrestrial Natural Communities Recognized by the California Natural Diversity Database. September 2003 Edition. Available online at <http://www.dfg.ca.gov/whdab/pdfs/natcomlist.pdf>
- California Department of Fish and Game, *Natural Diversity Database*, version 3.0.5, updated July 1, 2005. Data request for the San Quentin 7.5 minute quadrangle and for Contra Costa County.
- California Native Plant Society, *Electronic Inventory of Rare and Endangered Vascular Plants of California*, 2005. Data request for the San Quentin USGS 7.5 minute quadrangle and for Contra Costa County.
- Chevron, 2004. Chevron Richmond Refinery Water Enhancement Wetland Studies 1994–2004, November.
- Contra Costa County. 1996. *Contra Costa County General Plan 1995 - 2010*. July 1996.
- Garth JS, Tilden JW. 1986. *California Butterflies*. Berkeley, CA: University of California Press. 246 p. [California natural history guides; 51]
- Good, T.P., R.S. Waples, and P. Adams (editors). 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-66, 598 p.
- Heinz, G.H. 1996. Selenium in birds in Beyer, W.N., G.H. Heinz, and A.W. Redmon-Norwood (eds.). *Environmental contaminants in wildlife: interpreting tissue concentrations*. Lewis Publishers. Boca Raton, Florida. Pp. 447–458.
- Heinz, G.H. and M.A. Fitzgerald. 1993b. Reproduction of mallards following overwinter exposure to selenium. *Environmental Pollution* 81(2): 117-122.
- Hickman JC, ed. 1993. *The Jepson Manual: Higher Plants of California*. Berkeley, CA: University of California Press. 1400 p.
- Holland, R.F., *Preliminary Descriptions of the Terrestrial Natural Communities of California*, Department of Fish and Game, Sacramento, CA. 156 pp. 1986.
- Jameson EW, jr. 1988. *California Mammals*. Berkeley, CA: University of California Press. 403 p. [California natural history guides; 52]
- Kennish, M.J. 1997. *Practical handbook of estuarine and marine pollution*. CRC Press, Inc., Boca Raton, Florida. 524 pp.
- Lemly, A.D. 1996. Selenium in aquatic organisms in Beyer, W.N., G.H. Heinz, and A.W. Redmon-Norwood (eds.). *Environmental contaminants in wildlife: interpreting tissue concentrations*. Lewis Publishers. Boca Raton, Florida. Pp. 427-445.
- LSA Associates, 2005. San Pablo Peninsula Open Space Study, Volume II, Existing Conditions, Richmond, California. Prepared for the San Pablo Peninsula Open Space Committee, May 2005.
- Moyle, PB. 2002. *Inland Fishes of California*. Berkeley, CA: University of California Press. 502 pp.

- National Marine Fisheries Service (NMFS). Endangered and Threatened Species: 6-month Extension of the Final Listing Determinations for Ten Evolutionarily Significant Units of West Coast *Oncorhynchus mykiss*. Federal Register, Vol. 70, No. 123, June 28, 2005 (a).
- NMFS. Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California; Final Rule. Federal Register, Vol. 70, No. 170, September 2, 2005 (b).
- Nur, N, Spautz H, Chan, Y. 2002. *Tidal Marsh Song Sparrows of San Francisco Bay*. Observer: Quarterly Journal of PRBO Conservation Science, Number 128, Spring 2002.
- Page, LM, Burr, BM. 1991. *A Field Guide to Freshwater Fishes*. New York: Houghton Mifflin Company. 432 p. [Peterson's field guide series; 42]
- Peterson, RT. 1990. *Western Birds*. New York: Houghton Mifflin Company. 432 p. [Peterson's field guide series; 4]
- San Francisco Estuary Institute (SFEI) 2003. *Contaminant Concentrations in Fish from San Francisco Bay, 2000*, prepared by B. Greenfield, J. Davis, R. Fairey, C. Roberts, D. Crane, G. Ichikawa, and M. Petreas, *RMP Technical Report: SFEI Contribution 77*, July, pp. 53-54.
- San Francisco Bay Regional Water Quality Control Board. 2006. *Mercury in San Francisco Bay Proposed Basin Plan Amendment and Staff Report for Revised Total Maximum Daily Load (TMDL) and Proposed Mercury Water Quality Objectives*. Oakland, CA, pg.III-8.
- Stebbins, RC. 1985. *Western Reptiles and Amphibians*. New York: Houghton Mifflin Company. 336 p. [Peterson's field guide series; 16]
- U.S. Fish and Wildlife Service (USFWS). Dec 12 1994. *Final Rule: Endangered and Threatened Wildlife and Plants; Critical Habitat Determination for the Delta Smelt*. Federal Register 59 FR 65256. Available online: <http://ecos.fws.gov/docs/frdocs/1994/94-31063.pdf>
- USFWS. 2005. Species List for City of Richmond Chevron Renewal Project, Contra Costa County, California, December 2, 2005.
- Wiener, J.G. and D.J. Spry. 1996. Toxicological significance of mercury in freshwater fish in Beyer, W.N., G.H. Heinz, and A.W. Redmon-Norwood (eds.). *Environmental contaminants in wildlife: interpreting tissue concentrations*. Lewis Publishers. Boca Raton, Florida. Pp. 297-339.

4.5 Cultural Resources

Construction of the Proposed Project could result in several cultural resource impacts, all of which could be mitigated to less than significant levels:

- Construction could disturb currently unknown or unidentified cultural or paleontological resources or human remains.
- Construction would not impact historical resources, as defined in Section 15064.5, as no demolition of or substantial adverse change to historic structures would occur.
- Construction could impact previously identified cultural or paleontological resources during ground disturbance activities.

Potential impacts related to construction would be reduced to less than significant by standard mitigation measures and regulatory controls.

There would be no impacts to historical resources, unique archaeological resources, unique paleontological resources, unique geologic features or human remains during operation of the Proposed Project.

4.5.1 Introduction

Construction and operation of the Proposed Project would require excavations and grading that have the potential to affect cultural resources. Cultural resources includes, but not limited to, any object, building, structure, site, area, place, record, or manuscript that is historically or archaeologically significant, or is significant in the architectural, engineering, scientific (including paleontological and unique geological features), economic, agricultural, educational, social, political, military, or cultural annals of California (CEQA Guidelines Section 15064.5). Because archaeological resources can also be considered historical resources under CEQA, the term “cultural resources” encompasses both built, architectural historical resources and historical resources of an archaeological nature, in addition to unique archaeological resources.

4.5.2 Setting

4.5.2.1 Existing Conditions

Although the project area is urbanized with a history of industrial and maritime uses since the early 20th century, prehistorically it was a biologically rich upland and beach surrounded by intertidal flats and marsh. Natural marshland biotic communities along the edges of bays and channels were the principal source for subsistence and other activities from the middle Holocene until the contact period in the San Francisco Bay region. Efforts to reconstruct prehistoric times into broad cultural stages, e.g., Early Period, Middle Period, allows researchers to describe a wide

number of sites with similar cultural patterns and components during a given period of time, thereby creating a regional chronology.

Many of the original surveys of archaeological sites in the Bay region were conducted between 1906 and 1908 by N.C. Nelson and yielded the initial documentation of nearly 425 “earth mounds and shell heaps” along the littoral zone of the Bay (Nelson, 1909). From these beginnings, the most notable sites in the Bay region were excavated scientifically, like the Emeryville shellmound (Ala-309), the Ellis Landing Site (Cco-295) in Richmond, and the Fernandez Site (CC0-259) in Rodeo Valley (Morrato, 1984). These dense midden sites are vast accumulations of domestic debris, which have been carbon 14 dated to be 2310 +/- 220 years old, such as Ala-309, but other evidence from around the Bay suggests that human occupation in the region is of greater antiquity, or +/-5000 B.C. (Jones, 1992). While many interpretations exist as to the function of the shellmounds, much of the evidence suggests that they served as sociopolitical landmarks on the cultural landscape and may have served as ceremonial features as well.

The Early Period or the so-called “Berkeley Pattern” is characterized by almost exclusive use of cobble mortars and pestles, which is often associated with a heavy reliance on acorns in the economy (Moratto, 1984). Such unusually intensive reliance on one foodstuff indicates that a shift away from the earlier reliance on a broad spectrum of dietary sources to supply demand was needed by around 1,000 B.P. The Late Pleistocene/Early Holocene profusion of food availability along lakeshores and estuaries likely led to an overexploitation of the resources that led, initially, to population increases, which may explicate the shift toward exploiting a readily available, yet lower ranked resource like acorns or seeds (Jones, 1991). Nevertheless, given the burgeoning size of Early Period settlements, it is probable that the populations were denser and more sedentary, yet continued to exploit a diverse resource base—from woodland to grassland and marshland, to bay shore resources throughout the San Francisco Bay Area (King, 1974). Many of the Berkeley traits diffused throughout the region and spread to the interior areas of central California during this time period.

The population increases and larger, more complex settlements that began in the late-Early Period typify the Middle Period (ca. 500 BC – AD 1000) (Arnold et al., 2004). The sociopolitical landscape also appears to become more elaborate with clear differentiations in wealth. During the Late Period (ca. AD 1000 – 1700), however, new sites start to decline in the record and the large shellmounds were abandoned. The Late Period also showed population declines and concomitant changes in resource use—likely due to human-caused depletions in some terrestrial food sources during the Middle Period (Broughton, 1994). Broughton (1997; 1999) determined that vertebrate fauna discovered in the Emeryville shellmound showed clear changes in the Middle Period from preferred terrestrial species to expensive (or less efficiently pursued prey per unit of energy) marine mammals, and significant changes in body size in both terrestrial and marine animals, which suggests overexploitation.

Richmond Area Prehistory

Large numbers of shell mounds were identified at this location and on Ellis Landing (near Brooks Island in Richmond) by Nelson (1909) and some have been re-evaluated recently (Broughton

1997; 1999). These sites provide diverse collections of artifacts and faunal remains along with human burials with rich grave offerings. Banks & Orlins (1981) conducted an extensive regime of augering throughout the Richmond Harbor, which included the areas that constituted Nelson's shellmound dimensions. The augering revealed that the area had been covered by approximately 2 to 3 meters of compacted fill, followed by 3.5 meters of intact midden, in the case of CA-CCo-295. The dimensions of the shellmound were estimated to be 500 x 330 feet.

Native American archaeological sites located in western Contra Costa County are usually situated near seasonal and perennial freshwater sources and near the historic extent of bay tidal marshland. The project site is within one-half mile of recorded prehistoric archaeological resources. As mentioned, the Ellis Landing Shellmound (CA-CCo-295), located near Brooks Island (approximately 2 miles east of the Chevron Refinery), represented one of the largest and most significant shellmounds in the San Francisco Bay region.

Also within the vicinity of the project area is the Stege Mounds Archaeological District, CA-CCo-297, -298, -299, and -300. Originally recorded by Loud (1924), the Stege Mounds represented another example of long-term occupation of the salt marsh and tidal flats surrounding the Richmond Harbor. Two of the sites were re-evaluated (CA-CCo-297 and -298) by Banks & Orlins (1981), which verified that these sites were mostly intact at about 1 meter depths below landfill. The Stege Mounds are approximately five miles east of the Chevron Refinery.

Ethnographic Setting

Prior to Euro-American contact, the area of present-day Alameda County was occupied by the Ohlone (also known by their linguistic group, Costanoan). Politically, the Costanoan were organized into groups called tribelets. A tribelet constituted a sovereign entity that held a defined territory and exercised control over its resources. It was also a unit of linguistic and ethnic differentiation. Oakland, and a large area of the East Bay, is located within the territory of a people that spoke Chochenyo, one of several Costanoan languages.

The Ohlone economy was based on fishing, gathering, and hunting, with the land and waters providing a diversity of resources including acorns, various seeds, salmon, deer, rabbits, insects, and quail. The acorn was the most important dietary staple of the Costanoan, and the acorns were ground to produce a meal that was leached to remove the bitter tannin. Technologically, the Costanoan crafted tule balsa, basketry, lithics (stone tools) such as mortars and metates (a mortar-like flat bowl used for grinding grain), and household utensils. The Costanoan, like many other Native American groups in the Bay Area, likely lived in conical tule thatch houses.

In 1770, the Costanoan-speaking people lived in approximately 50 separate and politically autonomous nations or tribelets, and the number of Chochenyo speakers reached 2,000, substantially more than the typical size of a tribelet, which ranged from 40 to 200 members.

During the Mission Period (1770-1835), native populations, especially along the California coast, were brought—usually by force—to the missions by the Spanish missionaries to provide labor. The missionization caused the Costanoan people to experience cataclysmic changes in almost all

areas of their life, particularly a massive decline in population due to introduced diseases and declining birth rate, resulting in large part from colonization by the Spanish missionaries. Following the secularization of the missions by the Mexican government in the 1830s, most Native Americans gradually left the missions and established rancherias in the surrounding areas.

Native American archaeological sites that could shed light on the Costanoan ways of life in the pre-mission era tend to be situated near the historic extent of the Bay tidal marshland.

Historic Setting

In 1895, Augustin S. Macdonald visited Point Richmond and proposed a transcontinental rail terminal and ferry service, to provide a means for commerce and the transport of goods between Richmond and San Francisco. By 1901, Santa Fe had moved its shops to Richmond and the Standard Oil Company built its refinery here also in 1901 (City of Richmond, 1995). Richmond incorporated as a city in 1905.

During the early 20th Century, the harbor and major terminal construction began in earnest and, with the advent of World War II, ushered considerable growth for the Kaiser Richmond shipyards. At war's end, the shipyards closed and were subsequently used for the post-war industrialization and production that followed (City of Richmond, 1995).

As industry grew in the area, the most prominent were in warehousing and distribution, and chemical and research facilities. During this phase, Standard Oil, now called Chevron, and its subsidiaries, Chevron Chemical and (later) Chevron Research, were the mainstays in local employment, and they remain so to this day.

4.5.2.2 Research Methods

Archival

ESA conducted a cultural resources records search of all pertinent survey and site data at the Northwest Information Center, Sonoma State University on July 13, 2005 [File No. 05-40]. ESA accessed the records by utilizing the San Quentin and Richmond USGS 7.5-minute quadrangle maps and included the project area along with a quarter-mile radius around the project construction site. The records search included a review of the *Directory of Properties in the Historic Property Data File for Contra Costa County* for information on sites of recognized historical significance within the *National Register of Historic Places*, the *California Register of Historic Resources*, the *California Inventory of Historic Resources* (1976) *California Historical Landmarks* (1996) and the *California Points of Historical Interest* (1992).

Field Methods

A field reconnaissance was conducted by ESA archaeologist, Dean Martorana, RPA, to obtain a general impression of the area's potential to yield significant cultural resource sites and visually inspect project areas in relation to known archaeological sites. Because the entire project area is highly modified and developed, standard archaeological survey methods have little to no value

due to the lack of visible native ground surface and significant alteration of the topographic setting. Areas of exposed soils were more closely inspected.

Native American Heritage Commission

The Native American Heritage Commission (NAHC) was contacted by an ESA archaeologist on October 26, 2005 and requested to provide information on locations of importance to Native Americans and a list of Native Americans that should be contacted. The NAHC sacred lands search did not identify any traditional cultural properties within the project area. The NAHC provided a list of Native American organizations that should be contacted concerning locations of importance to Native Americans in the project area. ESA sent a letter to each organization on the NAHC list, providing information about the proposed project and requesting information on locations of importance to Native Americans. No responses have been received to date.

4.5.2.3 Research Results

The field reconnaissance conducted for the Proposed Project did not result in the identification of any historic resources, including unique archaeological resources. The archival research revealed that ten previously identified cultural resources within a half-mile radius of the project areas (see Table 4.5-1). No sites have been identified within the boundaries of the Chevron Refinery of proposed construction. Fourteen cultural resource investigations have been conducted within the project area. Hupman and Chavez (1993) conducted an inventory report that covered the spatial extent of the current project. No resources were identified during this survey. LSA (1990) conducted an historic resource evaluation of seven potentially historic properties on the Chevron Refinery grounds that constituted refinery process facilities, including the No. 1 Power Plant, and found that none qualified for the National Register of Historic Places (or, by default, the California Register of Historical Resources). Many, if not all, of the facilities in the Refinery have been subject to infrastructural changes from maintenance and upgrading for over 30-years; therefore, the facilities have lost integrity that would convey the historical period. The facilities are utilitarian, industrial structures that do not possess architectural elements that would give it distinction, nor contribute to the history of California to be eligible as an historical resource. No structures or facilities appeared to predate the Refinery.

In 1978, the town of Point Richmond—located about a half-mile south of the Chevron Refinery, across Interstate 580—was listed in the National Register of Historic Places as an historic district, which includes some 300 buildings. The recognition was bestowed because the Point has largely maintained the historical integrity of a turn-of-the century industrial village. However, given the distance from the proposed project area, no direct or indirect impacts to this district are expected.

The project area is underlain by artificial fill deposits of considerable disturbance due to the extensive excavation conducted for the construction of the Refinery and its ongoing operations (Helley & Graymer, 1997). Further, the 1899 USGS San Francisco Quadrangle indicates that the Refinery lies within areas that were inundated by the San Pablo Bay prior to development. Consequently, the areas that are proposed for construction will not likely affect intact archaeological deposits.

**TABLE 4.5-1
EXAMPLES OF RECORDED CULTURAL RESOURCE SITES WITHIN ONE-HALF MILE OF THE
PROJECT AREA**

Site Designation	Age	General Location	Description	Comments	Reference
CA-CCo-283	Prehistoric	Near Pt. Molate	Shellmound	Burials noted; site was partially leveled	Nelson 1907; Bennyhoff et al. 1952; Chavez 1985
CA-CCo-506H	Historic	Between Pt. Molate and Castro Pt.	Chinese earthenware; misc. debris		Chavez 1984
CA-CCo-765H	Historic	South of toll plaza	Submerged ship hull		W. Self 2001
CA-CCo-276	Prehistoric	Upland from Refinery	Shellmound	Site was destroyed	Nelson 1907
CA-CCo-277	Prehistoric	East shore line of San Pablo Pen.	Shellmound	Small diffuse deposit	Nelson 1907
CA-CCo-278	Prehistoric	East shore line of San Pablo Pen.	Shellmound		Nelson 1907
CA-CCo-281	Prehistoric	Northwest shore line	Shellmound	Measured 120 x 240 feet to a depth of 7 feet	Nelson 1907
CA-CCo-282	Prehistoric	Western shore line; ill-defined	Shellmound		Nelson 1907
CA-CCo-284	Prehistoric	Southwestern shoreline	Shellmound		Nelson 1907
CA-CCo-423	Prehistoric	Point Molate	Shellmound	Highly disturbed	None given

SOURCE: References on file at the Northwest Information Center, Rohnert Park, CA

4.5.2.4 Regulatory Framework

California Environmental Quality Act (CEQA)

CEQA requires that public or private projects financed or approved by public agencies must assess the effects of the project on historical resources. CEQA also applies to effects on archaeological sites, which may be included among “historical resources” as defined by Guidelines section 15064.5, subdivision (a), or, in the alternative, may be subject to the provisions of Public Resources Code section 21083.2, which govern review of “unique archaeological resources.” Historical resources may generally include buildings, sites, structures, objects or districts, each of which may have historical, architectural, archaeological, cultural, or scientific significance.

Under CEQA, “historical resources” include the following:

- (1) A resource listed in, or determined to be eligible by the State Historical Resources Commission, for listing in the California Register of Historical Resources (Pub. Resources Code, § 5024.1.)
- (2) A resource included in a local register of historical resources, as defined in section 5020.1(k) of the Public Resources Code or identified as significant in an historical resource

survey meeting the requirements of section 5024.1(g) of the Public Resources Code, shall be presumed to be historically or culturally significant. Public agencies must treat any such resources as significant unless the preponderance of evidence demonstrates that it is not historically or culturally significant.

- (3) Any object, building, structure, site, area, place, record, or manuscript which 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 may be considered to be an historical resource, provided the lead agency's determination is supported by substantial evidence in light of the whole record. Generally, a resource shall be considered by the lead agency to be "historically significant" if the resource meets the criteria for listing on the California Register of Historical Resources (Pub. Res. Code, § 5024.1) including the following:
 - (A) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
 - (B) Is associated with the lives of persons important in our past;
 - (C) 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
 - (D) Has yielded, or may be likely to yield, information important in prehistory or history.
- (4) The fact that a resource is not listed in, or determined to be eligible for listing in the California Register of Historical Resources, not included in a local register of historical resources (pursuant to section 5020.1(k) of the Public Resources Code), or identified in an historical resources survey (meeting the criteria in section 5024.1(g) of the Public Resources Code) does not preclude a lead agency from determining that the resource may be an historical resource as defined in Public Resources Code section 5020.1(j) or 5024.1.

Archaeological resources that are not "historical resources" according to the above definitions may be "unique archaeological resources" as defined in Public Resources Code section 21083.2, which also generally provides that "non-unique archaeological resources" do not receive any protection under CEQA. If an archaeological resource is neither a "unique archaeological" nor an "historical resource," the effects of the project on those resources shall not be considered a significant effect on the environment. It shall be sufficient that both the resource and the effect on it are noted in the EIR, but they need not be considered further in the CEQA process.

In summary, CEQA requires that if a project results in an effect that may cause a substantial adverse change in the significance of an historical resource, or would cause significant effects on a unique archaeological resource, then alternative plans or mitigation measures must be considered.

Therefore, prior to the assessment of effects or the development of mitigation measures, the significance of cultural resources must first be determined. The steps that are normally taken in a cultural resources investigation for CEQA compliance are as follows:

- Identify potential historical resources and unique archaeological resources
- Evaluate the eligibility of historical resources
- Evaluate the effects of a project on all eligible historical resources

Furthermore, CEQA also defines the significance of discoveries of Native American remains, in particular, and discoveries of human remains, as presented in Guidelines section 15064.5, subdivisions (d) and (e), respectively, and describes the procedures to be undertaken in the event of such discoveries.

Local Regulatory Framework

The City of Richmond General Plan contains the following policies and implementation programs relevant to the proposed redevelopment program and its relationship to cultural and historic resources, such as:

Policy LU-A.4: Require new development adjacent to historical sites to incorporate design elements so as to complement the character of the surrounding historical structures. (Note: Same as Policy OSC-E.4.)

Policy LU-A.5: Preserve and enhance existing cultural and artistic artifacts and resources in the City.

Policy OSC-E.1: Require archaeology reconnaissance surveys for all projects within an archaeological sensitivity area (as identified on maps on file with the Planning Department). When cultural resources are located, measures to deal with the historic resource shall be recommended by a qualified archaeologist.

Policy OSC-E.2: Protect notable historic, archaeological, and cultural sites from destruction.

Policy OSC-E.3: Support formulation of a plan for interpretive facilities on specific sites. Sites near local and regional recreation areas should be preferred. Sites should be included in parks, trails, and other facilities whenever possible.

Implementation Program OSC-E.1: City will continue to utilize environmental reviews under the California Environmental Quality Act to review developments for potential impacts on archaeological and historical sites. If sites of archaeological significance are present, the procedures established in Appendix K [now section 15064.5] of the CEQA Guidelines will be applied.

4.5.3 Significance Criteria and Methodology

Significance Criteria

Based on Appendix G of the CEQA *Guidelines*, a project may be deemed to have a significant effect on the environment with respect to cultural resources if it would result in:

- a) A substantial adverse change in the significance of a historical resource that is either listed or eligible for listing on the National Register of Historic Places, the California Register of Historic Resources, or a local register of historic resources;
- b) A substantial adverse change in the significance of a unique archaeological resource;
- c) Direct or indirect destruction of a unique paleontological resource or site or unique geologic feature; or
- d) Disturbance of any human remains, including those interred outside or formal cemeteries.

CEQA provides that a project may cause a significant environmental effect where the project “may cause a *substantial adverse change in the significance of an historical resource*[.]” (Pub. Resources Code, § 21084.1 (emphasis added).) CEQA Guidelines section 15064.5 defines a “substantial adverse change in the significance of an historical resource” to mean “physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be *materially impaired*.” (CEQA Guidelines, § 15064.5, subd. (b)(1) (emphasis added).)

CEQA Guidelines, section 15064.5, subdivision (b)(2), defines “materially impaired” for purposes of the definition of “substantial adverse change ...” as follows:

“The significance of an historical resource is materially impaired when a project:

- (A) demolishes or materially alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for, inclusion in the California Register of Historical Resources; or
- (B) demolishes or materially alters in an adverse manner those physical characteristics that account for its inclusion in a local register of historical resources pursuant to section 5020.1(k) of the Public Resources Code or its identification in an historical resources survey meeting the requirements of section 5024.1(g) of the Public Resources Code, unless the public agency reviewing the effects of the project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or
- (C) demolishes or materially alters in an adverse manner those physical characteristics of a historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register of Historical Resources as determined by a lead agency for purposes of CEQA.”

(CEQA Guidelines, § 15064.5, subd. (b)(2))

CEQA Guidelines Appendix G topics that will not be discussed further in this EIR

Review and comparison of the Proposed Project to the environmental setting clearly shows that the Proposed Project will create no impacts related to the following environmental topics listed in CEQA Guidelines Appendix G:

a) Cause a substantial adverse change in the significance of an historical resource as defined in Section 15064.5.

There are no historic resources as defined in Section 15064.5 located on the project site. The site of the proposed facilities has been a developed part of the Refinery for decades. There are no historic structures located at the site and the ground surface has been extensively disturbed as a result of past Refinery activities. The infrastructure of the Refinery is highly industrialized and thus retains no architectural distinction, nor do the

physical structures of the Refinery appear to be associated with significant events or persons in California's history. Therefore, the development of the proposed facilities would not directly or indirectly result to a change in any historic resources as defined in Section 15064.5. Construction and operation of the Proposed Project would not require the removal of historical structures or related demolition activities. As a result, there would be no impact to historical resources due to the Proposed Project.

d) **Direct or indirect destruction of a unique paleontological resource on site or unique geologic feature.**

The sites of the proposed facilities are in a developed part of the Refinery, which has been in existence for over 100 years. There are no known unique geologic structures located at the sites. There would be no impact with respect to unique geologic features.

4.5.4 Cultural Resources Impacts and Mitigations

Impact 4.5-1: If construction of the Proposed Project were to encounter currently unknown historical resources, including unique archaeological resources, this could cause substantial adverse changes to the significance of the resource. This would be a less than significant impact with implementation of Mitigation Measure 4.5-1.

While the project area is largely modified and disturbed, the general project vicinity has a considerable level of previously identified prehistoric sites, especially along the margins of the San Pablo Bay. Previously unknown archaeological sites, e.g. shell midden soils, lithic artifacts, historic trash scatters, may occur deeply buried within the project area. Damage to significant buried archaeological deposits would be a significant impact. Implementation of Mitigation Measure 4.5-1 would reduce potential impacts to a less than significant level.

Mitigation Measure 4.5-1: In the event that any prehistoric or historic subsurface cultural resources are discovered, such as structural features or unusual amounts of bone or shell, artifacts, human remains, architectural remains (such as bricks or other foundation elements), or historic archaeological artifacts (such as antique glass bottles, ceramics, horseshoes, etc.) during ground disturbing activities, all work within 50 feet of the resources shall be halted and Chevron and/or the lead agency shall consult with a qualified archaeologist to assess the significance of the find per CEQA Guidelines Section 15064.5. If any find is determined to be significant, representatives of Chevron and/or the lead agency and the qualified archaeologist shall meet to determine the appropriate avoidance measures or other appropriate mitigation, with the ultimate determination to be made by the lead agency. All significant cultural materials recovered shall be, as necessary and at the discretion of the consulting archaeologist, subject to scientific analysis, professional museum curation, and documented according to current professional standards.

As part of the Mitigation Monitoring and Reporting Program for the EIR, Chevron shall have environmental monitors onsite during construction of the Proposed Project. The construction workers shall be trained by the monitors on environmental sensitivity and the identification of prehistoric or historic subsurface cultural resources.

In considering any suggested mitigation proposed by the consulting archaeologist in order to mitigate impacts to historical resources or unique archaeological resources, the lead

agency shall determine whether avoidance is necessary and feasible in light of factors such as the nature of the find, project design, costs, and other considerations. If avoidance is infeasible, other appropriate measures (e.g., data recovery) shall be instituted. Work may proceed on other parts of the project site while mitigation for historical resources or unique archaeological resources is carried out.

Significance after Mitigation: Less than significant.

Impact 4.5-2: The Proposed Project could adversely affect unique paleontologic resources. This would be a less than significant impact with implementation of Mitigation Measure 4.5-2.

Paleontologic resources are the fossilized evidence of past life found in the geologic record. Despite the tremendous volume of sedimentary rock deposits preserved worldwide, and the enormous number of organisms that have lived through time, preservation of plant or animal remains as fossils is an extremely rare occurrence. Because of the infrequency of fossil preservation, fossils – particularly vertebrate fossils – are considered to be nonrenewable resources. Because of their rarity, and the scientific information they can provide, fossils are highly significant records of ancient life.

The majority of the project area contains sandy and alluvial deposits. Because the Proposed Project would result in minimal excavation in bedrock conditions for the installation of the Refinery facilities, significant paleontologic discovery would be unlikely. However, in the event a paleontologic resource is encountered, Mitigation Measure 4.5-2 is provided.

While not anticipated to result from the Proposed Project, significant fossil discoveries can be made even in areas of supposed low sensitivity, and could result from the excavation activities related to the Proposed Project, which could have a deleterious effect on such resources.

Mitigation Measure 4.5-2: In the event of unanticipated paleontologic discoveries, such as large deposits of fossil remains Chevron shall notify a qualified paleontologist who shall document the discovery as needed, evaluate the potential resource, and assess the significance of the find under the criteria set forth in CEQA Guidelines Section 15064.5. In the event of an unanticipated discovery of a breas¹, true, and/or trace fossil during construction, excavations within 50 feet of the find shall be temporarily halted or diverted until the discovery is examined by a qualified paleontologist (per Society of Vertebrate Paleontology standards (SVP, 1995). The paleontologist shall notify the appropriate agencies to determine procedures that would be followed before construction is allowed to resume at the location of the find. If the lead agency determines that avoidance is not feasible, the paleontologist shall prepare an excavation plan for mitigating the effect of the project on the qualities that make the resource important, and such plan shall be implemented. The plan shall be submitted to the lead agency for review and approval.

¹ A seep of natural petroleum that trapped extinct animals and which preserved and fossilized their remains.

As part of the Mitigation Monitoring and Reporting Program for the EIR, Chevron shall have environmental monitors onsite during construction of the Proposed Project. The construction workers shall be trained by the monitors on environmental sensitivity and the identification of prehistoric or historic subsurface cultural resources.

Significance after Mitigation: Less than Significant.

Impact 4.5-3: Project construction could result in damage to human remains. This would be a less than significant impact with the implementation of Mitigation Measure 4.5-3.

There is no indication that a particular site has been used for burial purposes in the recent or distant past within the Refinery boundary. Thus, it is unlikely that human remains would be encountered during project construction. However, in the event of the discovery of any human remains, including those interred outside of formal cemeteries, during project construction, the following Mitigation Measure is provided.

Mitigation Measure 4.5-3: In the event that human skeletal remains are uncovered during construction activities for the Proposed Project, Chevron shall immediately halt work, contact the Contra Costa County Coroner to evaluate the remains, and follow the procedures and protocols pursuant to Section 15064.5 (e)(1) of the CEQA Guidelines. If the County coroner determines that the remains are Native American, the project proponent will contact the NAHC, in accordance with Health and Safety Code Section 7050.5, subdivision (c), and Public Resources Code 5097.98 (as amended by AB 2641). Per Public Resources Code 5097.98, the landowner shall ensure that the immediate vicinity, according to generally accepted cultural or archaeological standards or practices, where the Native American human remains are located, is not damaged or disturbed by further development activity until the landowner has discussed and conferred, as prescribed in this section (PRC 5097.98), with the most likely descendents regarding their recommendations, if applicable, taking into account the possibility of multiple human remains.

Significance after Mitigation: Less than Significant.

References – Cultural Resources

- Banks, P. and R. Orlins. *Investigations of Cultural Resources within the Richmond Harbor Redevelopment Project 11-A, Richmond, California*. On file at the Northwest Information Center, Rohnert Park, CA, 1981.
- Broughton, J. M. *Declines in mammalian foraging efficiency during the late Holocene, San Francisco Bay, California*. *Journal of Anthropological Archaeology* 13: 371–401, 1994.
- Broughton, J. M. *Resource Depression and Intensification During the Late Holocene, San Francisco Bay: Evidence from the Emeryville Shellmound Vertebrate Fauna*, University of California Anthropological Records No. 32, Berkeley, 1999.

- Broughton, J. M. *Widening diet breadth, declining foraging efficiency, and prehistoric harvest pressure: Ichthyofaunal evidence from the Emeryville shellmound, California*. *Antiquity* 71: 845–862, 1997.
- City of Richmond. Richmond Chamber of Commerce Website. Available online: <http://www.ci.richmond.ca.us/index.asp?NID=112>, Accessed on November 22, 2005.
- Contra Costa County General Plan, Contra Costa County Community Development Department, Martinez, CA, 2005.
- Helley, E.J., R.W. Graymer, *Quaternary Geology of Contra Costa County, California and Surrounding Areas: Derived from the Digital Database Open-File 97-98*, United States Geological Survey, 1997.,
- Hupman, J.M. and Chavez, D. *Archaeological Resources Investigations for the Chevron Reformulated Fuels Project EIR, Richmond, California*. On file at the Northwest Information Center, Rohnert Park, CA, 1993.
- Jones, T. L. *Marine-resource value and the priority of coastal settlement: A California perspective*. *American Antiquity* 56: 419–443, 1991.
- Jones, T. L. *Settlement trends along the California coast*. In Jones, T. L. (ed.), *Essays on the Prehistory of Maritime California*, Center for Archaeological Research at Davis, Vol. 10, University of California, Davis, pp. 1–37, 1992.
- King, T.F. 1974. *The evolution of status ascription around San Francisco Bay*. In ?Antap: California Indian Political and Economic Organization. Eds Bean, L.J. and King, T.F. Bellena Press Anthropological Papers. 2: 35-54.
- Loud, L.L., *The Stege Mounds at Richmond, California*, University of California Publications in American Archaeology and Ethnology, 17(6), 1924.
- Nelson, N., *Shellmounds of the San Francisco Bay Region*, University of California Publications, American Archaeology and Ethnology, Vol. 7, No. 4, 1909.
- LSA. *Technical Appendix, Cultural Resources Assessment, Chevron Modernization Project*. Prepared for Fluor Daniel, Irvine, CA. On file at the Northwest Information Center, Rohnert Park, CA., 1990.
- Moratto, M.J. *California Archaeology*. Smithsonian Press: San Diego, CA, 1984.
- Society of Vertebrate Paleontology, *Assessment and Mitigation of Adverse Impacts to Nonrenewable Paleontologic Resources – Standard Guidelines*, Society of Vertebrate Paleontology News Bulletin, Vol. 163, p. 22-27, 1995.

4.6 Energy

Construction and operation of the Proposed Project would increase consumption of energy within the Refinery beyond current levels. However, the Proposed Project would increase the amount of hydrogen, electricity and CARB approved gasoline produced by the Refinery.

- The existing energy supplies are adequate for construction of the Proposed Project.
- The Proposed Project's cogeneration system would supply 50 MW gross (47 MW net) of electrical power and steam for use in process units, replacing boilers that now supply electrical power plus process steam. The new Hydrogen Plant would also produce 17 MW of electrical power. This would result in a net increase of 64 MW in electricity generation at the Refinery.
- The net result of the Proposed Project would be that the Refinery would typically self-generate all of the electricity needed for normal operations and at times export electricity to the grid.
- Hydrogen and fuel gas for process feed stocks and for firing the cogeneration system would be manufactured at the Refinery from crude oils and gas oils.
- Natural gas consumption would increase by about 1/3 above the existing consumption.
- No new electrical transmission lines or natural gas pipelines would be required to deliver energy to the Refinery.¹
- The Proposed Project would not increase reliance on renewable energy resources, and would also not decrease reliance on natural gas and oil, except to improve the efficiency with which useful products would be extracted from crude oil and gas oils at the Refinery.

The impacts to energy resources are less than significant. No mitigation measures would be required.

4.6.1 Introduction

Public Resources Code § 21100(b)(2) indicates that an EIR shall include mitigation measures “to reduce the wasteful, inefficient, and unnecessary consumption of energy.” Appendix F of the CEQA Guidelines concerns Energy Conservation, and indicates that an EIR should discuss the significant energy implications of a proposed project. Pursuant to Part II.C of Appendix F, environmental impacts considered in the EIR may include the Proposed Project's energy requirements and energy use efficiencies, the effects of the Proposed Project on local and regional energy supplies, requirements for additional capacity, effects on peak demand, the degree to which the Proposed Project complies with existing energy standards, overall projected

¹ Praxair, the third party builder and operator of the proposed new Hydrogen Plant, is also proposing to build a hydrogen pipeline that is not a part of the Proposed Project (See Section 5.2.3.2 for a complete description of this cumulative project. If the hydrogen pipeline is approved, and existing natural gas pipeline serving the Refinery would be converted to hydrogen service and a replacement natural gas pipeline would be constructed.

transportation use and use of transportation alternative. The transportation impacts of the Proposed Project are discussed in Section 4.16, *Transportation and Traffic* of this EIR.

4.6.2 Setting

The Chevron Richmond Refinery is located in the western end of the City of Richmond in western Contra Costa County, California. Pacific Gas and Electricity Company (PG&E) serves the area where the Proposed Project changes to the Refinery would occur and would supply a portion of the electricity and all of the natural gas for the Proposed Project.

4.6.2.1 State and Regional Setting

Energy Production and Distribution

California's energy system provides 16% of the natural gas, 42g% of the petroleum, and 78% of the electricity of the State's energy supply. The rest of the State's energy is imported and includes: natural gas purchases from Canada (24%) and from the Rocky Mountain States and the Southwest (61%); electricity from the Pacific Northwest (7%) and the Southwest (13%); and crude oil imported from Alaska (22%) and foreign sources (36%). Among the states, California ranks third in the nation in production of crude oil, eleventh in production of natural gas, third in generation of hydroelectric power, and sixth in electricity generation from nuclear power (CEC, 2005a).

Transportation Fuels Supply

Most petroleum fuel produced in California is for use in on-road motor vehicles and is refined within California to meet state-specific formulations required by the California Air Resources Board. The major categories of petroleum fuels are gasoline and diesel for passenger vehicles, transit, and rail vehicles; and fuel oil for industry and electrical power generation. Other liquid fuels include kerosene, jet fuel, and residual fuel oil for marine vessels.

California's oil fields comprise the fourth-largest petroleum producing area in the United States, behind Federal Offshore production, Texas, and Alaska. Crude oil is moved from area to area within California through a network of pipelines that carry it from both onshore and offshore oil wells to the refineries that are located in San Francisco Bay area, Los Angeles area, and the Central Valley. Currently, 21 petroleum refineries operate in California, processing approximately 1.9 million barrels² per day of crude oil (CEC, 2005b).

Because demand in California now exceeds the supply, crude oil and refined products must be imported from other producing areas. Imported crude oil must be brought in to California through marine facilities because there are no pipelines to bring crude into the state. Imports of clean gasoline, diesel and jet fuel, as well as crude oil imports are expected to grow each year into the foreseeable future. That growth would, in turn, lead to increases in petroleum vessel movements

² For crude oil, as for other petroleum products, one barrel contains 42 gallons.

and the need for additional docks, terminals, pipelines and storage tanks to support them (Western States Petroleum Association, 2005).

Other transportation fuel sources are alternative fuels, such as methanol and denatured ethanol (alcohol mixtures that contain no less than 70% of the alcohol fuel), natural gas (compressed or liquefied), liquefied petroleum gas (LPG), hydrogen, and fuels derived from biological materials (i.e., biomass).

Electricity and Natural Gas Supply

The production of electricity requires the combustion, consumption or conversion of other energy resources, including water, wind, oil, gas, coal, solar, geothermal, and nuclear. Of the electricity that is generated within the State, 58% is generated by fossil fuel-fired power plants and 15% by nuclear power plants. Nearly 11% of the in-State total electricity production is supplied by renewable sources, including large hydroelectric generation (17%), biomass (2%), geothermal (5%), small hydroelectric (2%), solar (0.2%) and wind (2%) (CEC, 2006a).

Natural gas ultimately supplies the largest portion of California's electricity market; natural gas-fired power plants in California meet approximately 38% of the in-state electricity demand. (CEC, 2006a). However, natural gas is also widely used for industrial, commercial and residential heating, as well as for the generation of electricity. Most of the natural gas consumed in California comes from the Southwest, the Rocky Mountains, and Canada, while the remainder is produced in California. Although contractually California can receive natural gas from any producing region in North America, it can only take supplies from the three producing regions due to the current pipeline configuration.

For Contra Costa County, Pacific Gas and Electric (PG&E) is the primary supplier for electricity and natural gas to businesses and residents of the area. PG&E's service area extends from Eureka to Bakersfield (north to south), and from the Sierra Nevada to the Pacific Ocean (east to west). On the PG&E system, the installed hydroelectric and renewable capacity is larger than in the rest of the state, and approximately 51% of the electrical generating sources delivering power to the PG&E grid use fossil fuels (CEC, 2002b). Electricity production facilities include natural gas-fired, coal-fired, and hydroelectric plants. PG&E obtains its energy supplies from power plants and natural gas fields in northern California and from electricity and natural gas purchased outside its service area and delivered through high voltage transmission lines of the power grid and through gas pipelines.

State and Regional Energy Consumption

With a relatively mild Mediterranean climate and strict energy efficiency and conservation requirements, California has lower energy consumption rates than other parts of the country. California has the lowest annual electrical consumption rate per person, at approximately 53% of the national average, and consumes approximately 11% of the United States natural gas supply average consumption (EIA, 2005). Nevertheless, with a population of 34 million people, California residents consume approximately 10% of the nation's total energy produced (EIA, 2005) and the state is the tenth largest consumer of energy in the world.

Transportation Sector Consumption

The transportation sector is a major end use of energy in California, accounting for approximately 37% of total statewide energy consumption in 2004. In addition, energy is consumed in connection with construction and maintenance of transportation infrastructure, such as streets, highways, freeways, locomotives, and airport runways. California's nearly 26 million vehicles consume more than 15 billion gallons of gasoline and more than 2 billion gallons of diesel each year, making California the second largest consumer of gasoline in the world. (CEC, 2005a).

Industrial and Residential Electricity and Natural Gas Consumption

California has the lowest annual electrical consumption per resident of any state and uses 20% less natural gas per person than the national average. In 2003, California per capita electricity usage was 6,732 kiloWatt hours (kWh), which was 56% of the national average usage of 11,997 kWh (CEC, 2006b).

Energy consumption from industrial shipments is expected to grow by 4.5% per year on average in the State. At the same time, industrial energy use has declined by an annual rate of about 2.3% due to increases in energy efficiency. Considering the 2.3% decrease in industrial demand due to conservation measures together with the 4.5% increase industrial shipments, industrial energy use is expected to grow 2.2% annually on average (CEC, 2001).

PG&E supplied its customers in northern California with approximately 900 billion standard cubic feet of natural gas in 2002. Industrial and commercial customers accounted for approximately two thirds of this gas.

Contra Costa County is located in a coastal climate zone (Climate Zone 3 in the Title 24 Climate Zone designation mapping) and, with the moderating influence of the bay, requires less energy for heating than other parts of the state.

4.6.2.2 Local Setting

PG&E supplies electricity and natural gas to the City of Richmond and to the Chevron Refinery. PG&E supplies electricity to the Refinery through two 115 kV lines. Distribution facilities within the Refinery, including the five substations, are owned and operated by Chevron. While PG&E supplies natural gas to all residential units and a major portion of commercial facilities in the City of Richmond, it is not the only supplier of natural gas

Electricity

The Refinery currently self-generates about 125 MegaWatts (MW) of electric power. The Refinery typically purchases an average of 10 MW from PG&E. Although the Refinery self-generates a substantial amount of its own electrical power and can at times sell power back to PG&E based on different Refinery unit load conditions, on average the Refinery continues to import approximately 10% of its electrical energy from the PG&E grid.

Natural Gas

The Refinery imports natural gas at an approximate rate of 90 million cubic feet per day. Natural gas is a raw material for the Refinery and this annual use rate has remained approximately the same since Chevron implemented its Reformulated Gasoline and FCC Upgrade Project in 1995.

4.6.2.3 Regulatory Framework

Federal and state agencies regulate energy use and consumption through various programs. On the federal level, the U.S. Department of Transportation (US DOT), U.S. Department of Energy (US DOE), and U.S. Environmental Protection Agency (US EPA) are three agencies with substantial influence over energy policies and programs. Generally, federal agencies influence transportation energy consumption through establishment and enforcement of fuel economy standards for automobiles and light trucks, through funding of energy related research and development projects, and through funding for transportation infrastructure projects. On the state level, the California Public Utilities Commission (CPUC) and California Energy Commission (CEC) are two agencies with authority over different aspects of energy.

Federal

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.

Energy Policy Act of 2005

Signed by President Bush on August 8, 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. Because driving fuel-efficient vehicles and installing energy-efficient appliances can provide many benefits, such as lower energy bills, increased indoor comfort, and reduced air pollution, businesses are eligible for tax credits for buying hybrid vehicles, building energy efficient buildings, and improving the energy efficiency of commercial buildings. Additionally, tax credits are given for the installation of qualified fuel cells, stationary microturbine power plants, and solar power equipment.

Intermodal Surface Transportation Efficiency Act

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) promotes the development of inter-modal transportation systems to maximize mobility as well as address national and local interests in air quality and energy. ISTEA contains factors that Metropolitan Planning Organizations (MPOs), such as the Association of Bay Area Governments (ABAG) are

to address in developing transportation plans and programs, including some energy-related factors. To meet the new ISTEA requirements, MPOs have adopted explicit policies defining the social, economic, energy, and environmental values that guide transportation decisions in their respective metropolitan areas. The planning process for specific projects would then address these policies. Another requirement of ISTEA is to consider the consistency of transportation planning with federal, state, and local energy goals. Through this requirement, energy consumption is expected to be a decision criterion, along with cost and other values to determine the best transportation solution.

Federal Ultra Low Sulfur Diesel Regulations

The US EPA established a comprehensive national control program to reduce the level of sulfur in highway diesel fuel by 97% in 2006. The regulations requires the use of ultra-low-sulfur diesel (ULSD), defined as diesel fuel with a sulfur content not to exceed 15 parts per million (ppm) in the United States. Discussed in greater detail below, California set a more stringent timeline for ULSD and chose to require low sulfur diesel to be used in all vehicles (e.g. both on-highway and off-road) as opposed to US EPA's initial requirement that low sulfur diesel fuel must be used in only on-highway vehicles.

State

California continues to be the national leader in efficiency. While energy use per person in the rest of the nation has increased by 45% over the last 30 years, California's per capita use has remained relatively flat as a result of the state's energy efficiency measures. In the 2003 Energy Report, the Energy Commission concluded that California could save an additional 30,000,000 MegaWatt hours (MWh) of energy from energy efficiency programs over the coming decade. In 2004, the CPUC established aggressive energy savings goals and authorized a significant increase in energy efficiency funding. Meeting these goals would reduce the utilities' need for additional electricity supplies between 2004 and 2013 by more than half. The recent passage of SB 1037 (Kehoe) Chapter 366, Statutes of 2005, further reinforces the state's energy efficiency policies by requiring all utilities to meet their unmet resource needs first with energy efficiency and demand reduction resources that are cost-effective, reliable, and feasible.

Title 24 Building Energy Efficiency Standards

The State of California regulates energy consumption under Title 24 of the California Code of Regulations. The Title 24 Building Energy Efficiency Standards were developed by the California Energy Commission (CEC) and apply to energy consumed for heating, cooling, ventilation, water heating, and lighting in new residential and non-residential buildings. The CEC adopted the first Title 24 standards in 1978 and updates them periodically to incorporate new energy efficiency technologies and methods. The most recent standards were adopted in 2005 - California Energy Code, Title 24, Part 6. Title 24, part 6 standards apply to the design and insulation of structures and to the space cooling equipment installed in structures.

State of California Integrated Energy Policy

The CEC adopts and transmits to the Governor and Legislature a report of findings biannually. In 2002, the Legislature reconstituted the State's responsibility to develop an integrated energy plan for electricity, natural gas, and transportation fuels. At a Special Business Meeting on November 12, 2003, the CEC adopted the 2003 Integrated Energy Policy. The 2004 Update to the Integrated Energy Policy was adopted by the Energy Commission on November 3, 2004. The 2005 Integrated Energy Policy was adopted by the Energy Commission on November 21, 2005.

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 Vehicle (ZEVs) and addressing their infrastructure needs; and encouragement of urban designs that reduce vehicle miles traveled and accommodate pedestrian and bicycle access.

Contra Costa County General Plan

The following goals from the Contra Costa County General Plan are relevant to the Proposed Project.

Goal 8-L: To reduce energy use in the County to avoid risks of air pollution and energy shortages which prevent orderly development.

Goal 8-R: To achieve utilization of oil and gas resources in a manner beneficial to all County residents.

(Contra Costa County, 2005)

City of Richmond

The City of Richmond (City) currently has no formal energy conservation plans or policies.

4.6.3 Energy Significance Criteria and Methodology

Significance Criteria

While no thresholds related to energy are included in CEQA Guidelines Appendix G, Part I of Appendix F of the CEQA Guidelines states that “[t]he goal of conserving energy implies the wise and efficient use of energy. The means of achieving this goal include:

1. decreasing overall per capita energy consumption,
2. decreasing reliance on natural gas and oil, and
3. increasing reliance on renewable energy resources.”

Appendix F states that an EIR should discuss the general energy implications of a proposed project, with particular emphasis on these three criteria. Because the Proposed Project involves changes to the operating Chevron Refinery, application of these basic criteria to this project, as

further explained in Part II.C of Appendix F, would suggest that the EIR should discuss whether the Proposed Project would:

- a. Substantially increase the consumption of electricity, natural gas, gasoline, diesel, or other nonrenewable energy types;
- b. Result in a reduction or interruption of existing electrical or natural gas services due to construction or operation of project features;
- c. Use substantial amounts of electricity and natural gas, thereby resulting in the construction of new facilities and sources of energy or major improvements to local infrastructure;
- d. Conflict with existing energy standards, including standards for energy conservation; or
- e. Cause a cumulatively considerable increase in energy consumption and associated environmental impacts.

CEQA Guidelines Appendix F topics that will not be discussed further in this EIR

Review and comparison of the Proposed Project to the environmental setting clearly shows that the Proposed Project would create no impacts related to the following environmental topics listed in CEQA Guidelines Appendix F.

- b. Potential of the Proposed Project to result in a reduction or interruption of existing electrical or natural gas services due to construction or operation of project features.**

There are no aspects of the Proposed Project that would result in a reduction or interruption of existing electrical or natural gas services.

- d. Potential of the Proposed Project to conflict with existing energy standards, including standards for energy conservation.**

The Proposed Project would be required to comply with all current energy standards. New structures, such as the new control room and maintenance facility would be required to meet current building standards for energy conservation. Several of the Proposed Project components would replace older less efficient processes within the Refinery. Consequently it is highly unlikely that the Proposed Project would conflict with current energy standards.

4.6.4 Energy Impacts and Mitigation Measures

This energy analysis addresses the changes in energy use that would result from the construction and operation of the Proposed Project. The Proposed Project would require the use of energy to construct the Project and the use of additional energy to increase the production of electricity, hydrogen, and CARB gasoline at the Refinery. The additional energy required would be provided from the cogeneration facility, new Hydrogen Plant, as well as Refinery Fuel Gases that are a byproduct of processing.

Although the Proposed Project would be an energy infrastructure project, the Proposed Project is relatively neutral in that it would have only a minimal direct effect on the three main criteria for CEQA's goal of conserving energy, as stated in Section 4.6.3, above.

The Proposed Project would not increase reliance on renewable energy resources and would also not decrease reliance on natural gas and oil, except to improve the efficiency with which useful products would be extracted from crude oil and gas oils at the Refinery. The Proposed Project would increase consumption of natural gas at the Refinery.

4.6.4.1 Construction

Impact 4.6-1: Construction of the Proposed Project would use non-renewable energy resources, primarily in the form of fuels for vehicles and equipment, and would use electrical energy from renewable and non-renewable sources for tools and lighting. The energy required is readily available, and the increased demand would not result in a substantial use of regional energy sources, nor would it require new energy infrastructure to be constructed. This would be a less-than-significant impact.

Energy expenditures to construct the Proposed Project would include both direct and indirect uses of energy. Combustion of the refined petroleum products needed to operate construction equipment would be a part of the direct energy use. The energy consumed through mining and extraction of raw materials, manufacturing, and transportation to make the steel and all other materials that are a part of the structure of the Proposed Project facilities would be a part of the indirect energy use. Indirect energy typically represents about three-quarters of total construction energy, while direct energy represents about one-quarter of total construction energy (Hannon, 1978). Though construction energy would be consumed only during the construction period, it would be a relatively small, but irreversible drain on finite natural energy resources.

Construction of the Proposed Project's major components would take place over a period of about two-and-a-half years. Construction energy use would be the highest during construction of the major components of the Proposed Project, between early 2007 and late 2009. Construction would consume fuel and electricity, along with indirect energy for materials used in the Proposed Project facilities. Based on estimates of construction vehicles reported in Section 4.16, *Traffic*, construction-related equipment and vehicles on-site are expected to consume a maximum of about 13,000 gallons of fuel per day, or about 2,000 million Btu/day. This is a worst-case calculation, based on the maximum quantities of equipment working onsite on a single day during the construction period. Actual average fuel consumption would be less than this estimate, because not all equipment would be used continuously for the entire duration of construction.

Electricity would be used by construction-related equipment, such as welding machines and power tools. A portion of the electricity consumed would likely be obtained from the onsite cogeneration plant, but a portion would be obtained from PG&E. Peak day electrical energy demand for construction during the Proposed Project could be in the range of 100 to 500 kW.

Because of the uncertainties involved in calculating indirect energy consumption, the indirect energy associated with materials used in the construction is not quantified.

Given that the Proposed Project objectives are to improve the efficiency of operation of the Refinery and given current construction practices, construction of the Proposed Project would not be considered a wasteful use of energy. Construction energy consumption would be limited to the construction period. Construction-related energy consumption would primarily be in the form of petroleum-based fuels, and electricity use would not have a significant effect on PG&E's energy resources. Energy consumed by construction activities, therefore, would not be a significant adverse environmental impact.

Mitigation: None required.

4.6.4.2 Operation

Impact 4.6-2: Operation of the Proposed Project and its components would increase long-term consumption of natural gas and increase production of electricity and hydrogen at the Refinery. Hydrogen would be used to process feed stocks. Refinery Fuel Gas, natural gas, and Refinery-produced LPG would also be burned in furnaces and in the CoGen unit to produce process heat, electricity and steam for use at the Refinery. This would be a less-than-significant impact.

Implementation of the Proposed Project would increase the production of finished products, hydrogen and refinery fuel gas, from the various crude oils and gas oils that are now imported to the Refinery, as described in Chapter 3, *Project Description*. These increases in production yield would represent more efficient use of those crude oils and gas oils than is now possible. The additional Refinery Fuel Gas that would be manufactured would be used as a feedstock, be substituted for natural gas, or be burned to produce heat.

Natural gas consumption after implementation of the Proposed Project is expected to increase by about 33% over current levels. The primary reasons for this increase are:

1. The new Hydrogen Plant would use natural gas as a feedstock and furnace fuel to produce 260 million standard cubic feet per day (SCFD) of hydrogen, on a typical day.
2. The new CoGen Unit would be fired with natural gas, Refinery Fuel Gas, and Refinery-produced LPG. Refinery-produced LPG would be used when natural gas is not available and to manage excess LPG inventory. The new CoGen would produce a net increase of 50 MW gross (47 MW net) in electrical generation at the Refinery. The CoGen is an efficient producer of electricity and, during normal operation. The new unit would remove the Refinery as a consumer of electricity from the public grid. Power from the increased generating capacity would be available to the grid to meet increasing public demand.

While the Proposed Project would increase natural gas consumption at the Refinery, this increase would be offset in part by the Refinery's additional capacity to generate electrical power and, at times, be a modest net exporter of electricity to the grid. This could be considered a trade-off because PG&E electricity, some fraction of which is generated by natural gas, would not be required by the Refinery. PG&E has informed Chevron that an adequate supply of natural gas is available and that the Proposed Project would not require the construction of new facilities or infrastructure for natural gas supply. Chevron's estimates, based on discussions with PG&E, confirm that the existing pipeline infrastructure would be capable of delivering the necessary flow rates required for operation of the Proposed Project (Chevron, 2007), thus this increase in consumption would be considered less-than-significant.

Mitigation: None required.

Impact 4.6-3: Operation of the Proposed Project and its components would increase long-term generation and consumption of electrical energy at the Refinery. Proposed Project operation would increase consumption of electrical energy within the Refinery. This would be a less-than-significant impact.

The Proposed Project would result in the shutdown of five existing boilers, each with a firing rate of approximately 250 million Btu/hr, that presently supply steam on an as-needed basis for existing Refinery processes and also supply approximately 10 MW of electricity for use at the Refinery. The boilers would be replaced by a single-turbine cogeneration system that would supply 50 MW gross (47 MW net) of electricity, as well as process steam, for the Refinery. The new Hydrogen Plant also would generate 17 MW net of electrical energy. Thus, the net change would be an increase of 64 MW in electricity generation at the Refinery. The cogeneration system would include one new gas turbine that would burn natural gas, medium-BTU natural gas, or LPG (including pentanes) and new duct burners that would be fired with Refinery Fuel Gas.

Other processes included in the Proposed Project would require additional electricity to operate, and would consume portions of the increased generation capacity of the Refinery resulting from the Proposed Project. Even accounting for the increased consumption of the Proposed Project components and 10 MW that the Refinery currently imports from PG&E, the increased generation capacity of the Proposed Project would enable the Refinery to self-generate all of the electricity needed for normal operations and at times to be a modest exporter (a few MegaWatts) to PG&E's grid.

Mitigation: None required.

Impact 4.6-4: Operation of the Proposed Project would require energy for transportation of employees, as well as product (crude oil, additives, refined products, and byproducts). The increase or decrease in energy use for transportation and production of product would be

insubstantial compared to existing Refinery consumption. This would be a less-than-significant impact.

As described in Chapter 3, *Project Description*, crude oil and gas oil are imported to the Refinery and processed to produce useful products. However, the processing is not able to transform all of the components of these crude and gas oils into useful products. As a result, the remaining residual products are of low value and are sold, primarily as fuel oils. Energy would be used to dispose of these residual fuels, either by paying to transport them or by selling them cheaply enough to enable the buyer to transport them. To the extent that the Proposed Project would decrease the amount or change the quality of the residual fuels, it would increase or decrease the energy used for transportation. In either event, the magnitude of those changes would be relatively small.

As described in Chapter 3, *Project Description*, among the useful products manufactured is CARB gasoline. Currently, some of the gasoline produced at the Refinery does not meet CARB standards and may not be sold in California, so is transported out of state for sale. Energy is used to transport of these non-CARB gasolines. Improved yield of CARB fuels would reduce the energy used to transport those fuels out of state. In either event, the magnitude of the change would be relatively small.

Mitigation: None required.

References – Energy

- Energy Information Administration, http://www.eia.doe.gov/emeu/states/_states.html, Department of Energy, Accessed 11/16/2005.
- Hannon, Bruce, et al., “Energy and Labor in the Construction Sector,” *Science* 202: 837-847, 1978.
- California Code of Regulations, Title 24, Part 6, (California Energy Code).
- California Energy Commission (CEC), 2001. *California Energy Outlook – Electricity and Natural Gas Trends Report*, available online at <http://www.energy.ca.gov/energyoutlook>, September 2001.
- CEC, 1999 *Operational Capacity of California’s Three (Major) Investor-Owned Utilities*, July 2002.
- CEC, 2005a. *Summary of California Energy*, available online at http://www.energy.ca.gov/html/calif_energy_facts.html. updated August 2005. Website accessed February 6, 2006.
- CEC, 2005b. *Oil and Petroleum in California*, available online at <http://www.energy.ca.gov/oil/index.html>, updated October 20, 2005. Website accessed February 6, 2006.
- CEC, 2006a. *2005 Gross System Electricity Production*, available online at <http://www.energy.ca.gov/html/energysources.html>. Website accessed March 20, 2007.

- CEC, 2006b. *US Per Capita Electricity Use By State in 2003*, available online at http://www.energy.ca.gov/electricity/us_percapita_electricity_2003.html, updated November 14, 2006.
- Chevron, 2007, Personal Communication with Bob Chamberlin of the Chevron Richmond Refinery, April 30, 2007.
- City of Richmond, *General Plan and Zoning Ordinance Update Program Environmental Impact Report*, prepared by ESA, August 1993.
- Contra Costa County, *Contra Costa County General Plan 2005-2020*, <http://www.co.contra-costa.ca.us/>, accessed March 2006.
- Western States Petroleum Association (WSPA). 2005. Fuel Supply Backgrounder. May 17, 2005.

4.7 Geology, Soils, Seismicity and Mineral Resources

The potential adverse environmental effects related to Geology, Soils, and Seismicity due to the implementation of the Proposed Project would be:

- Seismic ground shaking could result in injuries to persons or structural damage to equipment or facilities.
- Facilities could be exposed to expansive soils and natural settlement.

Each of these impacts would be reduced to less than significant by compliance with applicable codes and regulations.

4.7.1 Introduction

The Proposed Project includes new facilities or modifications of existing facilities at the Refinery. This section identifies and evaluates potential impacts related to geology, soils, seismicity and mineral resources that could result from construction and operation of the Proposed Project. This section establishes the existing conditions based on the regional geology and seismicity, considers the soils, geologic units, earthquake faults, and potential seismic hazards at the Refinery, and discusses the regulatory framework that pertains to the geologic hazards, seismic hazards, and protection of soil resources. The impact analysis determines the geologic impacts based on the significance criteria and when necessary, presents appropriate measures to mitigate adverse effects of the Proposed Project.

4.7.2 Setting

4.7.2.1 Geology and Soils

Geology

The Refinery is located on the San Pablo Peninsula, which contains a steep-sided, northwest-trending ridge about three miles long, separating the San Francisco and San Pablo Bays. Elevations range from just over 300 feet above mean sea level (amsl) at the ridge crest to at or near seal level at the San Francisco and San Pablo Bay margin. Most Refinery processing operations are situated on the southeast side of the peninsula on former tidal and slough lands, much of which was filled through the 1900's for bay reclamation. These flat lying areas are generally at elevations below 20 feet amsl. The Proposed Project would be built mostly on several sites within the flat low-lying areas of the project property.

The Proposed Project site lies within the geologically complex region of California, which is composed of old volcanic rocks and rocks originating from an ancient sea floor that was buried and then uplifted over time to form the Coast Ranges. The San Francisco Bay lies within a broad depression within the Coast Range created from an east-west expansion between the San Andreas and the Hayward faults. Sand, silt and clay deposits, estuarine (tidal marsh), artificial fill (placed

by humans for bay reclamation, underlie the bay margins. These deposits are associated with prehistoric changes in sea levels, surface water processes, and historic man-made activities.

The bedrock of the San Pablo Peninsula is sandstone with interbedded shale (Blake, et al, 1974). This rock unit is severely sheared and deformed but as evidenced by the topography, forms a resistant basement rock. To the east of the peninsula, where a majority of the Refinery operations are located, lies a trough with a thick sequence of alternating estuarine and alluvial sedimentary deposits. The sequence reflects the successive rise and fall of sea levels in response to glacial stage melting cycles. The most recent estuarine deposit is known as Young Bay Mud. Young Bay Mud is an unconsolidated, highly plastic, highly compressible, soft, and saturated silty clay. The upper few feet of the mud contain scattered deposits of peat. The mud mantles a northeastwardly sloping buried topography into which several steep-sided ravines have been eroded, accounting for thicknesses of Bay Mud between 5 feet and 100 feet on the eastern portions of the Refinery property.

Older alluvial and estuarine deposits underlie the mud. They are variable in composition, including gravels, sands, silts, and clays. They represent alluvial fans, which originate from the eastern lying hills, as well as stream-channel and marine deposits.

Beginning about the turn of the century, earth fill was used to reclaim portions of old tidal marsh land for Refinery development. The fill is largely hydraulic sandy fill and rocky sandy clay.

Soils

According to the Soil Conservation Service, the Refinery property consists of Conejo clay loams, Reyes silty clays, Millsholm loam, and Urban land (fill) (USDA, 1977). The Conejo loams consist of clay loams that are originate from sedimentary rock and have a slight erosion potential. The Reyes silty clays are associated with bayland margins and have no hazard of erosion. The steeper upland areas of the Refinery are mapped as Millsholm loams which can also include softer bedrock but overall have a high erosion hazard. Areas mapped as Urban land include areas filled with crushed rock adjacent to railroad yards and docks.

The Proposed Project area is underlain by a relatively steep northeast-sloping bedrock surface, over which considerable thicknesses of clay and silt have been deposited by stream and active marine processes. Young Bay Mud has been spread over the clays, infilling the former topography. Portions of this tidal flat area have been reclaimed by filling during the growth and development of the Refinery.

Several active, northwesterly trending faults traverse the Bay Area. The San Andreas, Hayward, San Gregorio, and Calaveras faults, as well as several smaller features are capable of generating substantial ground motion, surface rupture, and secondary geologic hazards including landslides, liquefaction and settlement. Regionally, the northern segment of the Hayward fault is thought to have the highest likelihood of generating the next large Bay Area earthquake.

4.7.2.2 Seismicity

The Proposed Project lies within a region of California that contains many active and potentially active faults and is considered an area of high seismic activity (Figure 4.7 -1).¹ The 2001 California Building Code locates the entire Bay Area within Seismic Risk Zone 4. Areas within Zone 4 are expected to experience maximum magnitudes and subsequent damage in the event of an earthquake. The U.S. Geological Survey (USGS) Working Group on California Earthquake Probabilities evaluated the probability of one or more earthquakes of Richter magnitude 6.7 or higher occurring in the San Francisco Bay Area within the next 30 years. The result of the evaluation indicated a 62% likelihood that such an earthquake event will occur in the Bay Area between 2003 and 2032 (USGS, 2003b).

Richter magnitude (M) is a measure of the size of an earthquake as recorded by a seismograph, a standard instrument that records ground shaking at the location of the instrument. The reported Richter magnitude for an earthquake represents the highest amplitude measured by the seismograph at a distance of 100 kilometers from the epicenter. Richter magnitudes vary logarithmically with each whole number step representing a ten fold increase in the amplitude of the recorded seismic waves. Earthquake magnitudes are also measured by their Moment Magnitude (M_w) which is related to the physical characteristics of a fault including the rigidity of the rock, the size of fault rupture, and movement or displacement across a fault (CGS, 2002b).

Ground movement during an earthquake can vary depending on the overall magnitude, distance to the fault, focus of earthquake energy, and type of geologic material. The composition of underlying soils, even those relatively distant from faults, can intensify ground shaking. For this reason, earthquake intensities are also measured in terms of their observed effects at a given locality. The Modified Mercalli (MM) intensity scale (See Table 4.7-1) is commonly used to measure earthquake damage due to ground shaking. 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.² The intensities of an earthquake will vary over the region of a fault and generally decrease with distance from the epicenter of the earthquake.

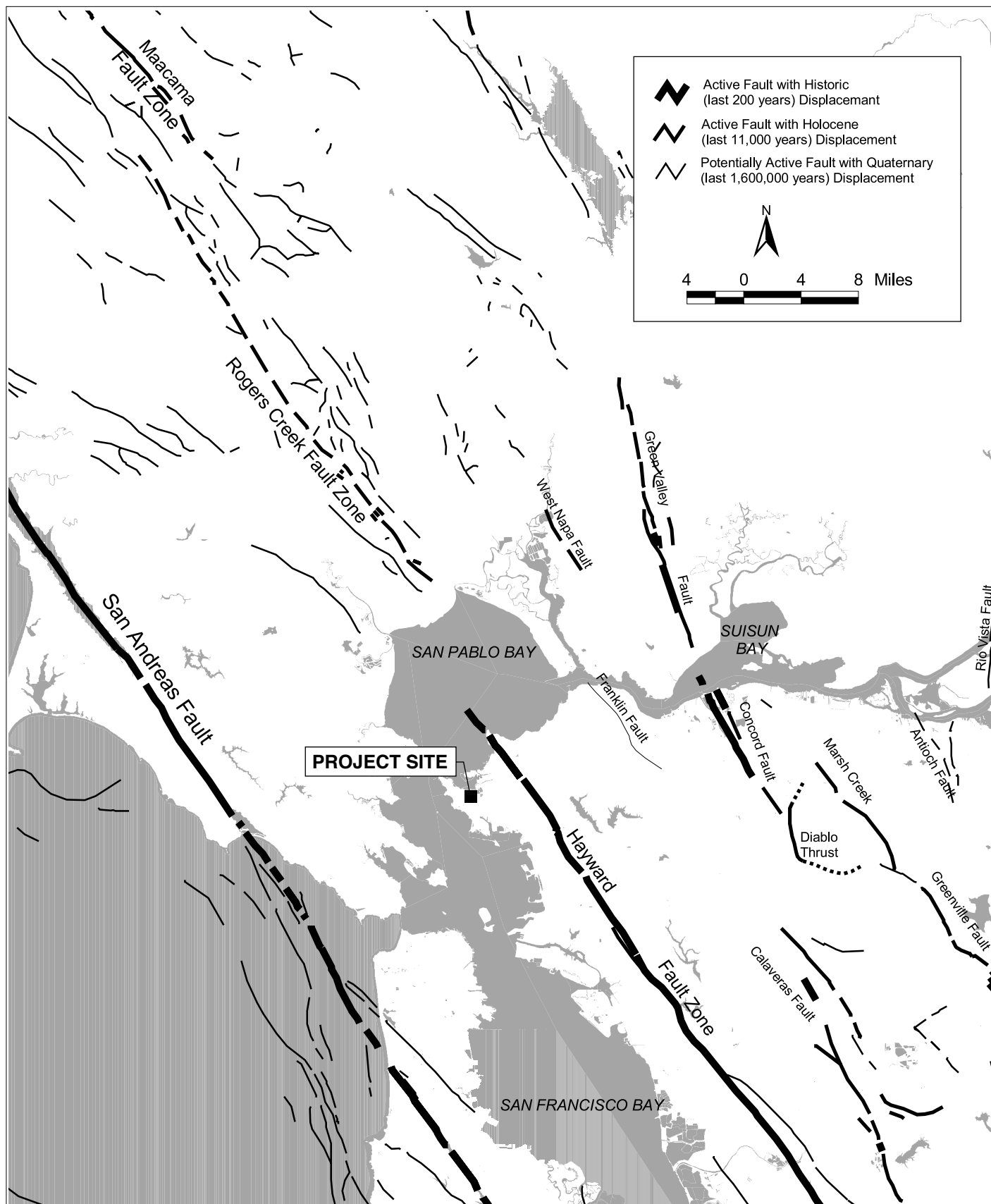
Regional Faults

The San Andreas, Hayward and Calaveras Faults pose the greatest threat of significant damage in the Bay Area according to the USGS Working Group (USGS, 2003b). These three faults exhibit strike-slip orientation and have experienced movement within the last 150 years.³

¹ See the definitions for fault activity levels under “Regional Faults” following.

² The damage level represents the estimated overall level of damage that will occur for various MM intensity levels. The damage, however, will not be uniform. Not all buildings perform identically in an earthquake. The age, material, type, method of construction, size, and shape of a building all affect its performance:

³ A strike-slip fault is a fault on which movement is parallel to the fault’s strike or lateral expression at the surface (Bates and Jackson, 1984).



SOURCE: California Department of Conservation,
Geological Survey (After Jennings, 1994)

Chevron Energy and Hydrogen Renewal Project . 205166

Figure 4.7-1
Active and Potentially Active
Bay Area Faults

**TABLE 4.7-1
MODIFIED MERCALLI INTENSITY SCALE**

Intensity Value	Intensity Description	Average Peak Acceleration^a (% of g)
I	Not felt except by a very few persons under especially favorable circumstances.	< 0.17
II	Felt only by a few persons at rest, especially on upper floors on buildings. Delicately suspended objects may swing.	0.17 – 1.4
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.	0.17 – 1.4
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.	1.4 – 3.9
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.	3.5 – 9.2
VI	Felt by all, many frightened and run outdoors. Some heavy furniture moved; and fallen plaster or damaged chimneys. Damage slight.	9.2 – 18
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.	18 – 34
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.	34 – 65
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. Underground pipes broken.	65 – 124
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 over banks.	> 124
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.	> 124
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.	> 124

^a g (gravity) = a force equivalent to an acceleration of 980 centimeters per second squared. For example, 1.0 g of acceleration is a rate of increase in speed equivalent to a car accelerating uniformly from rest and traveling 328 feet in 4.5 seconds.

SOURCE: ABAG, 2003; CGS, 2003

The principal faults capable of producing significant ground shaking in the Bay Area are listed on Table 4.7-2 and also include the Concord–Green Valley, Marsh Creek–Greenville, and Rodgers Creek faults.

An “active” fault is defined by the State of California as a fault that has had surface displacement within approximately the last 11,000 years. A “potentially active” fault is defined as a fault that

**TABLE 4.7-2
ACTIVE FAULTS IN THE PROJECT SITE VICINITY**

Fault	Location and Direction from Refinery	Recency of Movement	Fault Classification^a	Historical Seismicity^b	Maximum Moment Magnitude Earthquake (Mw)^c
Hayward	4 miles east-northeast	Pre-Historic (possible 1836; 1868 ruptures) Holocene	Active	M6.8, 1868 Many <M4.5	7.1
Concord–Green Valley	20 miles northeast	Historic (1955) Holocene	Active	Historic active creep	6.9
Rodgers Creek	15 miles north	Historic Holocene	Active	M6.7, 1898 M5.6, 5.7, 1969	7.0
San Andreas	15 miles west	Historic (1906; 1989 ruptures)	Active	M7.1, 1989 M8.25, 1906 M7.0, 1838 Many <M6	7.9
Calaveras (northern)	30 miles southeast	Historic (1861 rupture) Holocene	Active	M5.6-M6.4, 1861 M4 to M4.5 swarms 1970, 1990	6.8
Marsh Creek-Greenville	25 miles east	Historic (1980 rupture) Holocene	Active	M5.6 1980	6.9

^a See footnote 2.

^b Richter magnitude (M) and year for recent and/or large events. The Richter magnitude scale reflects the maximum amplitude of a particular type of seismic wave.

^c Moment magnitude is related to the physical size of a fault rupture and movement across a fault. Moment magnitude provides a physically meaningful measure of the size of a faulting event (CGS, 2002b). The Maximum Moment Magnitude Earthquake (Mw), derived from the joint CGS/USGS Probabilistic Seismic Hazard Assessment for the State of California, 1996. (Peterson, 1996).

SOURCES: Jennings, 1994; Hart, 1997.

has shown evidence of surface displacement during the last 1.6 million years, unless direct geologic evidence demonstrates inactivity for the last 11,000 years or longer. This definition does not, of course, mean that faults lacking evidence of surface displacement are necessarily inactive. “Sufficiently active” is also used to describe a fault if there is some evidence that displacement occurred in the last 11,000 years on one or more of its segments or branches. These faults are considered either active or potentially active. Inactive faults are those that have not shown evidence of displacement in more than 1.6 million years (Hart, 1997).

San Andreas Fault

The main trace of the San Andreas fault trends northwest through the Bay Area from the Santa Cruz Mountains and runs to the eastern side of the San Francisco Peninsula. As the principal strike-slip boundary between the Pacific plate to the west and the North American plate to the east, the San Andreas is often a highly visible topographic feature, such as between Pacifica and San Mateo, where Crystal Springs Reservoir and San Andreas Lake clearly mark the rupture zone. Near San Francisco, the San Andreas fault trace is located immediately off-shore near Daly

City and continues northwest through the Pacific Ocean approximately 6 miles due west of the Golden Gate Bridge.

In the San Francisco Bay Area, the San Andreas Fault Zone was the source of the two major seismic events in recent history that affected the San Francisco Bay region. The 1906 San Francisco earthquake was estimated at Mw 7.9 and resulted in approximately 290 miles of surface fault rupture, the longest of any known continental strike slip fault. Horizontal displacement along the fault approached 17 feet near the epicenter. The more recent 1989 Loma Prieta earthquake, with a magnitude of Mw 6.9, resulted in widespread damage throughout the Bay Area.

Hayward Fault

The Hayward Fault Zone is the southern extension of a fracture zone that includes the Rodgers Creek Fault (north of San Pablo Bay), the Healdsburg fault (Sonoma County), and the Maacama fault (Mendocino County). The Hayward fault trends to the northwest within the East Bay, extending from San Pablo Bay in Richmond, 60 miles south to San Jose. The Hayward fault in San Jose converges with the Calaveras fault, a similar type fault that extends north to Suisun Bay. The Hayward fault is designated by the Alquist-Priolo Earthquake Fault Zoning Act as an active fault.

Historically, the Hayward fault generated one sizable earthquake in the 1800s.⁴ In 1868, a Richter magnitude 7 earthquake on the southern segment of the Hayward Fault ruptured the ground for a distance of about 30 miles. Recent analysis of geodetic data indicates surface deformation may have extended as far north as Berkeley. Lateral ground surface displacement during these events was at least 3 feet.

A characteristic feature of the Hayward fault is its well-expressed and relatively consistent fault creep. Although large earthquakes on the Hayward fault have been rare since 1868, slow fault creep has continued to occur and has caused measurable offset. Fault creep on the East Bay segment of the Hayward fault is estimated at 9 millimeters per year (mm/yr) (Peterson, et al., 1996). However, a large earthquake could occur on the Hayward fault with an estimated moment magnitude (Mw) of about Mw 7.1 (Table IV.F-2). The USGS Working Group on California Earthquake Probabilities includes the Hayward–Rodgers Creek Fault Systems in the list of those faults that have the highest probability of generating earthquakes of magnitude (M) 6.7 or greater in the Bay Area (USGS, 2003b).

Calaveras Fault

The Calaveras fault is a major right-lateral strike-slip fault that has been active during the last 11,000 years. The Calaveras Fault has been the source of numerous moderate magnitude earthquakes and the probability of a large earthquake (greater than M6.7) is much lower than on the San Andreas or Hayward Faults (USGS, 2003a). However, this fault is considered capable of

⁴ Prior to the early 1990s, it was thought that a Richter magnitude 7 earthquake occurred on the northern section of the Hayward Fault in 1836. However, a study of historical documents by the California Geological Survey concluded that the 1836 earthquake was not on the Hayward Fault (Bryant, 2000).

generating earthquakes with upper bound magnitudes ranging from Mw magnitude 6.6 to magnitude 6.8.

Rodgers Creek Fault

The Rodgers Creek Fault Zone (RCFZ) is the southern segment of a fracture zone that includes the Rodgers Creek fault (north of San Pablo Bay) and the Healdsburg fault (northern Sonoma County). The most recent significant earthquakes on the RCFZ both occurred on October 1, 1969. On this date, two earthquakes of Richter magnitude 5.6 and 5.7 occurred within an 83-minute period. Buildings in Santa Rosa sustained serious damage during these quakes. Prior to these events, the last major earthquake (estimated Richter magnitude 6.7) was generated in 1898 with an epicenter near Mare Island at the north margin of San Pablo Bay. The California Geological Survey (CGS) estimates that the RCFZ is capable of generating a maximum moment magnitude 7.0 earthquake.

Project Site Vicinity Faults

There are no known active faults beneath the site. The San Pablo fault runs parallel to and along the east side of the San Pablo Peninsula but has shown no evidence of displacement in the last 1.6 million years. A trace of the inactive San Pablo fault is present on the Refinery property along the east edge of San Pablo Peninsula (Blake, et al, 1974); units of the Franciscan Complex are offset by the fault. The San Pablo fault runs northwesterly and its location has not been clearly defined. The nearest active fault is the Hayward fault, four miles to the east-northeast (see Table 4.7-2 and Figure 4.7-1 for the location of active Bay Area faults relative to the project site). The San Pablo fault is an inactive fault. Inactive faults with a long period of inactivity do not provide any guarantee that a considerable seismic event could occur. Occasionally, faults classified as inactive can exhibit secondary movement during a major event on another active fault. However, it is generally accepted that inactive faults present a low potential for activity.

4.7.2.3 Seismic Hazards

Surface Fault Rupture

Seismically induced ground rupture is defined as the physical displacement of surface deposits in response to an earthquake's seismic waves. The magnitude, sense, and nature of fault rupture can vary for different faults or even along different strands of the same fault. Ground rupture is considered more likely along active faults, which are referenced in Table 4.7-2.

The site is not within an Alquist-Priolo Fault Rupture Hazard Zone, as designated by the Alquist-Priolo Earthquake Fault Zoning Act, and no mapped active faults are known to pass through the immediate project region. The risk of ground rupture at the site is low due to the absence of zoned, active fault traces at the project site.

Ground Shaking

Strong ground shaking from a major earthquake could affect Richmond during the next 30 years. Earthquakes on the active faults (listed in Table 4.7-2) could produce a range of ground shaking

intensities at the project site. Ground shaking may affect areas hundreds of miles distant from the earthquake's epicenter. Historic earthquakes have caused strong ground shaking and damage in the San Francisco Bay Area, the most recent being the Mw 6.9 Loma Prieta earthquake in October 1989. This earthquake caused strong ground shaking for about 20 seconds and resulted in varying degrees of structural damage throughout the Bay Area, even at locations of up to 50 miles away from the epicenter.

The 1906 San Francisco earthquake, with an estimated Mw of 7.9, produced moderate (MMI VII) to violent (MMI IX) shaking intensities at the project site (ABAG, 2005b). The 1989 Loma Prieta earthquake, with an Mw of 6.9, produced light (MMI V) to very strong (VIII) shaking intensities in the project area (ABAG, 2005c). According to the earthquake hazard shaking maps prepared by the Association of Bay Area Governments, the strongest shaking at the site would result from an event on the North Hayward and Rogers Creek combined segments. A potential magnitude M 7.1 earthquake from these combined segments would likely cause strong (MMI VII) to very violent (MMI X) shaking at the site (ABAG, 2005a).

The common way to describe ground motion during an earthquake is with the motion parameters of acceleration and velocity in addition to the duration of the shaking. A common measure of ground motion is the peak ground acceleration. The peak ground acceleration for a given component of motion is the largest value of horizontal acceleration obtained from a seismograph. Peak ground acceleration is expressed as the percentage of the acceleration due to gravity (g), which is approximately 980 centimeters per second squared. In terms of automobile accelerations, one "g" of acceleration is a rate of increase in speed equivalent to a car accelerating uniformly from rest and traveling a total of 328 feet in 4.5 seconds. For comparison purposes, the maximum peak acceleration value recorded during the Loma Prieta earthquake was in the vicinity of the epicenter, near Santa Cruz, at 0.64 g. The highest value measured in the East Bay was 0.29 g, recorded at the Oakland Wharf near the Naval Supply Center where the soils are artificial fill overlying Bay Mud. Measurements closest to the project site were recorded at 0.12 and 0.13 g (CDMG, 1990). The lowest values recorded were 0.06 g in the bedrock on Yerba Buena Island. However, an earthquake on the nearby Hayward fault would likely produce far more severe ground shaking at the site than was observed during the Loma Prieta earthquake.

Probabilistic seismic hazard maps from the CGS indicate that peak ground acceleration in the Proposed Project area could reach or exceed 0.55 g (CGS, 2005).⁵

⁵ A CGS probabilistic seismic hazard map shows the predicted level of hazard from earthquakes that seismologists and geologist believe could occur. The map's analysis takes into consideration uncertainties in the size and location of earthquakes and the resulting ground motions that can affect a particular site. The maps are typically expressed in terms of probability of exceeding a certain ground motion in a specified interval of time. These particular maps depict a 10% probability of being exceeded in 50 years, which is also a 90% chance that these ground motions will not be exceeded during that time. This probability level allows engineers to design buildings for larger ground motions than seismologists think will occur during a 50-year interval, making buildings safer than if they were only designed for the ground motions that are expected to occur in the 50 years. Seismic shaking maps are prepared using consensus information on historical earthquakes and faults. These levels of ground shaking are used primarily for formulating building codes and for designing buildings.

Liquefaction

Liquefaction is a transformation of soil from a solid to a liquefied state during which saturated soil temporarily loses strength resulting from the buildup of excess pore water pressure, especially during earthquake-induced cyclic loading. Soil susceptible to liquefaction includes loose to medium dense sand and gravel, low-plasticity silt, and some low-plasticity clay deposits.

Soil liquefaction causes ground failure that can damage roads, pipelines, underground cables, and buildings with shallow foundations. Liquefaction can occur in areas characterized by water-saturated, cohesionless, granular materials at depths less than 40 feet. In addition, liquefaction can occur in unconsolidated or artificial fill sediments located at the Proposed Project site and other reclaimed areas along the margin of San Francisco Bay. The depth to groundwater influences the potential for liquefaction in this area, in that sediments need to be saturated to have a potential for liquefaction (Helley and LaJoie, 1979).

Hazard maps produced by the Association of Bay Area Governments (ABAG) depict liquefaction hazards for the entire Bay Area in the event of a significant seismic event (ABAG, 2005d). According to these maps, the Proposed Project site is in an area expected to have a very low to very high potential to experience liquefaction. The very low potential liquefaction corresponds to the presence of bedrock materials in the upland areas of the Proposed Project site and the very high potential to the lowland areas of the Refinery with estuarine deposits and fill materials. Because of this, liquefaction related ground failure is discussed in the impacts and mitigation measures section of this chapter.

Earthquake-Induced Settlement

Settlement of the ground surface can be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur as a result of the relatively rapid compaction and settling of subsurface materials (particularly loose, uncompacted, and variable sandy sediments above the water table) due to the rearrangement of soil particles during prolonged ground shaking. Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different amounts). Areas underlain by artificial fill are generally susceptible to differential settlement due to their heterogeneous nature. Given the geologic setting of the Proposed Project area, this area could be subjected to earthquake-induced settlement.

4.7.2.4 Geologic Hazards

Expansive Soil

Expansive soils possess a “shrink-swell” behavior. Shrink-swell is the cyclic change in volume (expansion and contraction) that occurs in fine-grained clay sediments from the process of wetting and drying. Structural damage may result over an extended period of time, usually the result of inadequate soil and foundation engineering or the placement of structures directly on expansive soils. Typically, soils that exhibit expansive characteristics comprise the upper five feet of the surface. The effects of expansive soils could damage foundations of above-ground structures, paved roads and streets, and concrete slabs. Expansion and contraction of soils,

depending on the season and the amount of surface water infiltration, could exert enough pressure on structures to result in cracking, settlement, and uplift.

Landslides

Ground failure is dependent on the slope and geology as well as the amount of rainfall, excavation, and seismic activities. A slope failure is a mass of rock, soil, and debris displaced down slope by sliding, flowing, or falling. Steep slopes and downslope creep of surface materials characterize landslide-susceptible areas. Debris flows consist of a loose mass of rocks and other granular material that, if present on a steep slope and saturated, can move down slope.

Landslides may occur on slopes of 15% or less, however, the probability is greater on steeper slopes, with old landslide deposits being the most likely to experience failure (Contra Costa County, 1996). Landslides typically occur within slide-prone geologic units that contain excessive amounts of water and are located on steep slopes. Most of the proposed Project elements are located within the flat land areas of the Proposed Project site and are not likely to be susceptible to potential landslides from the upland areas of the site. However, the proposed tank replacements would occur within the existing tank fields which extend into the upland areas.

Natural Settlement

Settlement can occur from immediate settlement, consolidation, shrinkage of expansive soil, and liquefaction (discussed above). Immediate settlement occurs when a load from a structure or placement of new fill material is applied, causing distortion in the underlying materials. This settlement occurs quickly and is typically complete after placement of the final load.

Consolidation settlement occurs in saturated clay from the volume change caused by squeezing out water from the pore spaces. Consolidation occurs over a period of time and is followed by secondary compression, which is a continued change in void ratio under the continued application of the load.

Natural settlement typically occurs in unconsolidated deposits, such as artificial fill and Bay Mud, over time as a result of increased foundation loads and vibrations from overlying structures. Natural settlement may affect foundations, slabs and pavements. Soils tend to settle at different rates and by varying amounts depending on the load weight or changes in properties over an area, which is referred to as differential settlement. Typically, development around the bay margin where soft compressible soils are present, like those at the Proposed Project site, requires specific engineering design to account for potential settlement.

4.7.2.5 Mineral Resources

The CGS (formerly the California Division of Mines and Geology) has classified lands within the San Francisco Bay Region into Mineral Resource Zones (MRZs). The classification of MRZs is based on guidelines adopted by the California State Mining and Geology Board, as mandated by the Surface Mining and Reclamation Act (SMARA) of 1975 (Stinson et al., 1983). The Refinery property is mapped by the CGS as containing both an MRZ-1 zone, an area where no mineral

deposits are present, and an MRZ-2 zone, an area where significant mineral deposits are present (Stinson et al., 1983). In general the MRZ-2 zone is limited to the upland areas of exposed bedrock while the MRZ-1 zone covers the lowland areas covered by alluvium. The Proposed Project would not infringe upon nor deny accessibility to the potential resources of the MRZ-2 zone. Therefore, there would be no significant impacts related to mineral resources and they are not discussed further in this document.

4.7.2.6 Regulatory Framework

Alquist-Priolo Earthquake Fault Zoning Act

Alquist-Priolo Earthquake Fault Zoning Act (formerly the Alquist-Priolo Special Studies Zone Act) of 1972 (revised in 1994) is the State law that addresses hazards from earthquake fault zones. The purpose of this law is to mitigate the hazard of surface fault rupture by regulating development near active faults. As required by the Act, the State has delineated Earthquake Fault Zones (formerly Special Studies Zones) along known active faults in California. The Proposed Project area is not located within or near an Alquist-Priolo Earthquake Fault Zone.

California Building Code

The California Building Code (CBC) has been codified in the California Code of Regulations as Title 24, Part 2, which is a portion of the California Building Standards Code. Title 24 is assigned to the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under state law, all building standards must be centralized in Title 24 or they are not enforceable. The purpose of the CBC is to provide minimum standards to safeguard life or limb, health, property and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all building and structures within its jurisdiction. Published by the International Conference of Building Officials, the Uniform Building Code is a widely adopted model building code in the United States. The CBC is based on the 1997 Uniform Building Code (UBC) with necessary California amendments. These amendments include significant building design criteria that have been tailored for California earthquake conditions.

The Proposed Project area is located within Zone 4, one of the four seismic zones designated in the United States. Zone 4 is expected to experience the greatest effects from earthquake ground shaking and therefore has the most stringent requirements for seismic design. The national model code standards adopted into Title 24 apply to all occupancies in California except for modifications adopted by state agencies and local governing bodies.

Other Design Standards

The American Petroleum Institute produces design standards for seismic design of welded steel oil storage tanks. These standards, API Standard 650 and API Standard 620, provide uniform guidelines and design criteria to assure stability of the tank during a significant earthquake event. These standards continue to be revised and updated to reflect changes in the current building codes.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act was developed to protect the public from the effects of strong ground shaking, liquefaction, landslides, or other ground failure, and from other hazards caused by earthquakes. This act requires the State Geologist to delineate various seismic hazard zones and requires cities, counties, and other local permitting agencies to regulate certain development projects within these zones. Before a development permit is granted for a site within a Seismic Hazard Zone, a geotechnical investigation of the site must be conducted and appropriate mitigation measures incorporated into the project design. The Proposed Project site has not yet been evaluated by the CGS for possible designation as a Seismic Hazard Zone. However, because there are areas of the Chevron Refinery that are underlain by liquefiable soils (ABAG, 2005d), it is very likely that portions of this area will eventually be included as liquefaction hazard zones.

Contra Costa County General Plan

The County of Contra Costa has established goals, policies, and programs in regards to geologic hazards. These are outlined in the Conservation and Safety Element sections of the Contra Costa County General Plan. The following geologic hazard policies are directly related to the Proposed Project:

- Staff review of application for development permits and other entitlements shall include appropriate recommendations for seismic strengthening and detailing to meet the latest adopted seismic design criteria.
- 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.
- Slope stability shall be given careful scrutiny in the design of developments and structures, and in the adoption of conditions of approval and required mitigation measures.
- Soil and geological reports shall be subject to the review and approval of the County Planning Geologist.
- Erosion control procedures shall be established and enforced for all private and public construction and grading projects.

City of Richmond General Plan

The City of Richmond has also established policies related to geologic hazards as part of their public safety element in the Richmond General Plan. The following policies relate to the Proposed Project:

SF-A.7: Require a site investigation for any major or important structures to determine the degree of seismic and geologic hazards that can be expected for the particular structure (e.g., unreinforced masonry), and have the investigation reviewed by a technically qualified professional.

SF-A.14: Conduct site specific geotechnical studies on a case by case basis on projects proposed to be built on or adjacent to inactive bedrock faults. These areas may represent geologic anomalies that could contribute to slope instability or other problems.

SF-A.16: Use established standards to limit industrial activities that may endanger human health and may cause damage to the environment.

City of Richmond Municipal Code

The City of Richmond Municipal Code Section 12.44 contains provisions for excavation and grading that require measures to control erosion. Any project that involves disturbing more than 50 cubic yards of soil is required to obtain a grading permit pursuant to the City's grading ordinance. The permit requires the preparation of an erosion control plan.

4.7.3 Significance Criteria and Methodology

Significance Criteria

Based on Appendix G of the *CEQA Guidelines*, a project may be deemed to have a significant effect on the environment with respect to Geology, Soils, Seismicity and Mineral Resources if it would result in:

- a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
 - i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map⁶ issued by the State Geologist for the area or based on other substantial evidence of a known fault?
 - ii) Strong seismic ground shaking?
 - iii) Seismic-related ground failure, including liquefaction?
 - iv) Landslides?
- b) Result in substantial soil erosion or the loss of topsoil?
- c) Be located on 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?
- 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?
- f) 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.

⁶ Per *CEQA Guidelines*, a known earthquake fault is one that has been 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.

- g) Result in the loss of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.

4.7.3.2 CEQA Guidelines Appendix G topics not discussed further in this EIR

Review and comparison of the Proposed Project to the environmental setting clearly shows that the Proposed Project will create no impacts related to the following environmental topics listed in CEQA Guidelines Appendix G:

b) Result in substantial soil erosion or the loss of topsoil?

As stated above in the Setting section, the erosion potential for soils is variable throughout the project area. However, typically, the soil erosion potential is reduced once the soil is graded and covered with concrete, structures, asphalt, or vegetation. In addition, an erosion control plan is required as part of the grading permit from the City which would reduce the potential for erosion to less than significant levels.

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 Refinery is served by its own wastewater system. There would be no septic tanks used. There would be no impact.

f). Potential of the Proposed Project to 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 Refinery, which is considered a heavy industrial use, has operated on this site for over 100 years. Despite some potential for mineral resources to be present beneath the site, the existing Refinery processing units and operations preclude access to any potential resources. The Proposed Project components would be located entirely within the developed area of the Refinery, that is, on land where access to mineral resources is already precluded. Thus, the Proposed Project would have no impact on the availability of mineral resources.

g). Potential of the Proposed Project to result in the loss of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.

The Refinery is not delineated by the City of Richmond *General Plan* as a significant mineral resource area. As stated above, the area of the Refinery where the Proposed Project would be constructed is already dedicated to Refinery operations. Thus, implementation of the Proposed Project would not result in the loss of a locally important mineral resource recovery site.

4.7.4 Geology, Soils, Seismicity, and Mineral Resource Impacts and Mitigation Measures

Impact 4.7-1: In the event of a major earthquake in the region, seismic ground shaking could potentially injure persons at the Proposed Project site due to structural damage of facility structures. Ground shaking could potentially expose persons and property to seismic-related hazards, including localized liquefaction and seismically-induced settlement. This significant impact would be reduced to less than significant by compliance with applicable codes and regulations.

The Proposed Project would likely experience at least one major earthquake (greater than Richter magnitude 6.7) within the next 30 years. The intensity of such an event would depend on the causative fault and the distance to the epicenter, the moment magnitude, and the duration of shaking. The Refinery is the closest Bay Area refinery to the Hayward fault. Potential damage at the Refinery from a significant earthquake on the Hayward fault could include broken piping, piping supports, ruptured tanks, and stressed support bolts, but the overall direct damage has been predicted to be minimal (CDMG, 1987). Damage from a significant earthquake on Rodgers Creek fault is considered to be similar to that of the Hayward with only modest direct damage considering the vast number of structures, tanks, and pipelines (CDMG, 1994).

Refineries are complex facilities and are, in general, conservatively designed and constructed. They consist not only of conventional buildings but also structures that are unique to the petroleum refinery process. Over time, refineries undergo modifications and additions. Each phase of modification may be constructed by different groups and may occur over many years. Because seismic design standards have changed considerably over the last several decades, the seismic resistance of a given refinery may vary with the age of construction, with the newest structures and process equipment expected to perform best. The Proposed Project would replace a number of older structures and manufacturing facilities with new ones that meet newer seismic standards. This would be considered as an overall beneficial impact regarding structural integrity.

Foundation and structural designs that can withstand the level of ground shaking that could occur at the Proposed Project site are in common use today. In accordance with the California Building Code (CBC), project equipment would be designed, at minimum, to withstand a ground acceleration that has a 10% probability of being exceeded in 50 years⁷. With foundation and structural design in accordance with the current CBC standards, seismic shaking should not result in significant structural damage to Proposed Project facilities. Seismic design consistent with current professional engineering and refinery industry standards would be employed in the proposed construction for resistance to strong ground shaking, especially for lateral forces. At a minimum, the CBC requirements would be followed during design and construction of all elements of the Proposed Project. In the course of the final facility design, the project engineering geologist or geotechnical engineer may provide additional foundation design recommendations based on the

⁷ CGS probability-based ground accelerations for the region encompassing the Refinery are estimated to reach or exceed 0.55 g (CGS, 2005).

ground conditions at the Proposed Project site. These recommendations would become part of the project specifications.

Appropriate grading and design, in accordance with the CBC requirements and local planning department requirements, would be used to reduce the secondary effects of ground shaking on structures and infrastructure. Approximately 40 to 60 cubic yards of contaminated soils would be removed from the proposed Hydrogen Plant site. An estimated 47,000 cubic yards of clean engineered fill would subsequently be imported to uniformly raise the area ground elevation to roughly 14 feet. The material would be further excavated for the construction of plant equipment foundations and the spoils spread throughout the remainder to reach the designed finished grades. Existing foundations and other identified subsurface obstructions would be removed from the proposed Continuous Catalytic Regeneration (CCR) Reformer site. An estimated 20 to 60 cubic yards of contaminated soils would additionally be removed and disposed. Approximately 1000 cubic yards of clean engineered fill would then be imported to return the CCR site to the existing grade elevation. The estimated total volume of contaminated soil requiring off site disposal is 500 cubic yards. The Hydrogen Purity facility would require approximately 1,000 cubic yards of imported fill and the co-generation facility an additional 6,000 cubic yards. The total volume of clean fill required for all the project elements is estimated at 110,000 cubic yards (this figure represents twice the actual estimated volumes mentioned earlier for a conservative estimate). Site materials would be appropriately compacted and engineered as directed by the project California certified engineering geologist or geotechnical engineer.

A design level geotechnical investigation would be performed for each project element site area. The project applicant would be required to submit the design-level geotechnical report to the City in order to obtain grading or construction permits. Each investigation would include an analysis of expected ground motions at the site from known active faults. The analyses would be in accordance with applicable City ordinances and policies and consistent with the most recent version of the California Building Code, which requires structural design that can accommodate ground accelerations expected from known active faults. The investigations would determine final design parameters for the earthwork, foundations, foundation slabs, and any surrounding related improvements (utilities, roadways, parking lots and sidewalks). The investigations would be reviewed and approved by a registered geotechnical engineer.

Mitigation: None Required.

Impact 4.7-2: Proposed construction could experience damage from expansive soils and natural settlement. This significant impact would be reduced to less than significant by compliance with applicable codes and regulations.

Over time, natural settlement typically occurs in unconsolidated deposits, as a result of increased foundation loads from overlying structures. Differential settlement would be a concern in areas that have been filled with non-engineered fill. As discussed above, engineered fill would be imported to the Hydrogen Plant site, the CCR Reformer, and the Hydrogen Purity Improvements

sites to achieve uniform grade.. Minimal soil removal is anticipated at these locations (approximately 500 cubic yards for all project elements). Therefore, the potential for settlement and differential settlement would be reduced with the placement of engineered fill.

Proper compaction of subsurface materials and installation of an adequate foundation can minimize potential foundation or structural damage associated with settlement. As earlier discussed, the project applicant would be required to submit a design-level geotechnical report to the City in order to obtain grading or construction permits. This report would include estimated excavation and fill volumes, compaction standards and methods, and foundation specifications. Compliance with ASTM⁸ soil compaction standards, the City of Richmond grading ordinance, and a structural foundation design that incorporates modern engineering standards and that is compliant with the CBC, would minimize potential settlement hazards to a less-than-significant level.

The effects of expansive soils, if present, could damage foundations of aboveground structures. Surface structures with foundations constructed in expansive soils could experience expansion and contraction depending on the season and the amount of surface water infiltration. The expansion and contraction could exert enough pressure on a structure to result in cracking, settlement, and uplift. As stated above, each project element associated with construction would receive a site-specific geotechnical investigation. As part of these geotechnical investigations, standard to current engineering practices, each site would be evaluated for potential expansive soils. The final geotechnical report for each site would include recommendations to mitigate any potential hazards associated with expansive soils, if any.

Mitigation: None Required.

References – Geology, Soils, Seismicity and Mineral Resources

Association of Bay Area Governments (ABAG), 2005a *Earthquake Hazards Maps for Richmond*
<http://www.abag.ca.gov/bayarea/eqmaps/pickcity.html>. accessed September 28.

Association of Bay Area Governments (ABAG), 2005b *Modeled Shaking Intensity Maps for Richmond, 1906 San Francisco Earthquake*,
<http://www.abag.ca.gov/bayarea/eqmaps/eq06.html>, accessed September 28.

Association of Bay Area Governments (ABAG), 2005c *Modeled Shaking Intensity Maps for Richmond, for 1989 Loma Prieta Earthquake*
<http://www.abag.ca.gov/bayarea/eqmaps/eq89.html>. accessed September 28.

Association of Bay Area Governments (ABAG), *Modified Mercalli Intensity Scale*
<http://www.abag.ca.gov/bayarea/eqmaps/doc/mmi.html>, 2003.

⁸ ASTM is an acronym for the American Society for Testing and Materials Standards, an organization that sets technical standards for materials, products, systems and services.

- Association of Bay Area Governments (ABAG), 2005d *Liquefaction Susceptibility*
<http://www.abag.ca.gov/bayarea/eqmaps/liqefac/liqefac.html>, accessed September 29.
- Blake, M.C. Jr., et al, 1974. *Preliminary Geologic Maps of Marin, and San Francisco Counties and Parts of Alameda, Contra Costa and Sonoma Counties, California*, Miscellaneous Field Studies Map MF-574.
- Bryant, W.A., and Cluett, S.E., compilers, 2000. *Fault number 55a, Hayward fault zone, Northern Hayward section, in Quaternary fault and fold database of the United States, ver 1.0: U.S. Geological Survey Open-File Report 03-417*,
<http://qfaults.cr.usgs.gov/faults/FMPro?-db=us%20web%20fault%20database.fp5&-format=record3%5fdetail.htm&-lay=scientist%20input&-sortfield=name&-op=cn&namesearch=Hayward&Statesearch=California&-max=10&-recid=34220&-find=>
- California Division of Mines and Geology (CDMG), 1987. *Earthquake Planning Scenario for a Magnitude 7.5 Earthquake on the Hayward Fault in the San Francisco Bay Area*, Special Publication 78.
- California Division of Mines and Geology (CDMG), 1994. *Earthquake Planning Scenario for a Major Earthquake on the Rodgers Creek Fault in the Northern San Francisco Bay Area*, Special Publication 112.
- California Division of Mines and Geology (CDMG), 1990. *The Loma Prieta (Santa Cruz Mountains): California, Earthquake of 17 October 1989*, Special Publication 104
- California Geological Survey (CGS), 2003. *Background Information on the ShakeMaps*,
<http://quake.usgs.gov/research/strongmotion/effects/shake/about.html>, April 21.
- California Geological Survey (CGS), 2002b. *How Earthquakes Are Measured*, CGS Note 32.
- CGS, 2005. Probabilistic Seismic Hazards Ground Motion Page ,
<http://www.conservation.ca.gov/cgs/rghm/pshamap/pshamap.asp?Longitude=-122.42&Latitude=37.956>, accessed, September 14, 2005.
- Contra Costa County, 1996. *Contra Costa County General Plan 1995 - 2010*. July
- Hart, E. W., 1997. *Fault-Rupture Hazard Zones in California:: Alquist-Priolo Special Studies Zones Act of 1972 with Index to Special Studies Zones Maps*, California Division of Mines and Geology, Special Publication.
- Helley, E.J., LaJoie, K.R., 1979. *Flatland Deposits of the San Francisco Bay Region, California*. U.S. Geological Survey Professional Paper 943.
- Jennings, C. W., *Fault Activity Map of California and Adjacent Areas*, California Division of Mines and Geology Data Map No. 6, 1:750,000, 1994.
- Peterson, M.D., Bryant, W.A., Cramer, C.H., 1996. *Probabilistic Seismic Hazard Assessment for the State of California*, California Division of Mines and Geology Open-File Report issued jointly with U.S. Geological Survey, CDMG 96-08 and USGS 96-706.
- Stinson, et al, California Department of Mines and Geology (CDMG), 1983. *Aggregate Materials in the San Francisco – Monterey Bay Area*, Special Report 146.

United States Department of Agriculture (USDA), Soil Conservation Service, 1977. *Soil Survey, Contra Costa County*, September.

United States Geological Survey (USGS) Working Group on California Earthquake Probabilities (WG02), 2003a. Open File Report 03-214,; *Earthquake Probabilities in the San Francisco Bay Region: 2002-2031*, <http://pubs.usgs.gov/of/2003/of03-214/>.

United States Geological Survey (USGS) Working Group on California Earthquake Probabilities (WG02), 2003b. Fact Sheet 039-03,; *Summary of Earthquake Probabilities in the San Francisco Bay Region: 2003-2032*, <http://quake.usgs.gov/research/seismology/wg02/>.

4.8 Hydrology and Water Quality

The Hydrology and Water Quality effects related to the implementation of the Proposed Project would be less than significant through compliance with applicable regulations and discharge requirements:

- Pollutants, including toxic metals and chemicals, could potentially increase in the Refinery wastewater effluent discharges to San Pablo Bay due to changes in source crudes and process activities. Discharges would be required to meet discharge requirements established by the Regional Water Quality Control Board. Uncertainties in the amounts of the increases, if any, in toxic metal and chemical loadings and uncertainties in the ability of the receiving waters to assimilate those increases would be mitigated by the controls imposed by the RWQCB discharge requirements and therefore the potential impact would be less than significant; and,
- Rainwater runoff from stockpiles of contaminated soils excavated during site preparation of the building sites for the Hydrogen Plant and for the Continuous Catalytic Regeneration (CCR) Reformer could introduce additional contaminant loading into the waste stream. However, these stockpiled soils would be managed under a Stormwater Pollution Prevention Plan (SWPPP) as required by the Regional Water Quality Control Board, which would mitigate the potential impact to less-than-significant levels.

4.8.1 Introduction

This section addresses water-related impacts associated with the Proposed Project at the Richmond Refinery. This section describes and discusses the existing hydrology and water quality conditions and analyzes potential impacts caused by both the construction and the operation of the Proposed Project.

4.8.2 Setting

4.8.2.1 Regional Setting

Precipitation

The climate of the San Francisco Bay Area is characterized as Mediterranean with cool wet winters and relatively warmer dry summers. The mean annual rainfall in Richmond, for the period between 1950 and 2005, is approximately 23 inches (WRCC, 2005). Analysis of long-term precipitation records indicate that wetter and drier cycles, lasting several years, are common in the region.

Mean annual precipitation on the San Pablo/Potrero Hills is approximately 16 inches (Rantz, 1971). The 100-year 24-hour storm is estimated as approximately 6 inches of rainfall in the Proposed Project area (U.S. Weather Bureau, 1961).

Floods in the San Francisco Bay Area result from intense rainstorms, generally preceded by a prolonged rainfall period that has saturated the ground. Peak flows are usually of short duration. Historically, major flood problems have occurred in urban areas located in the relatively flat, wide valleys near the mouths of rivers.

Hydrology

The Refinery lies within the San Francisco Bay Area Hydrologic Region which covers approximately 2.88 million acres (RWQCB, 1995). The region is highly developed and densely populated. There are 28 groundwater basins within the region.

The project area is located within the East Bay Plain Subbasin of the Santa Clara Valley Groundwater Basin (DWR, 2003). The East Bay Plain Subbasin is bounded by San Pablo Bay to the north, contact with the Franciscan bedrock to the east and Niles Cone Subbasin to the South. To the West, the subbasin extends beneath San Francisco Bay. Flows from this subbasin are generally toward the west towards San Francisco or San Pablo Bay. The water bearing formations of this region include alluvial fan deposits (Santa Clara Formation), mud and alluvial deposits associated with an estuarine environment (Alameda Formation), alluvial silts, clays and gravels (Temescal Formation), and artificial fill found mostly along the bay front (DWR, 2003). In general, these unconsolidated sediments can range up to 1,000 feet thick.

Groundwater use only accounts for about 5% of the water supply within the San Francisco Bay Area Hydrologic Region. For the purposes of this discussion, groundwater is of importance only because of its influence on surface water quality in the San Francisco Bay Estuary and, specifically, in San Pablo Bay.

Groundwater is not used at the Refinery, nor are discharges made at the Refinery to the contaminated groundwater that lies below. As discussed later, there are ongoing groundwater remediation efforts at the Refinery to contain, intercept, and extract contaminated groundwater and treat it through the existing wastewater treatment system.

San Francisco Bay Estuary

The San Francisco Bay Estuary is the largest estuary on the Pacific Coast of the United States. The estuary has two basic elements: San Francisco Bay and the Delta, a 2,800 square-kilometer wetland formed at the confluence of the San Joaquin and Sacramento Rivers. San Francisco Bay can be divided into two distinct water bodies, the northern and southern reaches, each with different physical and chemical properties. The northern reach includes three major embayments: Suisun Bay, San Pablo Bay, and Central Bay. Suisun Bay conveys outflow from the Delta at its head and thus can be considered to be a typical estuary. Central Bay is deeper and more oceanic in character than the northern and southern reaches because of its proximity to ocean inflow through the Golden Gate, a deep narrow channel through the coastal range. San Pablo Bay lies between the two. The southern reach is separated from the northern reach by the Central Bay and extends from the Oakland Bay Bridge to San Jose.

Freshwater strongly influences environmental conditions in the San Francisco Bay Estuary. Over 90% of the estuary's fresh water originates from the Sacramento-San Joaquin drainage basin and enters the northern reach. The Sacramento River provides about 80% of this flow, and the San Joaquin River and other streams contribute the remainder. The remaining 10% of freshwater comes from the San Francisco Bay watershed and flows into the southern reach (RWRCB, 1995). The southern reach, like the northern reach, has the physiographic characteristics of an estuary but lacks the fresh water inflow to drive a strong estuarine circulation. As a result, circulation in the southern reach is influenced predominantly by tides, evaporation, and wastewater discharges and thus functions much like a tidally oscillating lagoon for most of the year.

The total annual volume of fresh water reaching the estuary is highly variable and depends on the amount of rainfall in the Central Valley watershed and the amount of fresh water diverted or stored for agriculture, municipal, industrial, and other uses in the Central Valley. Beginning in the 1850's, flood control projects and agricultural diversions began to influence the volume of the annual fresh water inflow into the estuary. As a result, the annual volume of water entering the estuary has significantly been reduced over the years. This fluctuation is important because high flows flush the estuary and check the inland migration of saline ocean water into the Delta.

Water storage and diversions affect not only the total volume but also the seasonal flow of fresh water into the estuary. Today's level of development reduces fresh water flow to the estuary. The effects on seasonal flow are the greatest in the spring. Spring seasonal flows during the months of April, May, and June play an important role in the reproductive success and survival of several estuarine species, including striped bass and salmon, by transporting eggs and young through the Delta and into the estuary.

Freshwater flows affect the influx of pollutants to the estuary from the Delta and water movements disperse and eventually transport toxic materials out of the estuary. Circulation is relatively complicated in San Francisco Bay because of the complex geometry and the variable amount of freshwater flow during the year. Maintaining a sufficient Delta flow of freshwater is important for dispersing and flushing the estuary of wastes discharged into the Bay. The circulation of water in the Bay is driven by tides, wind, and estuarine circulation. Estuarine circulation is driven by the density difference between fresh and saline ocean water, and its magnitude is controlled by the amount of fresh water flowing into the estuary from the Delta. Tides are responsible for most of the water motion within the Bay and contribute greatly to the dispersion of material within the estuary. However, tidal motion contributes little to the transport of material out of the Bay. Net transport into and out of the Bay is driven primarily by estuarine circulation.

San Pablo Bay

The physical characteristics (i.e. salinity, temperature, and suspended solids) of the waters of San Pablo Bay vary greatly on a given day due to its location between the less salty Suisun Bay and the saltier San Francisco Bay. The interaction between the fresh and saline water has a major influence on the circulation of water in the San Pablo Bay itself. When freshwater and saltwater

meet, the denser saltwater tends to flow under the freshwater until the waters are mixed by stronger tidal currents and winds.

While the major source of freshwater to San Pablo Bay is inflow from the Sacramento/San Joaquin Delta (over 90% on an annual basis), surface water flow, surface storm water runoff, and groundwater all are important sources of fresh water to San Pablo Bay. The San Pablo Bay watershed has numerous river, creeks, and small streams that all flow toward the Bay among them the San Pablo Creek which drains the San Pablo Reservoir and Wild Cat Creek.

Surface runoff creates the majority of freshwater flows within the rivers and streams. Consequently, stream flow in all the creeks and rivers varies from season to season depending on precipitation. Most of water flow during a given year occurs during the rainy season, from November to April. Flows in smaller streams located in the upper reaches of the watershed are intermittent and start to run dry after the end of the rainy season. Major streams intercept some groundwater in their lower reaches, which allows them to flow all year.

Groundwater is used primarily by agriculture and rural residents. Rain and irrigation water recharge groundwater reserves. The principal groundwater watersheds in the San Pablo Bay watershed underlie the alluvial plains of the valleys. The water-bearing formations consist of younger and older alluvium deposits, along with volcanic and continental deposits.

Surface Water Quality

The quality of the waters in the bays and creeks of San Francisco Bay is a product of a mix of point and nonpoint source¹ discharges, ground and surface water interactions, and water quality/water quantity relationships. San Francisco Bay is an estuary with complex hydrodynamics and sediment and biochemical fate and transport processes. A number of water bodies are impaired due to excessive siltation, but it is very difficult to distinguish between excessive siltation and impairment due to flow alterations. The State and Regional Boards have implemented the Water Management Initiative as the model for which water resources are to be protected. The RWQCB is now structured to promote a watershed-based approach towards implementation of programs, with particular emphasis on integration of programs within county watershed management areas. RWQCB staff working in the San Francisco Watershed Management Area has identified issues based on consideration of a combination of water quality, customer service, and program requirements.

Surface water bodies in the Proposed Project region are used primarily for commercial and sport fishing, estuarine habitat, fish and wildlife habitat, recreation, rare species habitat, and industrial service supply. The RWQCB has listed impaired water bodies due to elevated levels of contaminants (see further discussion below) (RWQCB, 1995). Among the impaired water bodies for the San Francisco Bay Region are central San Francisco Bay, San Pablo Bay, San Pablo Creek, and Wildcat Creek. The pollutants include chlordane, pesticides, dioxins, furans, mercury,

¹ A point source is any discernible, confined, and discrete conveyance (e.g., a pipe discharge) of pollutants to a water body from such sources as industrial facilities or wastewater treatment plants. Nonpoint pollutant sources are sources that do not have a single, identifiable discharge point but are rather a combination of many sources.

PCBs, selenium, nickel, and diazinon. The sources of these pollutants or stressors include nonpoint sources from urban development, atmospheric deposition, ballast water, industrial and municipal point sources, agriculture, natural sources, and exotic species.

4.8.2.2 Project Setting

The Refinery is located on the San Pablo Peninsula, which contains a steep-sided, northwest-trending ridge about three miles long, separating the San Francisco and San Pablo Bays. Elevations range from just over 300 feet above mean sea level (amsl) at the ridge crest to at or near seal level at the San Pablo Bay edge. Most of the Refinery processing operations are situated on the southeast side of the peninsula on the former tidal and slough lands that were reclaimed by the placement of fill. These flat lying areas are generally below elevations of 20 feet amsl. The project includes either construction or reconstruction of processing equipment that would be built on several sites within the flat lying areas (see Figure 3-2).

Currently, the Refinery processes on average 225,000 barrels of crude oil per day (RWQCB, 2006). The crude oil is refined into a variety of petroleum products such as various fuels, lubricants, blending components, sulfur, and ammonia as well as some petrochemicals. The Refinery processes several different types of crudes and other raw materials. The crudes are delivered to the Refinery by pipeline and tanker.

Numerous sources of discharge water emanate from the Refinery including treated process wastewater, stormwater, steam condensate, firewater, groundwater, treated wastewater from General Chemical Corporation, and treated discharge wastewater from the Chevron Chemical Company LLC (includes both the Hensley Street and Castro Street facilities). All of the effluent water is ultimately discharged into the San Pablo or San Francisco Bays.

The effluent wastewater is regulated under a National Pollutant Discharge Elimination System (NPDES) permit issued by the RWQCB (No. CA0005134). The permit identifies 23 distinct wastewater streams with 10 identified outfalls as well as Chevron's 38-foot channel, Castro Creek, Wildcat Creek, and the Gertrude Street ditch.

Wastewater Treatment Plant

The Refinery's process wastewater and most of the storm water runoff is collected and managed in the existing wastewater treatment system that is regulated by the RWQCB. The process water is collected from three areas known as north yard, central yard and south yard. In 2004, the

**TABLE 4.8-1
REFINERY EFFLUENT WASTE STREAMS AS IDENTIFIED UNDER THE NPDES PERMIT**

Discharge No.	Description	Sources	Outfall No.	Receiving Water Body
Waste 001	Refinery and General Chemical Wastewater	Various process operations from refinery, Chevron Research and Technology Research Center, General Chemical wastewater, groundwater, ship ballast water and smaller contributions from other industrial sources	E-001	San Pablo Bay – deepwater outfall at an average depth of 30-50 feet and 2000 feet offshore.
Waste 005 ^a	Former Point Orient Tank Field (11 Basin)	Stormwater runoff from a 4 acre area	E-005	San Francisco Bay
Waste 006	Former Point Orient Tank Field (10 Basin)	Stormwater runoff from 48 acre area that also may include runoff from 12 Basin and Horse Pasture areas.	E-006	San Francisco Bay
Waste 007	Horse Pasture	Stormwater runoff from 17 acre area in former Point Orient Tank Field.	E-007	San Francisco Bay
Waste 008	Main Tank Field	Stormwater runoff from 496 acre area, mixed with steam condensate, groundwater seepage, and fire protection water	E-008 (or transferred to North Impound Basin)	San Pablo Bay
Waste 009	Quarry Tank Field (8 Basin)	Stormwater runoff from 26 acre area, mixed with steam condensate, and fire protection water.	E-009	San Francisco Bay
Waste 010	Reclamation Yard	Stormwater runoff from 6 acre area	E-010	Wildcat Creek via Gertrude Street Ditch then to Castro Creek and ultimately San Pablo Bay.
Waste 011	Hensley Street Facility	Stormwater runoff from 28 acre area, groundwater (seepage and extracted from containment systems), steam condensate, and fire protection water.	E-011	Castro Acres Surge Pond or Chevron's Integrated Wastewater Pond System (IWPS) but in high intensity rainfall can discharge to Castro Creek (E-011)
Waste 012	Castro Street Facility	Stormwater runoff from 19 acre area, mixed with groundwater (seepage and extracted from containment systems), steam condensate, fire protection water. .	E-012	Evaporation ponds on Castro Street unless during high intensity rainfall then can discharge to Castro Creek (E-012)
Waste 013	Integrated Wastewater Pond System (IWPS)	Stormwater runoff from 81 acres synthetically lined impoundment and 4 acre capped Class II waste management unit. Also may receive waters from Waste 011 and Waste 012.	E-013	Castro Creek (1000 feet upstream of Wildcat Creek confluence). If receiving Waste 011 and/or Waste 012 then discharged to City of Richmond sanitary sewer.

TABLE 4.8-1 (continued)
REFINERY EFFLUENT WASTE STREAMS AS IDENTIFIED UNDER THE NPDES PERMIT

Discharge No.	Description	Sources	Outfall No.	Receiving Water Body
1-Basin	Office Hill Tank Field	Stormwater runoff from 4 acre area	--	San Pablo Bay via Castro Creek from Chevron's 38-foot channel (from the City of Richmond's Castro Street Pump Station)
2-Basin	Office Hill Tank Field	Stormwater runoff from 5-acre area	--	Same as above
3-Basin	Office Hill Tank Field	Stormwater runoff from 7-acre area	--	San Francisco Bay
7-Basin	SP Hill Tank Field	Stormwater runoff from 20-acre area	--	San Francisco Bay
9-Basin	Quarry Tank Field	Stormwater runoff from 29-acre area	--	San Francisco Bay
12-Basin	Point Orient Tank Field	Stormwater runoff from 3-acre area	Sometimes E-006 via 10 Basin (Waste 006)	San Francisco Bay
Castro Street	City of Richmond	Stormwater runoff from 260 acres of Richmond through its stormwater management system	Castro Street Pump Station	San Pablo Bay via Castro Street Pump Station and Chevron's 38-foot channel which discharges to Castro Creek
Consolidation Area	Waste Management Area	Stormwater runoff from capped 5-acre waste management area.	--	San Pablo Bay via Castro Creek
Gertrude Street Site	Gertrude Street	Stormwater runoff from 3-acre capped waste management area.	--	San Pablo Bay via Castro Creek, Wildcat Creek, and the Gertrude Street ditch.
Landfill 15	Landfill 15	Stormwater runoff from 41-acre landfill site	--	San Pablo Bay via Castro Creek
North Yard Impound Basin	1 st Pass #1 Oxidation Pond	Stormwater runoff mixed with steam condensate, groundwater seepage, and fire protection water from former waste water treatment basin (341-acre area)	--	San Pablo Bay via Castro Creek from 1 st Pass #1 Oxidation Pond
Parr-Richmond	Parr- Richmond Site	Stormwater runoff from 7-acre capped waste management unit.	--	San Pablo Bay via Gertrude Street ditch, Wildcat Creek, and Castro Creek
Richmond Long Wharf	Richmond Long Wharf	Biologically treated wastewater from wastewater treatment system (Waste 001), may also contain Bay water	--	San Francisco Bay

^a Waste 002, 003, 004 were either eliminated or re-routed

SOURCE: RWQCB, 2001 (Note the recently updated NPDES permit has renamed the discharge points as 001-023)

Refinery treated and discharged an annual average flow² of 7.78 million gallons per day (MGD) of process wastewater that also includes wastewater from processing operations, cooling water facilities, water treatment facilities, steam and electrical generation facilities, outside facilities, fire protection systems, groundwater, and General Chemical Corporation wastewater (RWQCB, 2006). The total capacity of the treatment plant, while maintaining NPDES compliance, is approximately 20 MGD.

Treatment of oily and some non-oily wastewater streams begins in one of three oil water separators. Water from the separators is then routed for biological treatment in an aerated lagoon (bioreactor) and then treated by an activated carbon facility. Non-oily wastewater may be routed directly to the lagoon for treatment. A portion of the aerated lagoon effluent can, as an option, be routed to the onsite enhancement wetland, according to the NPDES permit. The final discharge of the effluent water is through a deepwater outfall, between 30 and 50 feet deep, located 2000 feet offshore to the north of Point San Pablo.

Stormwater from across the Refinery is either directly discharged through the various outfalls or is commingled with steam condensate, groundwater seepage and/or water from fire protection systems. The NPDES provides for optional conditions during periods of high intensity rainfall events (see Table 4.8-2).

Receiving Waters

All of the Refinery effluent ultimately is discharged into either the San Pablo Bay or the San Francisco Bay of the San Francisco Delta system. San Pablo Bay is the first water body that receives flows from the Sacramento-San Joaquin Delta and the Petaluma, Sonoma, and Napa Rivers. The drainage areas that contribute flows to the rivers comprise about 37% of the land area of the state. Much of the land area is primarily devoted to agricultural and forestry land uses, with some major urban centers that contribute discharges into the rivers. Pollutants produced by these activities reach the San Francisco Bay through discharge from wastewater treatment plants, storm water runoff, agricultural drain water, disposal of dredged material, as well as acid mine drainage from abandoned mines.

The receiving waters for the Refinery discharge, which include the San Pablo Bay, are tidally influenced water bodies with significant fresh water inflows during the wet weather season that allow frequent flushing and dilution. Based on Regional Monitoring Program data, San Pablo Bay meets the definition of estuarine under the definitions included in the California Toxics Rule (CTR) and the Water Quality Control Plan for the San Francisco Bay Basin (RWQCB, 2006). Therefore, the effluent limitations specified in for discharges to San Pablo Bay are based on the lower of the marine and freshwater water quality criteria.

NPDES Discharge Limitations

Discharges from the Refinery are currently governed by Waste Discharge Requirements specified in the NPDES Order and regulated by the San Francisco RWQCB. This RWQCB NPDES Order

² Based on effluent data reported in NPDES compliance report for 2004 (Chevron, 2005). Of this, approximately 5.75 MGD represents dry-weather wastewater flow, on average.

addresses the discharge of process wastewater from the wastewater treatment plant, stormwater runoff, and ship ballast water discharges. Routine water quality monitoring is conducted on all the waste streams identified in Table 4.8-1 as well as points for the receiving waters, land observations, influent waters, and representative rainfall for the area.

Effluent limitations are derived from the State Board's Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (State Implementation Policy, or SIP); the 1995 Basin Plan; CTR (Federal Register Volume 65, No. 97), Quality Criteria for Water (EPA 440/5-86-001, 1986 and subsequent amendments "Gold Book"), applicable Federal Regulations (40 CFR Parts 122 and 131), National Toxics Rule (57 FR 60848, 22 December 1992; 40 CFR Part 131.36(b), "NTR"), National Toxics Rule Amendment (Federal Register Vol. 60, No. 86, 4 May 1995 pg. 22229-22237), and best professional judgment (BPJ) as defined in the Basin Plan.

Toxicity bioassays are required for discharges from outfall, Waste 001. These bioassays consist of placing *Menidia beryllina* (silversides), the most sensitive species locally, in undiluted treatment plant effluent and evaluating their survival over a 96-hour period. For acute toxicity, the survival of test fish in 96-hour flow-through bioassays of Waste 001 as discharged is determined from an eleven-sample³ median value of not less than 90% survival, and an eleven-sample 90-percentile⁴ value of not less than 70% survival. The permit limitation on the toxicity tests requires a survival rate of not less than 70%. For chronic toxicity, an eleven-sample median value⁵ of 10 TUC⁶, and a 90-percentile value of 20 TUC. Discharge from Waste 001 is also subject to the following receiving water limitations:

- No floating, suspended, or deposited macroscopic particulate matter or foam;
- No bottom deposits or aquatic growth;
- No alteration of turbidity or apparent color beyond present natural background levels;
- No visible, floating, suspended, or deposited oil or other products of petroleum origin; and
- No toxic or other deleterious substances to be present in concentrations or quantities which will cause deleterious effects on aquatic biota, wildlife, or waterfowl, or which render any of these unfit for human consumption either at levels created in the receiving waters or as a result of biological concentrations.

Monitoring of the discharge from the treatment plant to the Bay is required under the self-monitoring program to confirm compliance with the RWQCB NPDES Order, and is reported monthly to the RWQCB.

³ A bioassay test showing survival of less than 90% represents a violation of this effluent limitation, if five or more of the past ten or less bioassay tests show less than 90% survival.

⁴ A bioassay test showing survival of less than 70% represents a violation of this effluent limit, if one or more of the past ten or fewer tests show less than 70% survival.

⁵ A test sample showing chronic toxicity greater than 10 TUC represents consistent toxicity and a violation of this limitation, if five or more of the past ten or less tests show toxicity greater than 10 TUC.

⁶ Chronic toxicity unit, which is equal to 100/NOEL (no observed effect concentration).

**TABLE 4.8-2
WATER QUALITY EFFLUENT DISCHARGE LIMITATIONS**

Constituent – Production Based Mass Emission Limitations	Discharge Units	2004 Monthly Average	2004 Daily Maximum	NPDES Monthly Average Limitation	NPDES Daily Maximum Limitation
BOD (5-day @20C)	kg/day	221.13	519.8	2,497	4,702
TSS	kg/day	183.2 (a)	267.7(a)	2,057	3,232
TOC	mg/l	507.07	1,166.2	5,485	10,334
Oil & Grease	kg/day	87.68 (c)	184.9 (c)	783	1,469
Oil & Grease	mg/l	<PQL	<PQL	8	15
Phenolic Compounds	kg/day	0.37(a)	0.68(a)	9.37	34.47
Ammonia as N	kg/day	65.8 (a)	155.3(a)	930	2,032
Sulfide	kg/day	1.9 (a)	6.2(a)	13.6	30.3
Settleable Solids	ml/l-hr	<PQL(a)	<PQL(a)	0.1	0.2
Total Chromium	kg/day	0.10	0.436	10.88	31.33
Hexavalent Chromium	kg/day	0.117	0.25	0.89	2.00
Cadmium	µg/l	<PQL	<PQL	22.11	11.02
Copper	µg/l	1.9	4	27.06	10.96
Lead	µg/l	<PQL(b)	<PQL (b)	66.80	33.30
Zinc	µg/l	13	44	995.43	204.08
Benzo(a)Anthracene	µg/l	ND	ND	0.962	0.480
Benzo(k)Fluoranthene	µg/l	ND	ND	0.950	0.474
Benzo(a)Pyrene	µg/l	ND	ND	0.981	0.489
Chrysene	µg/l	ND	ND	0.662	0.4816
Dibenzo(a,h)Anthracene	µg/l	ND	ND	0.9780	0.4875
G-BHC	µg/l	ND	ND	1.260	0.62
Heptachlor	µg/l	ND	ND	0.0042	0.002
Hexachloro-benzene	µg/l	ND	ND	0.0153	0.007
Heptchlor Epoxide	µg/l	ND	0.1 (e)	0.00161	0.0007
Indeno(1,2,3-cd)Pyrene	µg/l	ND	ND	0.9561	0.4766
PCB-1016	µg/l	ND	ND	0.00034	0.00017
PCB-1221	µg/l	ND	ND	0.00034	0.00017
PCB-1232	µg/l	ND	ND	0.00034	0.00017
PCB-1242	µg/l	ND	ND	0.00034	0.00017
PCB-1248	µg/l	ND	ND	0.00034	0.00017
PCB-1254	µg/l	ND	ND	0.00034	0.00017
PCB-1260	µg/l	ND	ND	0.00034	0.00017
Toxaphene	µg/l	ND	ND	0.00118	0.00059
Mercury	µg/l	0.021	0.022	--	0.075
Nickel	µg/l	20	27	65	--
Selenium	µg/l	9.47	15.3	50	--
Cyanide	µg/l	<PQL	<PQL	25	--
Aldrin	µg/l	ND	ND	0.001	--
A-BHC	µg/l	ND	ND	0.13	--
Chlordane	µg/l	ND	ND	0.0008	--
4,4-DDT	µg/l	ND	ND	0.0059	--
4,4-DDE	µg/l	ND	ND	0.0059	--
4,4-DDD	µg/l	ND	ND	0.0059	--
Dieldrin	µg/l	ND	ND	0.001	--
Alpha-Endosulfan	µg/l	ND	ND	0.087	--
beta-Endosulfan	µg/l	ND	ND	0.087	--
Endrin	µg/l	ND	ND	0.02	--
TCDD Equivalents	pg/l	ND	ND	0.1	--

BOD = Biological Oxygen Demand

TOC = Total Organic Carbon

TSS = Total Suspended Solids

N = Nitrogen

mg/l = milligrams per liter or parts per million (ppm)

µg/l = micrograms per liter or parts per billion (ppb)

<PQL = below Practical Quantification Limit

NA = not analyzed

ND = not detected above laboratory reporting limit

Note: The effluent discharge limits in this table reflect the NPDES permit limits from the then current NPDES permit (Order No. 01-067).

= no daily/monthly average limitation value applied

(a) Determined from quarterly sampling events.

(b) Based on single sample (11/04)

(c) Analyzed as Hexane Extractable Materials (HEM)

(d) Based on 28 samples during wet season

(e) Reported as a violation of permit, however according to 2004 monitoring report, this detection was considered erroneous because it is not a compound associated with the facility.

Tsunamis

Tsunamis (seismic sea waves) are long period waves that are typically caused by underwater disturbances (landslides), volcanic eruptions, or seismic events. 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 but are still at or near sea level. There have been 19 recorded tsunamis in the Bay Area during the period of 1868 to 1968. The maximum wave height associated with these tsunamis was just under 15 feet at the Golden Gate Tide Gage in 1868 (CGS, 2005). After natural attenuation across the Bay, estimates have been made that the wave height was approximately half that on the Richmond shoreline and reduced to nothing by the Carquinez Strait (Contra Costa County, 1996).

The Proposed Project locations within the Proposed Project area are all located on the northeastern side of the San Pablo Peninsula away from the entrance of the Bay. Therefore, potential tsunami waves would break on the southwestern shoreline and the peninsula would effectively shelter the northeastern shoreline. In addition to the sheltered location of the Proposed Project elements and the systematic attenuation of these waves across the Bay, all components of the Proposed Project are located at topographic elevations of approximately 10 feet above mean sea level, above the predicted high tide tsunami wave height.

Seiche

A seiche is a free or standing wave oscillation(s) of the surface of water in an enclosed or semi-enclosed basin that may be initiated by an earthquake. No seiches have ever been recorded in the Bay Area. Due to the relatively large size of San Pablo Bay with an inlet to the south and an outlet to the west, the hazard of seiche waves is interpreted to be low. In addition, there is no historic record of such waves occurring in San Pablo Bay during recent strong earthquakes.

4.8.2.3 Regulatory Setting

The regulatory requirements for the Proposed Project include:

- The federal floodplain management requirements of the Federal Emergency Management Agency (FEMA);
- The Federal Clean Water Act, as enforced by the Environmental Protection Agency (EPA);
- The California Porter-Cologne Water Quality Control Act and related California Administrative Code sections administered by the California State Water Resources Control Board and the San Francisco Bay Regional Water Quality Control Board; and
- Permitting and licensing requirements, which occur prior to development, and are reviewed by Contra Costa County.

The applicable plans, policies, and regulations are discussed below.

Federal Surface Water Quality Requirements

Federal Clean Water Act

The purpose of the Clean Water Act is to protect and maintain the quality and integrity of the nation's waters by requiring states to develop and implement state water plans and policies. Section 303 of the Clean Water Act requires states to establish water quality standards consisting of designated beneficial uses of water bodies and water quality standards to protect those uses for all waters of the United States. Under Section 303(d) of the Clean Water Act, states, territories and authorized tribes are required to develop lists of impaired waters. Impaired waters are those that do not meet water quality standards, even after point sources of pollution have installed the required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for waterways on the lists and develop action plans to improve water quality. This process includes development of Total Maximum Daily Loads (TMDL) that set waste load⁷ allocations for point source and load allocations for non-point source pollutants. The Ducheny Bill (AB 1740) requires the State Water Resources Control Board (State Board) and its nine Regional Water Quality Control Boards to post this list and to provide an estimated completion date for each TMDL.

San Pablo Bay is included on the 2002 California 303(d) List as an impaired water body resulting from the presence of chlordane, DDT, diazinon, dieldrin, dioxin compounds, exotic species, furan compounds, mercury, PCBs (non dioxin-like and dioxin-like), and selenium. The 303(d) list identifies the sources of each pollutant-ranging from unknown nonpoint sources (for PCBs) to municipal point sources, resource extraction, atmospheric deposition, natural sources and nonpoint sources (for mercury) and industrial point sources, agriculture, natural sources and exotic species (for selenium). The 303(d) program has been and will continue to be administered through California's permitting process, which is administered by the State Board and its nine Regional Water Quality Control Boards.

Environmental Protection Agency

The US EPA is responsible for implementing federal laws designed to protect air, water, and land. While numerous federal environmental laws guide US EPA's activities, its primary mandate with respect to water quality is the Clean Water Act. US EPA has developed national technology-based standards and states have developed water quality standards in accordance with the Clean Water Act. US EPA also has authority to establish water quality standards if a state fails to do so. US EPA has established such standards for certain toxic pollutants applicable to California waters, in the National Toxics Rule (NTR) and California Toxics Rule (CTR). These standards are used to determine the amount and the conditions under which pollutants can be discharged.

On April 28, 2000 the Office of Administrative Law approved the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (State Implementation Policy). The State Water Resources Control Board adopted the policy in

⁷ The load represents the total amount of a pollutant that can be discharged over a given time period. This differs from the discharge limits that usually focus on the concentration of a pollutant in the wastewater discharged into the receiving water.

March 2000. On May 18, 2000, the US EPA published in the Federal Register the California Toxics Rule (CTR) establishing water quality standards for toxic pollutants for California waters (FR 31681). The CTR was effective on the date of publication. The State Implementation Policy (SIP) (discussed below) became fully effective on May 18, 2000 because it was conditioned on the effective date of the CTR.

National Pollutant Discharge Elimination System

Part of the Clean Water Act provides for the National Pollutant Discharge Elimination System (NPDES), in which discharges into navigable waters are prohibited except in compliance with specified requirements and authorizations. Under this system, municipal and industrial facilities are required to obtain a NPDES permit that specifies allowable limits, based on available wastewater treatment technologies, for pollutant levels in their effluent. In California, US EPA has delegated the implementation of this program to the State Board and to the Regional Boards.

Storm water discharges are regulated somewhat differently. Storm water runoff from construction areas of one acre or more requires either an individual permit or coverage under the statewide General Construction Stormwater Permit. In addition, specific industries, including wastewater treatment plants that have direct storm water discharges to navigable waters are required to obtain either an individual permit issued by the Regional Board, or obtain coverage under the statewide General Industrial Storm Water Permit for stormwater discharges.

Flood Control

Under Executive Order 11988, the Federal Emergency Management Agency (FEMA) is responsible for management of floodplain areas defined as the lowland and relatively flat areas adjoining inland and coastal waters subject to a one percent or greater chance of flooding in any given year (also termed the 100-year floodplain). FEMA requires that local governments covered by federal flood insurance pass and enforce a floodplain management ordinance that specifies minimum requirements for any construction within the 100-year floodplain. In Contra Costa County, construction requirements are contained in the Floodplain Management Ordinance, adopted in 1982. Along with construction standards, the ordinance also specifies that a Floodplain Permit must be obtained prior to any grading within the 100-year floodplain. The vast majority of the Refinery operations are outside the 100-year floodplain although the property boundary includes areas that are within the 100-year floodplain (ESRI-FEMA, 2001). All of the Proposed Project elements would be located outside the 100-year floodplain.

State, Regional and Local Water Quality Regulations and Agencies

Porter-Cologne Act

The State Board and the Regional Boards share the responsibility under the Porter-Cologne Act to formulate and adopt water policies and plans, and to adopt and implement measures to fulfill Clean Water Act requirements. Specific to the Proposed Project area, the Regional Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) serves to protect the water quality of the State consistent with identified beneficial uses.

Prior to authorizations of waste discharge by the Regional Board, the Porter-Cologne Act requires reports of waste discharges to be filed. The Regional Board then prescribes Waste Discharge Requirements, which serve as NPDES permits under a provision of the Porter-Cologne Act. The Basin Plan, the Enclosed Bays and Estuaries Plan, and the NPDES permit, regulate discharges from the Refinery wastewater treatment plant into San Pablo Bay.

Bay Conservation and Development Commission

The 27-member San Francisco Bay Conservation and Development Commission (BCDC) was created by the California Legislature in 1965 in response to broad public concern over the future of San Francisco Bay. The Commission is made up of appointees from local governments and state/federal agencies. The Commission, among other responsibilities, is charged with:

- Regulating new development within the first 100 feet inland from the Bay to ensure that maximum feasible public access to the Bay is provided.
- Pursuing an active planning program to study Bay issues so that Commission plans and policies are based upon the best available current information.
- Administering the federal Coastal Zone Management Act within the San Francisco Bay segment of the California coastal zone to ensure that federal activities reflect Commission policies.
- Participating in California's oil spill prevention and response planning program.

State Water Resources Control Board

The State Board administers water rights, water pollution control, and water quality functions statewide. The State Board provides policy guidance and budgetary authority to nine Regional Boards, which conduct planning, permitting, and enforcement activities. The State Board shares the authority for implementation of the Clean Water Act and the State Porter-Cologne Act with the Regional Boards. The water quality near the Refinery is under the jurisdiction of the San Francisco Bay Regional Water Quality Control Board (RWQCB).

Developed to apply statewide to all enclosed bays and estuaries, the Enclosed Bays and Estuaries Plan was one of the water quality policies that the State Board developed for California. As defined by the State Board, enclosed bays are indentations along the coast that enclose an area of oceanic water within distinct headlands or harbor works. San Francisco Bay and its constituent parts, including San Pablo Bay, fall under this category. However, State water quality control plans with water quality criteria for priority toxic pollutants were subsequently invalidated by a State court order in 1994.

The State of California has developed an Antidegradation Policy, which is consistent with the federal policy under 40 CFR 131.12. The Antidegradation Policy requires waste discharge requirements for any activity which may produce increased volumes or concentrations of waste discharge in high quality waters (State Water Resources Control Board Resolution No. 68-16⁸). The Antidegradation Policy applies to inland surface waters, ocean waters, and groundwater. Should there be a potential for significant increase in effluent pollutant discharge, the RWQCB

⁸ Resolution 68-16 is the "Statement of Policy with Respect to Maintaining High Quality of Waters in California."

may require an industrial discharger to submit an Antidegradation Report, which would address mass increases of pollutants discharged and propose new treatment process units, if necessary, to maintain water quality. The purpose of the Antidegradation assessment and report is to ensure that before any changes in discharge volume or concentration are implemented under the NPDES permitting process, there is sufficient data indicating that existing water quality can be maintained.

Water Quality Control Plan for the San Francisco Region (Basin Plan)

The RWQCB is responsible for developing and implementing the Water Quality Control Plan for the San Francisco Region (Basin Plan), which documents approaches to implementing state and federal policies in the context of actual water quality conditions. The Regional Board's other activities include permitting of waste discharges, and implementing monitoring programs of pollutant effects.

On June 21, 1995, the Board adopted a revised Basin Plan, which the SWRCB and the Office of Administrative Law approved in 1995. The Basin Plan identifies beneficial uses of receiving waters, water quality objectives imposed to protect the designated beneficial uses, and strategies and schedules for achieving water quality objectives. Section 303 (c) (2) (B) of the Clean Water Act requires Basin Plans to include water quality objectives governing approximately 68 of EPA's list of 126 pollutants.

Water Quality objectives are achieved primarily through the establishment and enforcement of Waste Discharge Requirements for each wastewater discharger. The Basin Plan was amended in 1992 to include stricter water quality criteria that had been previously adopted in 1991 Enclosed Bays and Estuaries Plan and although the Enclosed Bays and Estuaries Plan was later invalidated by court order, certain water quality criteria that were based on that plan remain in the Basin Plan. State policy for water quality control in California is directed toward achieving the highest water quality consistent with maximum benefit to the people of the State. Therefore, all water resources must be protected from pollution and nuisance that may occur from waste discharges. Beneficial uses of surface waters, ground waters, marshes, and mud flats serve as a basis for establishing water quality standards and discharge prohibitions to attain this goal.

The State Implementation Policy (SIP), also implemented by the RWQCB establishes the policy for determining effluent limitations for toxic pollutants. The SIP establishes the implementation policy for all toxic pollutants including dioxins and furans. The SIP also requires monitoring for a minimum of 3 years by all major NPDES dischargers for the seventeen dioxin and furan compounds, whether or not a limit is necessary to prevent exceedance of the water quality standard that has been established for one of the dioxin compounds (2,3,7,8-TCDD). In summary, the steps involve:

- Identifying applicable criteria and objectives,
- Determining whether there is a reasonable potential for the pollutant to cause or contribute to exceedance of a water quality criterion or objective; and

- Calculating a value for the effluent limit taking into consideration the applicable criteria or objective, and discharge variability; or
- If a TMDL is in effect, assigning a portion of the loading capacity to the discharge.

Waste Discharge Requirements (Point Source)

Point source discharges are subject to federal regulations that are implemented at the state level by the Regional Board. Prior to any point source discharge that could affect the quality of the water of the State, the discharger must file a report of waste discharge with the Regional Board. After any necessary public hearings, the Regional Board prescribes Waste Discharge Requirements, which implement the water quality control plans. Under the Porter-Cologne Act, Waste Discharge Requirements serve as NPDES permits.

Another point source control strategy of the State is the requirement to use site-specific Best Management Practices and a Storm Water Pollution Prevention Plan. These individual or combined measures are those that are the most practical and effective which, when applied, prevent or minimize the potential release of toxic or hazardous pollutants in significant amounts to discharge waters. A Best Management Practices Program is required to include information of potential releases and management of solid and hazardous waste.

Contra Costa Clean Water Program

The Contra Costa Clean Water Program was established as the local entity responsible for implementing compliance with the federal Clean Water Act to control stormwater pollution. It is comprised of Contra Costa County, 16 incorporated cities, and the Contra Costa County Flood Control and Water Conservation District. The program is being conducted in compliance with the municipal NPDES Permit No. CAS0029912 issued by the San Francisco Bay RWQCB. The permit contains a comprehensive plan to reduce the discharge of pollutants to the “maximum extent practicable” and mandated that participating municipalities implement an approved stormwater management plan by September 1, 1993. The program incorporates Best Management Practices (BMPs) that include construction controls (such as a model grading ordinance), 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.

The RWQCB added provision C.3 to the stormwater permit in February 2003. In accordance with these updated requirements, new development and redevelopment projects are required to incorporate treatment measures and other appropriate source control and site design features to reduce the pollutant load in stormwater discharges and manage runoff flows. The Proposed Project would not be subject to these requirements because stormwater flows from the facility are already treated by the water treatment plant and regulated under the existing Chevron NPDES permit.

County of Contra Costa General Plan

Contra Costa County policies to which the project would be required to conform include those of the Contra Costa County General Plan⁹. Applicable goals and policies of that Plan include:

Water Resources Goals

Goal 8-T: To conserve, enhance, and manage water resources, protect their quality, and assure an adequate long-term supply of water for domestic, fishing, industrial, and agricultural use.

General Water Resources Policies

Policy 8-74: Preserve watersheds and groundwater recharge areas by avoiding the placement of potential pollution sources in areas with high percolation rates.

Policy 8-75: Preserve and enhance the quality of surface and groundwater resources.

Policies for New Development along Natural Watercourses

Policy 8-87: On-site water control shall be required of major new developments so that no increase in peak flows occurs relative to the site's pre-development condition, unless the Planning Agency determines that off-site measures can be employed which are equally effective in preventing adverse downstream impacts.

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

IM 8-dd: Require groundwater monitoring programs for all large-scale commercial and industrial facilities using wells.

Floodplain Development

Policy 10-38: Flood-proofing of structures shall be required in any area subject to flooding; this shall occur both adjacent to watercourses as well as in San Pablo Bay or along the waterfront.

Policy 10-60: Structures for human occupancy, and particularly critical structures, and potentially dangerous commercial or industrial facilities (e.g., plants for the manufacture or storage of hazardous materials) shall be protected against tsunami hazard.

Groundwater Quality

Industrial facilities, such as the Refinery, are often associated with areas with contaminated soil and groundwater. The following hazardous waste laws and regulations place restrictions on certain facilities that generate wastes considered to be hazardous, which includes soil contaminated with chemicals, fuels, oils, and other substances. These regulations also protect groundwater quality from hazardous materials that could leach through contaminated soils and contact groundwater.

⁹ Contra Costa County General Plan 2005-2020, January 2005.

Federal Requirements

Environmental Protection Agency (US EPA). To implement the following laws, the US EPA has developed regulations to implement the federal statutes that provide the general framework of the national hazardous waste management system. Hazardous waste sites, including those with contaminated soil, groundwater, or surface water are subject to one or more of the following laws and implementing regulations:

Resource Conservation and Recovery Act (RCRA). RCRA was enacted in 1974 as the first step in regulating the potential health and environmental issues associated with solid hazardous and non-hazardous waste disposal. Under RCRA, EPA regulates the generation, transportation, treatment, storage, and disposal of hazardous waste. Under RCRA, individual states may implement their own hazardous waste management programs, as long as they are consistent with and at least as stringent as RCRA. EPA must approve state programs intended to implement RCRA requirements.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Also known as Superfund, CERCLA was enacted in 1980 to ensure that a source of funds was available to clean up abandoned hazardous waste dumps, address releases of hazardous materials, and establish liability standards for responsible parties.

Superfund Amendments and Reauthorization Act (SARA). SARA amended CERCLA in 1986 to increase Superfund funding, modify contaminated site cleanup criteria, and revise settlement procedures. It also provides a regulatory program for leaking underground storage tank cleanups, and a broad, emergency planning and community right-to-know program.

State, Regional and Local Requirements

Regional Water Quality Control Board (RWQCB). Through the state legislation known as the Porter Cologne Act, the Regional Board is responsible for enforcing water quality objectives as outlined in the Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan). The Basin Plan designates water quality objectives for waters of the State, including groundwater. It also includes programs of implementation to achieve water quality objectives. The Basin Plan was duly adopted and approved by the State Water Resources Control Board, U.S. EPA, and the Office of Administrative Law where required. The latest version is effective as of December 22, 2006.

The Regional Board shares enforcement responsibility with the Department of Toxic Substances Control (DTSC). The DTSC uses state regulations found in Title 22 of the California Code of Regulations to enforce groundwater quality standards. The Regional Board, San Francisco Bay Region, has identified over 5,400 sites with confirmed releases of constituents of concern which have polluted or threaten to pollute groundwater. For each individual polluted site, the Regional Board approves all proposed groundwater and soil cleanup levels. Cleanup activities are required by the Regional Board to be performed in a manner that promotes attainment of background water quality, or the highest water quality, which is reasonable, if background levels of water quality cannot be restored.

County of Contra Costa General Plan. The County of Contra Costa Plan identifies the Chevron Refinery as a site involved in hazardous substance management. When handling any hazardous substances involved with the groundwater extraction at the site or during construction of the components of the project, the site must be in compliance with permitting and other regulatory requirements.

City of Richmond General Plan

The Open Space and Conservation (OSC) Element of the City of Richmond General Plan (1994) lists the following goals and policies applicable to hydrology and water quality for the Proposed Project:

OSC-J.1: Greatly expand reclamation of wastewater. Such water would be utilized by all appropriate users, in particular by industry (e.g., Chevron Refinery and Richmond Rod and Gun Club).

OSC-M.2: Protect the City's waterways and the Bay from run-off containing high concentrations of pesticides and fertilizers, industrial wastes, or other contaminants.

4.8.3 Hydrology and Water Quality Significance Criteria and Methodology

Construction and operation of the Proposed Project could potentially affect the quality of San Pablo Bay and the San Francisco Bay Estuary because of changes in either the quantity of treated effluent discharges or in the quality of these wastewaters. One issue examined is the ability of the Refinery's processing units and wastewater treatment plant to continue meeting compliance requirements during normal operations.

Significance Criteria

California Environmental Quality Act (CEQA) Guidelines Appendix G, states that a project would have a significant hydrology and water quality impact if it would:

- a) Violate any water quality standards or waste discharge requirements, such as the discharge limits and capacity requirements in Chevron's current National Pollutant Discharge Elimination System (NPDES) Permit;
- b) Disturb, expose or otherwise alter the present state of the existing soil contamination leading to significant adverse changes to wastewater effluent quality;
- c) Substantially deplete groundwater supplies or interfere with groundwater recharge;
- d) Substantially alter the existing drainage pattern of the site, including through alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in substantial erosion, siltation or flooding on- or off-site;
- e) Create or contribute to runoff water which would exceed the capacity of existing or planned stormwater drainage systems;

- f) Cause or significantly contribute to violations of ambient water quality objectives, such as contributions of specific toxic materials that already impair the waters of San Francisco and San Pablo Bays;
- g) Place structures within the 100-year flood hazard area which would impede or redirect flood flows; or,
- h) Inundation by seiche, tsunami, or mudflow.

CEQA Guidelines Appendix G topics not discussed further in this EIR

Review and comparison of the Proposed Project to the environmental setting clearly shows that the Proposed Project will create no impacts related to the following environmental topics listed in CEQA Guidelines Appendix G:

- b) Disturb, expose or otherwise alter the present state of the existing soil contamination leading to significant adverse changes to wastewater effluent quality.**

The Proposed Project would be constructed and its operations conducted entirely within the Refinery. If contaminated soils are encountered, they would be remediated. There would be no changes to wastewater effluent quality. There would be no impact.

- c) Substantially deplete groundwater supplies or interfere with groundwater recharge;**

The Proposed Project would be constructed entirely within an area where groundwater is not extracted and groundwater recharge is minimal. No use of groundwater resources is proposed for the Project. There would be no impact.

- d) Substantially alter the existing drainage pattern of the site, including through alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in substantial erosion, siltation or flooding on- or off-site;**

The Project would be constructed entirely within the Refinery, which is already developed and therefore would not significantly alter existing drainage patterns. There would be no impact.

- e) Create or contribute to runoff water which would exceed the capacity of existing or planned stormwater drainage systems;**

All Project structures would be located in developed areas and result in negligible changes in stormwater flows. There would be no impact.

- f) Place structures within the 100-year flood hazard area which would impede or redirect flood flows; or**

All Proposed Project structures would be located outside the 100-year flood zone, at an elevation of approximately 10 ft msl. There would be no impact.

g) Inundation by seiche, tsunami, or mudflow

The Proposed Project would be constructed entirely within the Refinery at an elevation of approximately 10 ft msl. This is not within an area subject to inundation by seiche, tsunami, or mudflow. As discussed in the Setting above, the San Pablo Peninsula would effectively shelter the location of the Proposed Project elements from any potential tsunami waves and no seiche waves have been recorded for the San Pablo Bay largely because it is not an enclosed Bay. There would be no impact.

Methodology

In general, the Proposed Project would replace process equipment with more modern equipment and would add new units which would be constructed according to current engineering standards. Some of the new process units would use the same technologies as existing conditions. However, no new constituents of hazardous materials would be handled under the Proposed Project. Crude oil components currently fluctuate under existing Refinery operations, which would continue to be the case without the Proposed Project. The following analysis considers the projected changes to the crude oil sources and the potential change to the wastewater stream with the new process units as provided by the applicant. While the levels of some of the toxics processed may actually decrease, this analysis focuses on the potential impacts of those that might increase.

Addition of impervious surfaces could adversely affect runoff, erosion or flooding. However, for the Proposed Project, the major components would be constructed in parts of the Refinery where storm water runoff is already controlled by the existing wastewater treatment system with adequate capacity, and therefore, this impact would be less than significant and is not discussed further. Potential water quality impacts associated with erosion and runoff during construction would also be managed by the existing wastewater treatment system as well as standard construction methods and applicable regulations.

The presence of contaminated subsurface soil provides a major source of the contaminated groundwater. Removal of existing contaminated soil during project construction would benefit groundwater cleanup efforts by appropriately disposing of such soil off-site. The Proposed Project would include importing clean engineered fill for grading and geotechnical engineering purposes. Ongoing groundwater remediation efforts at the Refinery include a trench designed to intercept, contain, and extract contaminated groundwater. The extracted contaminated groundwater is treated through the existing wastewater treatment system. Therefore there is a less-than-significant impact on the existing groundwater quality and it is not discussed further.

4.8.4 Hydrology and Water Quality Impacts and Mitigation Measures

Impact 4.8-1: The Proposed Project would allow for a wider range of crude sources to be processed, which could result in an increase of pollutants, including toxic metals and chemicals, in the process wastewater stream and in effluent discharges. The Refinery is required to adequately treat the effluent to avoid exceeding discharge limits that are

established by the Refinery's existing NPDES permit. While uncertainties in the amounts of the increases in toxic metal and chemical loadings and in the ability of the receiving waters to assimilate any increases could make this effect potentially significant, by continued compliance with the discharge requirements of the Refinery's NPDES permit this impact would be less than significant.

The Proposed Project includes the replacement of several process units with newer units using identical or similar technologies. The new units would allow the Refinery to process a wider range of crude oils. The Refinery currently averages 5.75 MGD of wastewater discharge into the Bay during dry weather. The project design would allow a 0.3 to 0.4 MGD increase in the process wastewater flow rate, which would represent approximately a 4 to 5% increase during dry weather, but a smaller percentage during wet weather due to the increased stormwater runoff. The higher process wastewater flow rate could increase the pollutant loading to the effluent discharge thereby increasing wastewater volumes from the new Hydrogen Sulfide Plant, the FCC Feed Hydrotreater, a new ammonia scrubber, and the addition of new water washes and steam stripping systems. The wastewater treatment plant has the capacity to treat a total of 20 MGD and therefore would be fully capable of accommodating the additional flow without affecting performance and the ability to meet NPDES discharge requirements.

The Refinery currently receives crude oils from different sources that vary in composition. The composition of a particular crude source can also change over time. One of the key constituents that can vary in crude is sulphur. In addition to sulphur, crude oils contain a variety of elemental metals that can vary in concentration. However, there are no anticipated constituents that are not already addressed or sampled under Chevron's NPDES permit.

Among the pollutants that are contained within the effluent discharge, bioaccumulative pollutants such as selenium are considered most likely to detrimentally affect the beneficial uses of the San Pablo Bay. Selenium can adversely affect the hatchability in nesting water-diving birds. The majority of the selenium found in crude oil ends up in the product sulfur due to their similar chemical properties. Currently, the principle crudes processed by Chevron have selenium concentrations of approximately 50 parts per billion (ppb). Future crudes will likely be at or lower than this concentration and as a result, the concentration of selenium in the waste stream would be at or lower than current levels with the Proposed Project (Chamberlin, 2005). As shown in Table 4.8-2, Chevron has demonstrated that they are well within their NPDES permitted levels for discharge including selenium.

Mercury is also a known detrimental element to San Pablo Bay. Mercury levels in crude can vary and the Refinery has demonstrated a general history of compliance with mercury levels in their wastewater discharge despite two specific violations in December 2002 (RWQCB, 2006). Although future levels could vary, current plans indicate that anticipated future crudes with the Proposed Project would contain lower levels of mercury than what they are presently processing.

Arsenic is not included in the current NPDES permit; however, it is monitored as part of Chevron's NPDES compliance sampling. The Proposed Project would eliminate the use of an arsenic-containing corrosion inhibitor which is added to monoethanolamine (MEA) in the

existing Hydrogen Manufacturing Plant. The new Hydrogen Plant design would replace the MEA system with a pressure swing adsorption system and eliminate the use of MEA in the refinery. Therefore, the levels of arsenic in the wastewater treatment system would be essentially eliminated with implementation of the Proposed Project.

Other elements of concern include nickel, vanadium, iron, cadmium, copper, and lead. The typical concentrations of cadmium, copper, and lead exist in concentrations that are several orders of magnitude lower than nickel, vanadium, and iron. All of these metals are non-volatile and during processing tend to remain within the heavier petroleum products like bunker fuel oil which is used to fuel ships. The fraction of metals that are released from the heavier oils tend to become retained in the catalyst in the FCC Feed Hydrotreater and are then disposed of with the spent catalyst offsite. The source of these metals in the wastewater stream is either from incoming raw water, small quantities of released catalyst, or from the various alloys in the Refinery equipment. These potential sources would not be affected by the Proposed Project.

Through the NPDES permitting process, the RWQCB sets forth effluent limitations for surface water pollutants. These effluent limits are based on the National Toxics Rule, California Toxics Rule, State Implementation Policy (SIP) and the Basin Plan. As shown on Table 4.8-2, the wastewater effluent discharges of all the constituents analyzed are well below the maximum daily and monthly average limitations for 2004 as established through the NPDES permit. Over the course of the last permit period from 2001 through 2005, there were a total of eight violations reported. Two of the violations consisted of high pH values and were reported in the stormwater discharge and not related to wastewater treatment. One violation, reported in 2004, was related to Heptachlor Epoxide, a compound not associated with the facility and considered to be anomalous. The other violations were related to mercury and oil and grease concentrations reported in 2002 and 2003 respectively. Since that time, the facility has demonstrated full compliance with the NPDES permit.

However, the Proposed Project may increase the discharge of some pollutants such as heavy metals. Currently, there is not a TMDL established for selenium or mercury in San Pablo Bay and until a TMDL is determined, the RWQCB will rely on interim limits determined through the NPDES process. Interim mass limits for selenium, mercury, copper and nickel were established in the NPDES permit in order to “limit the discharge of 303(d) listed pollutants to their current levels” until TMDL-based final limits are established (RWQCB NPDES Order, Finding 46). Chevron’s current NPDES permit (Order No. R2-2006-0035) was effective on June 14, 2006, and will expire on June 13, 2011. In general, the current NPDES permit contains discharge limitations that are more stringent than those in the previous permit (Order No. 01-067) (RWQCB, 2006)

The Antidegradation Policy requires waste discharge requirements for any activity which may produce increased volumes or concentrations of waste discharge in high quality waters (State Water Resources Control Board Resolution No. 68-16). The Antidegradation Policy applies to inland surface waters, ocean waters, and groundwater. To ensure the increase in effluent pollutant discharge is consistent with Resolution No. 68-16¹⁰, the RWQCB Order may require an industrial

¹⁰ Resolution 68-16 is the “Statement of Policy with Respect to Maintaining High Quality of Waters in California.”

discharger to submit an Antidegradation Report, which will address mass increases of pollutants discharged and propose new treatment process units if necessary to maintain water quality. The purpose of the Antidegradation assessment and report is to ensure that before any changes in discharge volume or concentration are implemented under the NPDES permitting process, there is sufficient data indicating that existing water quality can be maintained. According to the current NPDES permit, the permitted discharge is consistent with the antidegradation provision of 40 CFR §131.12 and State Water Board Resolution 68-16 (RWQCB, 2006).

In addition, the RWQCB would have the authority to modify (according to CFR 40 122.62(a)(1)), but not revoke and reissue (unless Chevron requests or agrees), the existing NPDES permit under certain circumstances specified in the NPDES regulations. This clause was established in order to respond to any sudden changes or significant deviations from historical discharge levels. If changes or amendments to the NPDES permit are necessary, such changes would not be subject to CEQA analysis because issuance of an NPDES permit is statutorily exempt from CEQA. The RWQCB, however, requires consistency with adopted water quality objectives in considering issuance of a NPDES permit. In developing discharge limits, the RWQCB would use all available technical sources for water quality data.

Conclusion

The Proposed Project would result in a 4 to 5% increase in the total volume discharge of wastewater. The anticipated increase is well within the total capacity of the wastewater treatment system. The Refinery has processed and will continue to process a range of crude sources that vary in composition. The levels of arsenic and selenium in the wastewater stream are anticipated to decline while other constituents may increase with the Proposed Project. Overall, the Refinery has had a history of effluent discharge compliance well within their discharge limits, often by an order of magnitude or more. These effluent limits are based on water quality standards established by the RWQCB to protect water quality, human health and the health of aquatic organisms in San Pablo and San Francisco Bay. Continued compliance with these limits is intended by the RWQCB to ensure that project-related changes in the discharge do not cause a significant adverse change in existing water quality.

The RWQCB has primary regulatory authority to determine and assign effluent discharge limits for the Refinery. This authority enables the RWQCB to request appropriate analyses, determine impacts to receiving waters, and, if necessary, require amendments to the NPDES permits. The RWQCB will use this information to determine whether changes in the current NPDES permit may be needed to ensure that the permit remains effective in protecting water quality.

The effects of increases in toxic metal and chemical loading would be substantially mitigated by the NPDES discharge requirements established by the RWQCB. The discharge limits set in the NPDES permit are based on water quality criteria and objectives to protect the beneficial uses of receiving waters as identified in the Basin Plan. Therefore the potential impact to water quality would be considered less than significant. For related effects, please refer to Section 4.4, *Biological Resources*, for a discussion of potential secondary impacts on aquatic wildlife.

Mitigation: None required.

Impact 4.8-2: Rainwater runoff from stockpiles of contaminated soils excavated during site preparation of the building sites for the Hydrogen Plant and the CCR Reformer could introduce additional contaminant loading into the waste stream.

The Proposed Project would include importing clean engineered fill for grading and geotechnical engineering purposes. Excavation and removal of a total of approximately 500 cubic yards of contaminated soil during project construction would occur for all Proposed Project elements. Any excavated soil would be profiled for the presence of contaminants. If contaminants are present, the soil would be managed in conformance with the Refinery's Regional Water Quality Control Board-approved Soil Management Program for disposal. In addition, the Proposed Project would operate under a General Construction Permit under the National Pollution Discharge Elimination System. The Permit would require a Stormwater Pollution Prevention Plan (SWPPP) which would include control measures for stockpiled materials. Adherence to the handling measures within the SWPPP and the existing NPDES permit would make this potential impact less than significant.

Mitigation: None required.

References – Hydrology and Water Quality

- Chamberlin, Bob, Chevron, *Wastewater Response Memorandum*, November 9, 2005.
- Chevron, 2005. *NPDES Self-Monitoring Report – December 2004*, January 27.
- City of Richmond, *City of Richmond General Plan Open Space and Conservation Element*, 1994.
- CGS, 2005. *Historic Tsunamis of California*,
http://www.consrv.ca.gov/CGS/geologic_hazards/Tsunami/About_Tsunamis.htm#Historic%20Tsunamis%20in%20California., accessed September 30.
- Contra Costa County, *General Plan, Safety Element*, 1996.
- Department of Water Resources, 2003. *California's Groundwater, San Francisco Bay Hydrologic Region, Bulletin 118*.
- ESRI-FEMA, 2001. Flood Hazard Maps for Richmond, California,
http://map1.msc.fema.gov/idms/IntraView.cgi?ROT=0&O_X=13441&O_Y=8710&O_ZM=0.313016&O_SX=907&O_SY=488&O_DPI=400&O_TH=55884628&O_EN=56145883&O_PG=1&O_MP=1&CT=0&DI=0&WD=14892&HT=10223&JX=1046&JY=548&MPT=0&MPS=0&KEY=55884166&ITEM=1&BIRDS_EYE.x=108&BIRDS_EYE.y=78, updated September 7.
- Rantz, S.E., *Mean Annual Precipitation and Precipitation Depth-Duration-Frequency Data for the San Francisco Bay Region, California*, U.S. Geological Survey, 1971.

- Regional Water Quality Control Board (RWQCB), 2001. *National Pollutant Discharge Eliminations System Permit No. CA0005134, Order no. 01-067.*
- Regional Water Quality Control Board (RWQCB), 2006. *National Pollutant Discharge Eliminations System Permit No. CA0005134, Order no. R2-2006-0035.*
- Regional Water Quality Control Board (RWQCB), 1995. *Water Quality Control Plan (Basin Plan)*, June 21, 1995, approved July 20, 1995.
- State Water Resources Control Board, *Order No. WQ 2001-067*, p.23., 2001
- U.S. Weather Bureau, *Rainfall Frequency Atlas of The U.S. For Durations From 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years*, Technical Paper #40, 1961.
- Western Regional Climate Center, (WRCC), 2005. <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?carchm+sfo>, accessed July 27.

4.9 Land Use, Plans, and Policies

- All land use effects of the Proposed Project either would be less than significant or would result in no impact. No mitigation is required.
- The Proposed Project would not conflict with established plans, policies and ordinances.
- Because it would be contained within the existing Refinery, the Proposed Project would not potentially divide an established community.
- The Proposed Project would not affect a habitat conservation plan or natural community plan.

4.9.1 Introduction

This section addresses land use impacts associated with the Proposed Project at the Richmond Refinery. This section describes and discusses the existing land uses and analyzes potential impacts caused by both the construction and the operation of the Proposed Project.

4.9.2 Setting

4.9.2.1 Existing Conditions

Regional Land Uses

Contra Costa County encompasses approximately 480,000 acres located along the eastern edge of San Francisco Bay and the southern edge of San Pablo Bay and the Carquinez Strait, and is one of the nine counties that comprise the Bay Area.¹ Nearly 75 percent of the land area in Contra Costa County remains undeveloped, and most of the existing development consists of residential and commercial development, as well as streets and highways. The County is divided into three primary planning areas: West Contra Costa County, Central Contra Costa County, and East Contra Costa County. West Contra Costa County includes the cities of Richmond, El Cerrito, Hercules, Pinole, and San Pablo and the unincorporated urbanized areas of North Richmond, Rodeo, Crockett, and Port Costa.

West Contra Costa County (West County) is partially located along San Francisco Bay, and with the exception of El Cerrito, all of the incorporated cities in West County include land along the waterfront. (The unincorporated areas of North Richmond, Rodeo, Crockett, and Port Costa also include shoreline areas along the Bay.) Most of these waterfront areas continue to serve heavy industrial uses and marine and port-based operations. However, as heavy industrial uses have moved away, there has been a trend toward providing more recreational and residential access

¹ The following counties comprise the Bay Area: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties (ABAG, 2006).

along the waterfront. These waterfront areas now include regional open space preserves, public hiking and bicycle trails, public plazas and piers, public marinas, parks, restaurants, stores and shops, and multi-family residential complexes. Regional open spaces along the West Contra Costa County waterfront include the 2,315-acre Point Pinole Regional Shoreline Park, the 295-acre Miller/Knox Shoreline Park, and the 2,795-acre Carquinez Regional Shoreline Park, and other smaller regional or municipal parks and marinas.

Contra Costa County is also home to four of the Bay Area's five refineries, two of which are located in West County in the City of Richmond and in the unincorporated community of Rodeo. The combination of undeveloped agricultural land and marshes; natural deep water ports; the development of the railroad; local and national demand for refined oil products; access to San Francisco, the Sacramento/San Joaquin valleys, and the Pacific Ocean; and the proximity of available workers encouraged refinery development in Contra Costa County. In many cases, the refineries were established at or near long-standing ferry routes, existing ports, or trading posts that preceded the development of nearby cities. In almost every case, refineries were one of several waterfront industrial land uses that included shipbuilding, commercial and agricultural shipping, assembling and processing plants, ferry transit, and military use.

City of Richmond

The City of Richmond encompasses 15,740 acres of land² along the eastern edge of San Francisco Bay and the western edge of Contra Costa County. Richmond's borders include unincorporated land (north, northeast, west, including the community of Rodeo), and the cities of San Pablo (northeast), El Cerrito (west), and Albany (south). The City has over 32 miles of shoreline, more shoreline than any other city in the Bay Area.

Land uses in the City of Richmond were, before the turn of the last century, primarily agricultural or related to fishing and maritime use until the arrival of the Santa Fe Railroad in 1900 and the construction of the Standard Oil refinery soon thereafter in 1901-1902.^{3,4} The Refinery provided housing for its workers in nearby Point Richmond and, in its efforts to provide employee amenities, developed an infrastructure that included roadways, and other facilities such as the Rod and Gun Club. Located near the Richmond-San Rafael ferry line, the Refinery originally occupied approximately 600 acres. Industries along the waterfront came to include the Ford Motor Company, shipbuilders (especially during World War II), iron and metal factories, other facilities that processed raw materials, and military facilities. Most of these industries are no longer located along the Bay.

Land uses in the western section of the City of Richmond now include a mixture of remaining industrial uses, open space, single-family and medium-density residential, commercial, military, and port/maritime-related uses. In 1984, the Richmond General Plan designated approximately 3,780 acres of the City (or approximately 24% of its land) for heavy industrial, Port, maritime,

² The City's boundary also encompasses open waters.

³ When built, the Standard Oil refinery was reportedly the largest on the Pacific coast and the third largest in the world (Fridell, 1954).

⁴ Standard Oil became Chevron in 1977; the corporate identity became Chevron in 1984.

and light industrial uses. (Amendments to the General Plan since 1984 have reduced some of this acreage.)

Site Vicinity

The Refinery, located in Richmond's West Shoreline area at 841 Chevron Way, is the largest in the Bay Area, and occupies an estimated 2,900 acres, including a major portion of the Point San Pablo Peninsula. Most of the remainder of San Pablo Peninsula is used as open space or for recreation, and includes the Point San Pablo Yacht Harbor, Red Rock Marina, undeveloped marsh lands, Point Molate Beach Park (a 15-acre site), portions of the Bay Trail, Point Pinole Regional Park, and the Molate Naval Fuel Depot (a 303-acre site that is considered an important potential open space resource once the Navy vacates the property). South of the refinery lies Miller-Knox Regional Shoreline Park.

The Refinery is also located at the eastern terminus of the Richmond-San Rafael Bridge. Its perimeter is formed by Interstate 580 (I-580)⁵ to the south, the former Point Molate Naval Fuel Supply Depot and San Francisco Bay to the west, San Pablo Bay to the north, an active landfill to the northwest, industrial developments including the Santa Fe Intermodal Facility and rail yards (also to the north and east), and Castro Street to the east. A small portion of the property (400 by 800 square feet) just north of Gertrude Street is located in an unincorporated portion of Contra Costa County. No development is proposed within that small, unincorporated area.

With the exception of the Point Richmond area and marsh lands, in general, land uses immediately adjacent to and in the immediate vicinity of the Refinery are industrial and recreational, as listed in Table 4.9-1.⁶

Portions of five residential neighborhoods are located within a one-mile radius of the Refinery (see Figure 4.9-1). These are:

Shields-Reid (North Richmond)

The Shields-Reid community, in the unincorporated North Richmond area, is located east of Richmond Parkway and the Refinery, and includes single-family and medium-density housing; industrial, agricultural, open space, and undeveloped land. Besides residential uses, land uses in this area include portions of San Pablo Creek and Wildcat Creek, the Verde Elementary School, a nursery, the North Richmond Ball Park, and the Shields-Reid Community Center.

Major land uses nearest to the refinery site (and Richmond Parkway) include commercial nurseries, Verde Elementary School, West Contra Costa County Sanitary Landfill, Wildcat Creek, San Pablo Creek, and the Shields-Reid Community Center.

⁵ Interstate 580 (I-580) links western Contra Costa County with Marin County and US 101 via the Richmond-San Rafael Bridge.

⁶ Biological resources, such as creeks and marsh, are discussed in detail in Section 4.4, *Biological Resources*.

**TABLE 4.91
LAND USES ADJACENT TO AND IN THE IMMEDIATE VICINITY OF THE REFINERY**

Name	Address	General Land Use Type	Proximity to Refinery
General Chemical Company	500 Castro Street	Industrial	East (adjacent)
West Contra Costa County Sanitary Landfill	Foot of Parr Boulevard	Industrial	North (adjacent)
Terminal Four	Northern tip of Point San Pablo Peninsula	Industrial	North (adjacent)_
Point Molate	Western edge of Point San Pablo Peninsula	Former military and vineyard uses	West (adjacent)
San Pablo Yacht Harbor	Northern edge of Point San Pablo Peninsula	Recreation	North (adjacent)
Point Molate Beach Park	Western edge of Point San Pablo Peninsula (adjacent to Point Molate and the Refinery)	Recreation	West (adjacent)
Santa Fe Intermodal Facility	East	Industrial	East (adjacent)
Point Richmond	South (south of I-580)	Residential and Commercial	South (adjacent)
Richmond-San Rafael Bridge toll plaza	East	Institutional	East (adjacent)

Iron Triangle North and South and Atchison Village

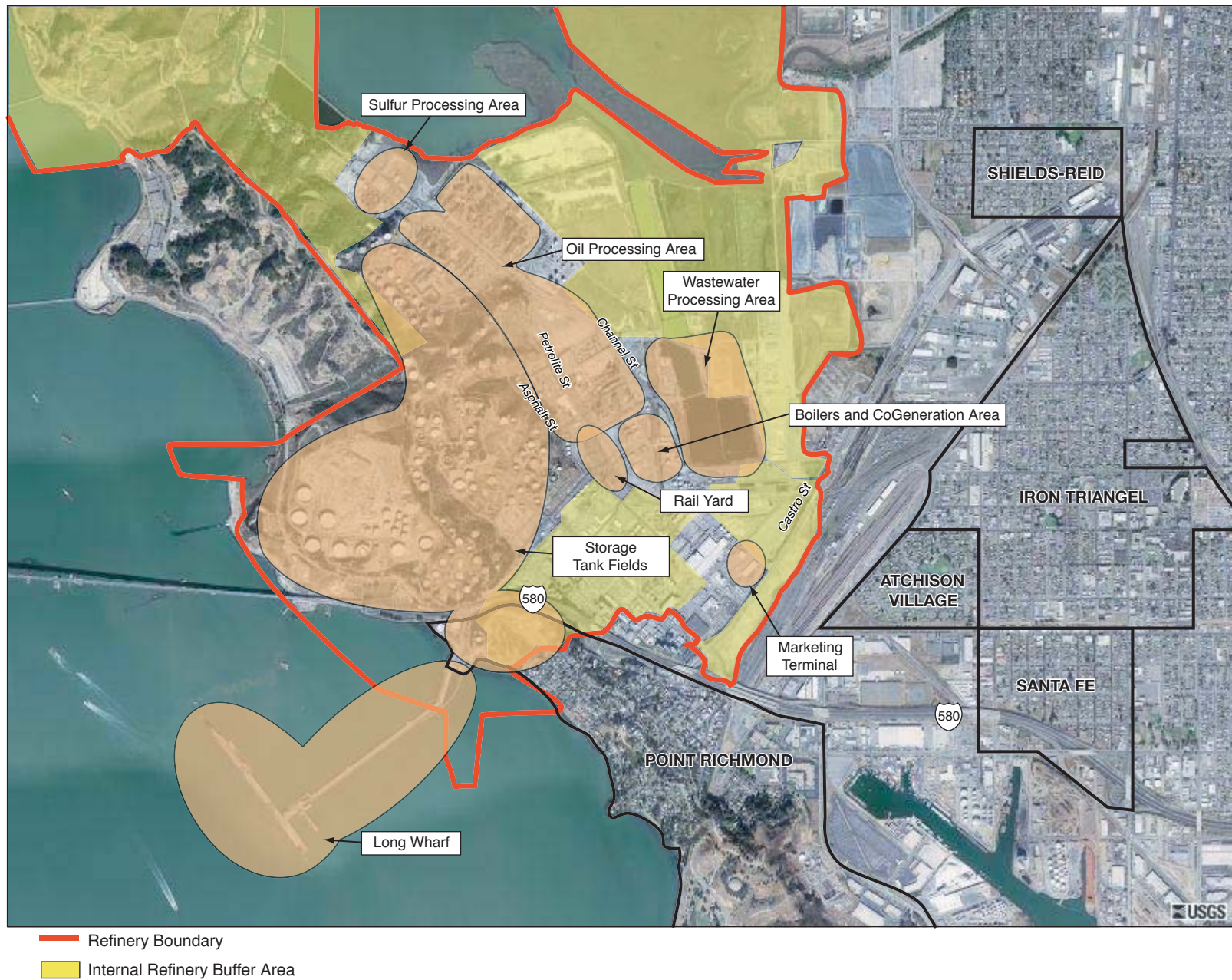
The Iron Triangle North, Iron Triangle South, and Atchison Village neighborhoods of Richmond, located east of the Refinery, include single-family, low-, medium- and high-density housing units; commercial, open space and industrial uses. Some of its major land use features include Atchison Village,⁷ Atchison Park, the Richmond Museum of History, Nevin Park and Community Center, Hacienda Homes, Peres Elementary School, Roosevelt Junior High School, and Triangle Court. The Santa Fe Intermodal Rail Facility and Richmond Parkway separate these three neighborhoods from the Refinery.

Point Richmond

The Point Richmond⁸ neighborhood of Richmond, located south of the Refinery, encompasses a mix of single-family, low- and medium-density residential units, commercial, open space and industrial land uses. I-580 separates most of the Refinery from the Point Richmond community. The single-family residential area east and south of Western Drive and Golden Street abuts portions of the Chevron property. Major land use features in the area include Washington Elementary School, Washington Park, Miller Knox Regional Shoreline Park, and the Richmond Natatorium.

⁷ Atchison Village is listed on the National Register of Historic Places.

⁸ The Point Richmond area is listed on the National Register of Historic Places.



SOURCE: ESA, 2005

Chevron Energy and Hydrogen Renewal Project . 205166

Figure 4.9-1
Chevron Refinery Functional Land Use
and Richmond Neighborhoods Map

Santa Fe Neighborhood/Santa Fe Channel Area

The Santa Fe neighborhood of Richmond is primarily a single-family, low density residential area; the Santa Fe Channel area is comprised of industrial uses. Major facilities within these two areas within a one-mile radius of the Refinery include the North Face Distribution Center, the Richmond Public Works Corporation Yard, Richmond Municipal Wastewater Treatment Plant, and the Richmond Point Quarry. This area is separated from the Refinery by the Pt. Richmond, the railroad tracks, and I-580.

New Development in Richmond

Several established residential communities occupy the areas south and east of the Refinery, and south of I-580 along San Francisco Bay, the largest and oldest of which is the Marina Bay Residential development, which is also a Master Plan development community. Most of this area is separated from the Refinery by the Point Richmond area, and/or the Santa Fee neighborhood and Santa Fe Channel area. New development that has either been approved or proposed in the Marina Bay area of Richmond, east of the Harbor Channel include the Ford Building, which was approved in 2004 as a mixed use commercial/residential project and was envisioned to serve as a center for commercial and cultural activities to vitalize the Ford Peninsula area. Other developments include: Westshore Marina (269 residential condos); Seacliff Marina (300 residential condos); Anchorage at Marina Bay Anchor Cove (mixed use: 46,000 square feet of retail and 128 townhouses); and The Crossing at Marina Bay (80,156 square feet of office space). New development is also underway

Another residential development in this area south of the Refinery is Seacliff Estates and the Brickyard Cove Marina and residential development. The City of Richmond is currently considering a proposal to develop up to 51 additional units in the Brickyard Cove subdivision. East of Brickyard Cove is another residential development proposal (Point Richmond Shores) that could result in an additional 310 units on 11 acres at the end of Dornan Drive.

Land Use within the Refinery

Current operations and facilities are discussed in detail in Section 3.3.2, *Existing Refinery*. The Refinery consists of several plants that process crude oil into a variety of products, including LPG, gasoline, aviation gasoline, jet fuel, diesel fuel and lube oils. The Refinery also produces steam, electricity, fuel gas and hydrogen, primarily for its own use. Examples of existing plants on site include No. 4 Crude Unit, which distills crude oil; a 99-megawatt Cogeneration Plant; several processing plants that produce motor gasoline components including reforming, alkylation, isomerization, conversion of gas oil and residuum, and blending; an effluent water treating plant, steam and electrical generating plant, and several tank yards.

Within the Refinery, related facilities and operations are concentrated in specific centralized portions of the site. Most of the Refinery storage tank fields are situated to the west of the center of the property along the north-south axis of the hills. Some storage tanks and the marine terminal called the Long Wharf, lie south of I-580. Since the 1970s, Chevron has been systematically removing petroleum processing units from areas near public land uses. As a result, the central

portion of the Refinery site contains the bulk of Chevron's oil refining process equipment and supporting infrastructure. Chevron characterizes the resulting vacant land areas near the refinery's southern and eastern perimeter as an "internal refinery buffer area." The rail terminal is located near the center of the Refinery and the truck loading terminal is located on the southeastern edge of the property.

4.9.2.2 Regulatory Setting

Land Use Plans and Policies

The Richmond Shoreline has been the subject of numerous planning studies and plans aimed at establishing guidelines for development along the shoreline. A brief summary of the applicable land use plans and policy documents and their relevance to the Renewal Project follows.

City of Richmond General Plan

Adopted in August 1994 (and currently being updated), the Richmond General Plan establishes the policy framework that serves as the City's basis for both public and private decision-making, and guides the community's long-range development. The goals and policies of the plan reflect the City's philosophy on public and private development and provide guidance for making decisions on related issues.

The current General Plan Land Use Designations for the Chevron Refinery property are *Heavy Industry* (901), *Port/Marine Terminal/Ship Repair* (906), *Recreation Lands* (908), *Water Related Commerce and Commercial Recreation* (910), *Light Industry* (919), and *Preservation/Resource Area*. (see Figure 4.9-2: General Plan Land Use Designations: Site and Vicinity). The majority of proposed project area is classified as *Heavy Industry* though proposed new tank construction sites could extend into land designated as *Recreational Lands*. The Land Use Element of the Richmond General Plan states that the heavy industry category "accommodates a wide variety of industrial land uses including, but not limited to, oil refining, contractor storage yards, warehouses, machine shops, co-generation plants, and other 'heavy' industrial type uses." Policies in the Richmond General Plan relevant to the Renewal Project are:

Land Use Element Policies

LU-A.1: Evaluate project proposals for their contribution to improving Richmond's aesthetic and economic values.

LU-B.2: Accommodate heavy industrial uses in large areas buffered from major arterials and adjacent uses.

LU-B.4: Establish performance standards to govern the development and operation of industrial facilities to safeguard adjacent industrial uses, residential areas, and other land use in the community which might otherwise be affected.

LU-B.5: Require sufficient visual open space and/or landscaped screening between industrial operations and adjacent residential or recreational activities in order to create adequate buffers.

LU-O.5: Use established standards to limit industrial activities that may be objectionable due to odors, noise, fumes or other emissions.

LU-O.6: Use established standards to limit industrial activities that may endanger human health and may cause damage to the environment.

LU-P.1: Promote industrial development that creates maximum job opportunities for area residents.

Economic Development Policies

ED-H.2: Encourage the conversion of underutilized industrial areas to more intensive uses.

ED-G: Retain and encourage upgrading and expansion of existing industrial development.

Safety Element Policies

SF-B: Minimize the risks to people, property and the environment due to fire hazards and the use and storage of hazardous materials.

SF-A.17: Establish thresholds and require health risk assessments; where appropriate, provide necessary buffers for all new operations handling substantial amounts of hazardous material.

Open Space and Conservation Element Policies

OSC-J.1: Greatly expand reclamation of wastewater. Such water should be utilized by appropriate users, in particular by industry (e.g., Chevron Refinery and Richmond Rod and Gun Club).

OSC-O: Preserve, enhance and expand sites for public access to the Bay in accord with the Bikeways and Trails Circulation Plan. Existing and proposed programs and actions designed to meet the policies of Goal OSC-O.

OCS-O.4: Provide for maximum feasible access to the Richmond Shoreline.

OSC-S.3: Encourage development of special facilities to provide public access where ordinary trails and paths are impractical or where free public access would create a safety hazard.

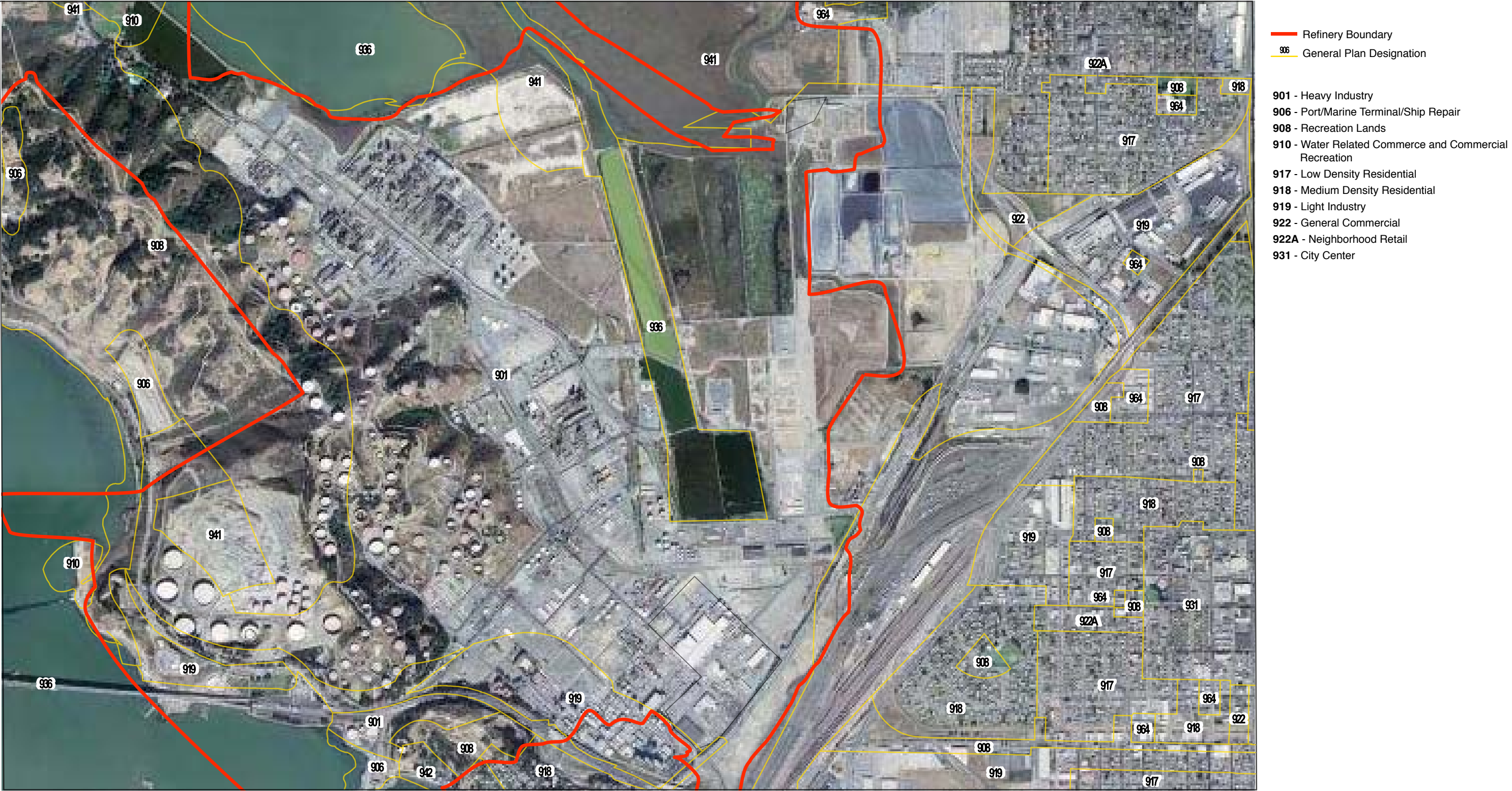
OSC-S.5: Provide public access where a local or regional trail is planned or located.

OSC-S.6: Promote the development of regional and local urban trails and collaborate with regional, County, and other local public agencies and with non-profit and private groups to develop urban trails.

OSC-P: Preserve the air quality so that air pollution levels do not threaten public health and safety. This will apply not only to the local area, but to potential sources of pollution originating in though not impacting the City of Richmond.

OSC-P.3: Ensure that developers and businesses work with regional, state and federal agencies to meet air quality standards.

Additionally, the following are specific guidelines that pertain to the West Shoreline area and would be relevant to the Renewal Project.



This page left intentionally blank

Land Use Element Shoreline – General Guideline

3. Develop Richmond’s shoreline potential for residential, commercial, and recreational uses as well as for port/maritime and industrial uses.

Circulation Element Shoreline - General Guideline

5. Encourage development of a system of hike/bike trails throughout the shoreline area as shown on Circulation Map, 2 of 2.

Open Space and Conservation Element West Shoreline Guidelines

3. Establish a public access trail from Point Richmond to Point San Pablo including a pedestrian trail from Keller Beach to the Richmond-San Rafael Bridge and a bicycling trail from I-580 along Western Drive to the tip of Point San Pablo (as shown on Circulation Plan Map 2 of 2).

City of Richmond Zoning Ordinance

The majority of the proposed project site is zoned M-3 (Heavy Industrial) (see Figure 4.9-3: Zoning Districts: Refinery and Vicinity). The Zoning Ordinance states that “[t]he M-3 zone is intended to create, preserve and enhance areas containing a wide variety of industrial uses including but not limited to manufacturing and related establishments which are potentially incompatible with most other establishments, and is generally found in areas which are distant from residential areas and which provide a wide variety of sites with good rail and highway access” (Section 15.04.330.010).

Other zoning designations within the refinery property boundaries (see Figure 4.9-3) include M-2 (Light Industrial), M-4 (Marine Industrial), and CRR (Community and Regional Recreation District). Proposed new tank construction and tank replacement sites could be on CRR zoned lands within the tank farms. Under the existing Zoning Ordinance, petroleum refining is a conditional use because of the potential for obnoxious or offensive emission of odor, dust, smoke, gas, noise, vibration, etc. In approving a conditional use pursuant to Section 15.04.190 of the Zoning Ordinance, the Planning Commission has the authority to impose such conditions as it deems necessary to protect the best interests of the neighborhood property or neighborhood and to carry out the purposes of the Zoning Ordinance and General Plan.

As illustrated in Figure 4.9-3, zoning districts immediately adjacent to the Refinery include CRR (Community and Regional Recreation District), MFR-1 (Multi-Family Residential), M-4 (Marine Industrial), and PC (Public and Civic Uses).

Contra Costa County General Plan and Zoning Ordinance

The Contra Costa County General Plan: 2005-2020, adopted in January, 2005, “expresses the broad goals and policies, and specific implementation measures, which will guide decisions on future growth, development, and the conservation of resources through the year 2020” (p. 1-1). The North Richmond unincorporated area of Contra Costa County, which is one of the larger unincorporated areas within the Richmond Planning Area, has generally been designated by the County General Plan for single-family residential use in the urbanized North Richmond community, and for light and heavy industry uses between San Pablo and Wildcat Creeks, as the

primary land uses. Other land uses in unincorporated Contra Costa County near the Refinery include light and heavy industrial, commercial nursery, and open space.

All refinery property lies within the City of Richmond, except an approximately 320,000 sq. ft. area (400 ft. by 800 ft., or 7.3 acres) north of Gertrude Avenue that lies in the unincorporated North Richmond area. This area is designated by the Contra Costa County General Plan as *HI (Heavy Industry)*, a designation that “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” (p. 3-19). The maximum average employees per gross acre is 45. The maximum site coverage is 30 percent, and the maximum floor-to-area ratio is 0.67.

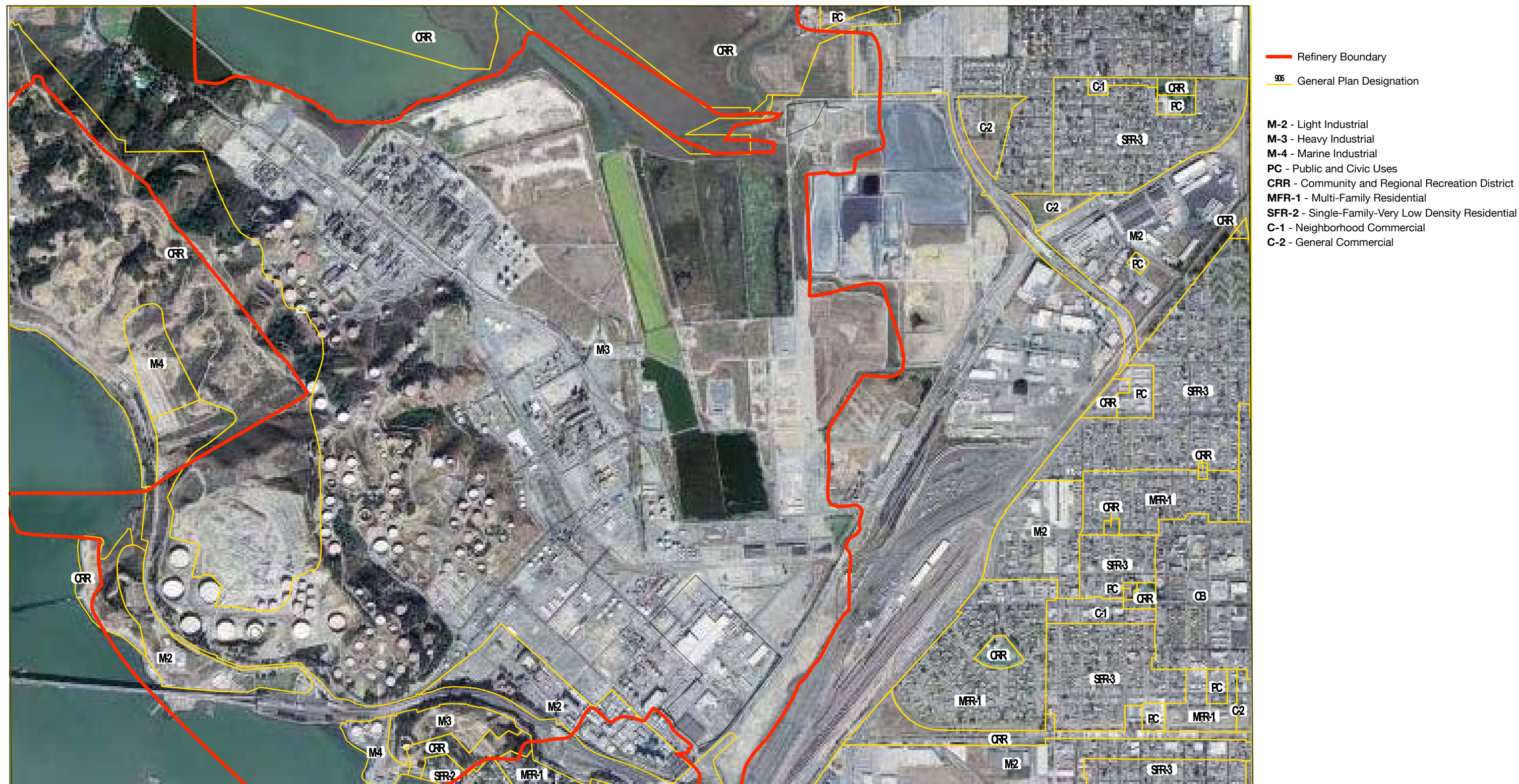
The Contra Costa County Zoning Ordinance designates the Chevron Refinery property as Heavy Industrial. Chevron has no facilities in this area, nor any plans to construct in this area which is located within the internal refinery buffer zone (Piersante, 2007).

Association of Bay Area Governments - Bay Trail Plan

As mandated by Senate Bill 100, the Association of Bay Area Governments (ABAG) prepared the Bay Trail Plan, which proposes the development of a 400-mile regional hiking and bicycling trail around the perimeter of San Francisco and San Pablo Bays. In Richmond, completed portions of the spine of the Bay Trail intermittently follow the shoreline south of I-580 until reaching Washington Park, at the corner of Cutting Boulevard and Garrard Boulevard. The trail then runs to the northeast, under I-580 and along Garrard Boulevard, until well past the Refinery. As a part of the 15-year implementation plan for the Bay Trail Plan, an alignment for a Bay Trail spur has been proposed along the western shoreline, running from the Point Richmond neighborhood to the Richmond/San Rafael Bridge, continuing north along Western Drive through Point Molate and Point San Pablo to the Point San Pablo Yacht Harbor. However, the Bay Trail Plan does not propose to encircle the Refinery. See Figure 4.15-1, *Recreation Facilities Within the Vicinity of the Project Site*.

Bay Conservation and Development Commission San Francisco Bay Plan

The San Francisco Bay Plan was prepared in January 1969 and amended in July 1988. The Plan establishes policies which guide development along San Francisco Bay within 100 feet of the shoreline extending from the mean high tide line inland. The Commission also has permit authority over filling, dredging, and shoreline development along the Bay. A substantial portion of Richmond’s shoreline has been designated as Priority Use Areas for 1) Port; 2) Water-Related Industry; 3) Waterfront Park, Beach; and 4) Tidal Marsh (San Francisco Bay Plan, Plan Map 4, 2003). Water-related industry is defined as “certain industries requiring a water-front location on navigable, deep water to receive raw materials and distribute finished products by ship, thereby gaining a significant transportation cost advantage.” The Chevron Refinery is shown as a water-related industry, which is a consistent use under the Plan (BCDC, 2003).



SOURCE: ESA

Chevron Energy and Hydrogen Renewal Project . 205166

Figure 4.9-3
 Zoning Districts:
 Refinery and Vicinity

This page left intentionally blank

Contra Costa Countywide Bicycle and Pedestrian Plan

On December 17, 2003, the Contra Costa Transportation Authority adopted its first ever Countywide Bicycle and Pedestrian Plan. This effort was coordinated with other regional agencies and plans, including the East Bay Regional Park District Master Plan, the San Francisco Bay Trail (ABAG), and the Metropolitan Transportation Commission. The Plan shows a bicycling trail near the Richmond Refinery also identified by the Bay Trail Plan.

East Bay Regional Park District Master Plan

The East Bay Regional Park District's (EBRPD) Master Plan, adopted in 1997, states that future acquisition plans could include Point Molate. Point Molate, located adjacent to the Refinery, is identified as a potential regional shoreline park that would provide "significant recreational, interpretive, natural, or scenic values on land, water, and tidal areas along the San Francisco Bay, San Pablo Bay, and Sacramento/San Joaquin Delta" (p. 52). In addition, the 1997 Master Plan indicates that plans for the Bay Trail may include the shoreline lands of the Refinery.

San Pablo Peninsula Open Space Study

The San Pablo Peninsula Open Space Study was completed in May 2005. The study area is roughly bound by the San Francisco Bay shoreline on the west, Potrero Ridge on the east, the Richmond-San Rafael Bridge on the south, and Point San Pablo on the north. The study presents recommendations for future uses of the Peninsula and conceptual plans. The Study's Preferred incorporates the following:

- Developing Point San Pablo (Terminal 4) for public recreation use,
- Establishing a park along the Point Molate shoreline,
- Preserving the western slopes of the Peninsula as protected open space, providing interpretive facilities to highlight the Peninsula's unique amenities, and establishing the Bay Trail along the shoreline.

Chevron land comprises a substantial portion of the southwestern portion of the study area and the Open Space Study's plans for this property include provision of Class I and Class II recreational trails through the property (LSA Associates, Inc., *et al.*, 2005).

4.9.3 Land Use Significance Criteria and Methodology

Significance Criteria

Based on Appendix G of the *CEQA Guidelines*, a project may be deemed to have a significant effect on the environment with respect to land use if it would result in:

- a) Physically divide an established community;
- b) Fundamentally conflict with any applicable land use plan, policy, or 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 and result in a physical change in the environment; or

- c) Fundamentally conflict with any applicable habitat conservation plan or natural community conservation plan.

CEQA Guidelines Appendix G topics that will not be discussed further in this EIR

Review and comparison of the Proposed Project to the environmental setting clearly shows that the Proposed Project will create no impacts related to the following environmental topics listed in CEQA Guidelines Appendix G:

- c) **Fundamentally conflict with any applicable habitat conservation plan or natural community conservation plan.**

There are no adopted habitat conservation plans or natural community conservation plans in the Refinery area. The Proposed Project would have no impact on habitat conservation plans or natural community conservation plans.

4.9.4 Land Use Impacts and Mitigation Measures

Impact 4.9-1: The Proposed Project would involve the replacement and alteration of existing equipment in several centralized process areas within the Refinery that are already developed and would add tanks within developed tank farm areas. The Proposed Project would not expand the Refinery's perimeter boundary and would maintain the buffer between existing operations and the Refinery's eastern and southern boundaries. Any potential land use conflict within the Refinery or between the Proposed Project and the surrounding community would be less than significant.

Although the Proposed Project would intensify uses at the Refinery, it would not create a land use conflict outside of the Refinery. With the exception of Point Richmond, which is generally screened by hills, surrounding residential areas are buffered by industrial, recreational, and institutional uses, such as a landfill and a railroad yard, in addition to the buffer hundreds of feet wide within the Refinery. The Point Richmond area is located south of the Proposed Project, and is separated by roadways and other Refinery uses from the project. Therefore, the Proposed Project also would not physically divide an established community.

Chevron has been consolidating its operations toward the center of its site in order to create a buffer between its operations and its site perimeter, as well as a buffer between the southern and eastern perimeters of the site and land uses adjacent to the site perimeter. This consolidation further ensures that the Proposed Project would not divide an established mixed-use community that includes industrial/marine-based businesses, recreational uses, and residential neighborhoods.

The Proposed Project would be built within existing Chevron operational areas. As part of the Conditional Use Permit (CUP) review process required by the City prior to the issuance of building permits, the Planning Commission could impose conditions that would specify how the

Renewal Project would comply with the applicable Commercial and Industrial provisions in Section 15.04.820 of the Zoning Ordinance. Further, the Design Review Board could impose conditions specifying how the Renewal Project would comply with Performance Standards in Section 15.04.840 of the Zoning Ordinance related to location and color of tanks, screening of mechanical equipment, landscaping and buffering the facilities on site from neighboring properties. Adoption of any specific screening, landscaping and buffering requirements by the Planning Commission as part of the Renewal Project approval, and implementation of the conditions by Chevron, would further mitigate the Renewal Project from potential land use conflicts with the surrounding community. However, even without additional conditions, the project would not divide an existing community.

Mitigation: None required.

Impact 4.9-2: The Proposed Project would not fundamentally conflict with any applicable land use plan, policy, or 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 and result in a physical change in the environment. This impact would be less than significant.

The four main components of the Proposed Project (Hydrogen Plant Replacement, Catalytic Reformer Replacement, Power Plant Replacement, and Hydrogen Purity Improvements) would be located in areas designated by the General Plan as *Heavy Industry*, and by the Zoning Ordinance as *M-3 Heavy Industrial*. These components of the Proposed Project would therefore be consistent with both the General Plan land use designation and the Zoning Ordinance.

Proposed new tank construction and/or tank replacement in the Main Tank Field, the Quarry Tank Field, SP Hill Tank Field, Office Hill Tank Field and the Pole Yard Tank Field (See Figure 3-3) could extend beyond the boundaries of areas designated as *Heavy Industry* (901) by the General Plan Land Use Element and *M-3 Heavy Industrial* by the Zoning Ordinance. Tank construction in these areas of the Refinery could extend into land designated by the General Plan as *Recreation* (908) and as *Community and Regional Recreation* (CRR) by the Zoning Ordinance. This action would require a Conditional Use Permit (CUP), as described in Impact 4.9-1 above. Under the CUP review, the Planning Commission could impose conditions and the Design Review Board could impose conditions specifying how the Renewal Project will comply with Performance Standards of the Zoning Ordinance related to location and color of tanks, screening of mechanical equipment, landscaping and buffering the facilities on site from neighboring properties. Application of these measures would reduce land use impacts of the Proposed Project to less than significant. Such conditions are likely to include, among others, restrictions on the location of individual storage tanks within the tank farm, as well as restrictions on color and requirements for screening plantings for new tanks.

Any encroachment of the Proposed Project into an area designated as *Community and Regional Recreation* (CRR) would not conflict with existing recreational uses or potential future uses such as the Bay Trail, which is located along the shoreline, or the potential acquisition of Point Molate, but would be located adjacent to existing tank facilities on land owned by the Refinery. Because

the Proposed Project would be constructed entirely on Refinery property and well away from the public shoreline of the Bay, the shoreline area would not be directly or indirectly affected. Furthermore, the project would not cause off-site noise, air emissions, or risk to health or safety that would prevent public use of the shoreline. For these reasons, the Proposed Project would not conflict with the East Bay Regional Park District's (EBRPD) Master Plan or the Bay Trail Plan.

The ABAG Bay Trail Plan generally seeks to establish access to the perimeter of the Bay within Richmond. The present Bay Trail Plan implicitly recognizes that it is impractical, for reasons that include Refinery security and public safety, for such access within the active Refinery areas. Thus, the completed Trail spine approaches the Refinery from the south and goes to the east of the Refinery before eventually returning to the shore of the Bay north of the Refinery and the proposed Bay Trail spur alignment to Point Molate goes along the shoreline to the west of the Refinery as shown in Figure 4.15-1, *Recreation Facilities within the Vicinity of the Project Site*.

The changes related to the Proposed Project would not alter the Refinery security and public safety reasons for the present or proposed future location of the Bay Trail in the vicinity of the Refinery and thus, would have no effect on the Bay Trail Plan. For additional discussion of the effects of the proposed project on the Bay Trail Plan, see Section 4.9 (Parks and Recreation).

The Proposed Project, which includes replacements and modifications to the existing facilities as well as the additions of storage tanks to the tank farms, represents no essential change with respect to the Refinery's conformance with the San Francisco Bay Plan water-related industry priority use designation and Contra Costa County's General Plan and Zoning designations.

Mitigation: None required.

References – Land Use

Association of Bay Area Governments (ABAG), *The Bay Trail*, <http://baytrail.abag.ca.gov/>, accessed September 9, 2005 and March, 2006.

California State Coastal Conservancy, Chevron Richmond Refinery, City of Richmond, East Bay Regional Park District, Muir Heritage Land Trust, Trails for Richmond Action Committee, *San Pablo Peninsula Open Space Study*, <http://www.fathomservices.com/sanpablostudy.htm> (accessed March 2006), May 2005.

City of Richmond Zoning Ordinance, January 1997.

City of Richmond, Richmond General Plan, Volume One, August 1994.

City of Richmond, Richmond General Plan, Land Use Maps, August 1994, Amended May 1998.

Contra Costa County, *Contra Costa County General Plan 2005-2020*, <http://www.co.contra-costa.ca.us/>, accessed March 2006.

Contra Costa County, *Contra Costa County Code*, <http://www.co.contra-costa.ca.us/>, accessed March 2006.

Contra Costa Transportation Authority, *Contra Costa Countywide Bicycle and Pedestrian Plan*, December 17, 2003.

East Bay Regional Park District, *Master Plan 1997*,
http://www.ebparks.org/resources/pdf/misc/RPM_Plan97.pdf, accessed March 2006.

Fridell, Lee D., *The Story of Richmond*. Richmond Union High School District, 1954.

LSA Associates, Inc. et al., 2005. *San Pablo Peninsula Open Space Study*, May 2005.

Piersante, Mark, Chevron Contractor, Personal Communication, May 3, 2007.

San Francisco Bay Conservation and Development Commission (BCDC), *San Francisco Bay Plan*, June, 2003.

U.S. Geological Survey, 7.5 Minute Richmond Quadrangle Topographical Map, 1959.

4.10 Noise

Construction and operation of the Proposed Project would result in noise effects that either would be less than significant or would be reduced to a less-than-significant level with the implementation of the identified mitigation measures:

- Proposed Project construction could result in temporary significant noise impacts to adjacent sensitive land uses, such as nearby residences. Construction impacts would be mitigated to a less-than-significant level by implementing the identified mitigation measures.
- Proposed Project operations would result in less-than-significant noise impacts on sensitive receptors.

4.10.1 Introduction

This section addresses noise impacts associated with the Proposed Project at the Refinery. This section describes and discusses the existing noise conditions and Richmond noise ordinances, analyzes potential noise impacts caused by both the construction and the operation of the Proposed Project, and presents measures to mitigate significant noise impacts.

Basic information on environmental sound, including some definitions of the terms commonly used in noise analysis and regulation, follows.

Sound and Noise

Sound is mechanical energy transmitted by pressure waves through a medium such as air. 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 ears 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).¹ Frequency A-weighting follows an international standard methodology of frequency de-emphasis and is typically applied to community noise measurements.

Noise Exposure and Community Noise

Noise is defined as unwanted sound. 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. Rather, community noise varies continuously with time with respect to the contributing sound sources of the community noise environment. Community noise is primarily the product of many distant noise sources, which constitute a relatively stable background noise exposure, with the individual contributors being unidentifiable. The background noise level changes throughout a typical day, but does so gradually, corresponding with the addition and subtraction of distant noise sources such as traffic and atmospheric conditions. What makes community noise constantly variable throughout a day, besides the slowly changing background noise, is the addition of short duration single event noise sources (e.g., aircraft flyovers, motor vehicles, sirens), which are readily identifiable to the individual.

These successive additions of sound to the community noise environment change 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, typically one hour, in terms of a single numerical value. The L_{eq} is the constant sound level that 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 period of interest.
- L_{min}:** The instantaneous minimum noise level measured during the period of interest.
- L_x:** The sound level that is equaled or exceeded x percent of a specified time period. The L₅₀ represents the median sound level. L₉₀ represents the background noise level.
- DNL:** The day-night noise level 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.

¹ All noise levels reported herein reflect A-weighted decibels unless otherwise stated.

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 in industrial plants generally experience noise in the last category. There is no universal measure for the subjective effects of noise, nor does a measure exist for the corresponding human reactions from noise annoyance. This is due to the wide variation in the individual thresholds of annoyance, and different tolerances to noise tend to develop based on an individual’s past experiences with noise.

Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment 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 will be judged by those hearing it. Therefore a new noise source will be judged more annoying in a quiet area than it would be in a noisier area. With regard to increases in A-weighted noise level, the following relationships occur:

- Except in 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;
- 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 adverse community response.

These relationships occur in part because of the logarithmic nature of sound and the decibel system. 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 logarithmically. For example, if two identical noise sources of 50 dBA are combined, their doubled sound level would be 53 dBA, not 100 dBA.

Noise Attenuation

Stationary point sources of noise, including stationary mobile sources such as idling vehicles, attenuate (lessen) at a rate of 6 to 7.5 dBA per doubling of distance from the source, depending on the topography of the area and environmental conditions (i.e., atmospheric conditions and noise barriers, vegetative or manufactured, etc.). Widely distributed noise, such as a large industrial facility spread over many acres or a street with moving vehicles, would typically attenuate at a lower rate, approximately 4 to 6 dBA per distance doubled.

Vibration

In addition to generating noise, heavy construction equipment can generate groundborne vibration. Pile driving and similar activities, because they result in blows or impacts on the ground surface, produce vibrational waves that radiate along the surface of the earth and downward into the earth, potentially resulting in effects that range from annoyance to structural damage. As vibrations travel outward from the source, they excite the particles of rock and soil through which they pass and cause them to oscillate by a few ten-thousandths to a few thousandths of an inch. Differences in subsurface geologic conditions and distance from the source of vibration will result in different vibration levels characterized by different frequencies and intensities. In all cases, vibration amplitudes will decrease with increasing distance. The maximum rate or velocity of particle movement is the commonly accepted descriptor of the vibration “strength.” This is referred to as the *peak particle velocity* (ppv) and is typically measured in inches per second.

Vibration energy spreads out as it travels through the ground, causing the vibration level to diminish with distance away from the source. High frequency vibrations reduce much more rapidly than low frequencies, so that low frequencies tend to dominate the spectrum at large distances from the source. Discontinuities in the soil strata can also cause diffractions or channeling effects that affect the propagation of vibration over long distances. When vibration encounters a building, a ground-to-foundation coupling loss will usually reduce the overall vibration level, however, under certain circumstances, the ground-to-foundation coupling may also amplify the vibration level due to structural resonances of the floors and walls.

Human response to vibration is difficult to quantify. Vibration can be felt or heard well below the levels that produce any damage to structures. The duration of the event has an effect on human response, as does frequency. Generally, as the duration and vibration frequency increase, the

potential for adverse human response increases. While people have varying sensitivities to vibrations at different frequencies, in general they are most sensitive to low-frequency vibration. Vibration in buildings caused by construction activities may be perceived as motion of building surfaces or rattling of windows, items on shelves, and pictures hanging on walls. Vibration of building components can also take the form of an audible low-frequency rumbling noise, which is referred to as ground-borne noise. Groundborne noise is usually only a problem when the originating vibration spectrum is dominated by frequencies in the upper end of the range (60 to 200 Hz), or when the structure and the construction activity are connected by foundations or utilities, such as sewer and water pipes.

Table 4.10-1 summarizes the average human response to vibration that may be anticipated when a person is at rest in quiet surroundings. If the person is engaged in any type of physical activity, vibration tolerance increases considerably.

**TABLE 4.10-1
EFFECTS OF CONSTRUCTION VIBRATION**

Peak Particle Velocity (in/sec)	Effect on Humans	Effect on Buildings
<0.005	Imperceptible	No effect on buildings
0.005 to 0.015	Barely perceptible	No effect on buildings
0.02 to 0.1	Barely to distinctly perceptible	No effect on buildings
0.1 to 0.5	Distinctly perceptible to strongly perceptible; Vibrations considered unacceptable for people exposed to continuous or long term vibration	Minimal potential for damage to weak or sensitive structures
0.5 to 1.0	Strongly perceptible to mildly unpleasant; Vibrations considered bothersome by most people, however tolerable if short-term in length	Threshold at which there is a risk of architectural damage to buildings with plastered ceilings and walls. Some risk to ancient monuments and ruins.
1.0 to 2.0	Mildly unpleasant to distinctly unpleasant; Vibrations considered unpleasant by most people	U.S. Bureau of Mines data indicates that blasting vibration in this range will not harm most buildings. Most construction vibration limits are in this range.
>2.0	Distinctly unpleasant to intolerable	Potential for architectural damage and possible minor structural damage.

SOURCE: Bender 1996

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; 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. Commercial and industrial uses are considered the least noise-sensitive.

4.10.2 Setting

4.10.2.1 Project Setting

The Proposed Project is located within the Refinery in the City of Richmond. The Refinery is bordered by Interstate 580 (I-580) to the south, the Point Molate Naval Fuel Supply Depot and San Francisco bay to the west, San Pablo Bay, the Paktank area and an active landfill site to the northwest, and industrial developments including the Santa Fe Intermodal Facility and rail yards to the north and east, and Castro Street to the east. The Refinery site is situated at the eastern terminus of the Richmond-San Rafael Bridge.

Portions of five residential neighborhoods are within a one-mile radius of the Refinery. To the northeast, is the Shield-Reid neighborhood (North Richmond) East of the Refinery, across Castro Street and Garrard Boulevard, are the communities of Atchison Village, Iron Triangle and Sante Fe. To the south, is the Point Richmond neighborhood. Refer to the Section 4.9, *Land Use* of this document for more detail on the types and locations of land uses in the vicinity of the Refinery. Generally, the nearest residences are approximately 2,500 feet or farther from the nearest Proposed Project process units. The only exception to this are the three proposed replacement tanks, T-954, T-1451, and T-1504. These three tanks are located just to the west of the Point Richmond neighborhood at distances ranging between 700 to 1400 feet with the closest tank being T-1451 (See Figure 3-3).

Existing Noise Sources and Ambient Noise Levels

Transportation sources, such as automobiles, trucks, trains, and aircraft, are the principal sources of noise in most urban environments. Along major transportation corridors, noise levels can reach 80 DNL, while along arterial streets, noise levels typically range from 65 to 70 DNL. Industrial and commercial equipment and operations also contribute to ambient noise in their vicinities.

The ambient noise environment at the project site is dominated by existing operations at the Refinery, traffic on I-580 and rail activity along the Union Pacific Railway tracks.

To establish a baseline to evaluate project-related increases in noise level at sensitive uses around the Refinery, noise measurements were taken at representative locations around the Refinery. The noise monitoring locations have varying views of the Refinery process block and the overall Refinery, and therefore varying direct exposures to those noise sources, due to the surrounding topography. Noise measurements were made using Metrosonics dB-308 Sound Level Meters. The meters were calibrated before and after the surveys with a Metrosonics acoustical calibrator. The nearer sensitive land uses are primarily located to the south and southeast of the Refinery. Therefore, noise monitoring focused on locations in these areas. The long-term measurement locations are described in the following paragraphs.

Location 1

The first long-term measurement was taken in the residential neighborhood of Point Richmond at the corner of Tewksbury Avenue and Marine Street. Since this community is located right next to the I-580 freeway, ambient noise levels in this area are already generally high. Being at an elevation greater than the elevation of the Refinery operations block, this location has an unobstructed line of sight (and exposure) to the Refinery's operations and its noise-producing equipment, which is located approximately 2,500 feet distant.² The process block of the Refinery is where most of the equipment associated with the Proposed Project would be located.

The noise environment at Location 1 is mainly dominated by traffic on I-580, which is located to the east at a lower elevation. Noise from the Refinery was barely audible to the monitoring technician over the traffic noise at Location 1. However, while the Refinery noise is fairly constant, noise from the freeway changes over the day. Therefore, long-term measurements were taken to capture this variation. The monitored DNL at Location 1 was 72 dBA. The monitored DNL, daytime and nighttime L_{eq} values are shown in Table 4.10-2.

Location 2

The second long-term measurement was taken at the northeastern corner of Chevron's reclamation area, near Gertrude Street. This monitoring point is approximately 2,600 feet from the process block of the Refinery. The noise environment at this site is dominated by noise from activity at the reclamation yard (primarily vehicles from the Refinery) and traffic on West Gertrude Avenue. The Shields-Reid residential neighborhood is located approximately 1,000 feet to the east. The monitored DNL at Location 2 was 59 dBA. The DNL, daytime and nighttime L_{eq} values are shown in Table 4.10-2.

Location 3

The third long-term measurement was taken at the Refinery's eastern fence line, underneath the elevated Castro Street/Richmond Parkway. The residential communities of Atchison Village and Iron Triangle are located to the east of Richmond Parkway, approximately 1,000 feet to the east. This monitoring point is located approximately 2,600 feet from the process block of the Refinery. The noise environment at this site is dominated by noise from traffic on Castro Street, noise from the General Chemical Plant and intermittent noise from rail activity along the Union Pacific tracks that are approximately 100 feet to the east. The monitored DNL at Location 3 was 67 dBA. The DNL, daytime and nighttime L_{eq} values are shown in Table 4.10-2.

² s described in Section 4.10.2, Setting, above three proposed replacement tanks would be located less than 2,500 feet from the nearest potential sensitive receptors in Point Richmond. However, there is no real operational noise associated with tanks, unlike Refinery equipment within the process blocks.

**TABLE 4.10-2
AMBIENT NOISE LEVELS AT MONITORED LOCATIONS, dBA**

Site	Location	Measurement Period (September, 2005)	Noise Level in dBA		
			Daytime L _{eq}	Nighttime L _{eq}	DNL
1	Near corner of Tewksbury Avenue and Marie Street	24-Hour	62–81	44–78	72
2	At the northeast corner of the reclamation area, near Gertrude Street	24-Hour	55–69	40–52	59
3	Along the eastern property line of the Refinery next to Castro Street and just south of the General Chemical Plant	24-Hour	61–76	53–70	67

SOURCE: Environmental Science Associates, 2005

4.10.2.2 Regulatory Setting

Noise issues applicable to the Proposed Project are addressed in Richmond General Plan policies, and local noise ordinance standards.

City of Richmond General Plan

The Noise Element of the Richmond General Plan contains goals and policies to reduce or eliminate the effects of excessive noise in the community when implementing changes in land use. Goals applicable to the Proposed Project include (City of Richmond, 1994):

Goal NE-A: Control the level of noise pollution in the community by preventing the development of incompatible land uses, rather than relying entirely on acoustical techniques after the fact such as sound walls, buffers, etc

Policy NE-A.1: Discourage development where such development will significantly increase existing noise levels unless mitigation measures are designed as part of the project to limit noise emissions to an acceptable level compared to the existing sound level.

Policy NE-A.6: Require new commercial and industrial developments with potential noise and vibration producing activities to provide noise study reports prepared by a qualified professional with demonstrated experience in noise control engineering.

Policy NE-A.9: Seek to limit the impact of nuisance noise sources upon noise-sensitive land uses and consider noise and vibration impacts in land use planning decisions.

Policy NE-A10: Require parties responsible for noise producing sources or activities to limit noise, which affects nearby noise-sensitive land uses.

The General Plan has adopted the State's noise compatibility matrix for determining the compatibility of various land uses with different noise environments (City of Richmond, 1994). The compatibility guidelines recognize that some land uses are more sensitive to ambient noise levels than others, due to the amount of noise exposure (in terms of both exposure duration and

insulation from noise) and the types of activities typically involved. For Residential uses, the most sensitive land use, a noise environment of DNL 60 dBA or less is considered “normally acceptable”, while a noise environment between DNL 60 and 70 dBA is considered “conditionally acceptable”, a DNL of 70 to 75 dBA is considered “normally unacceptable” and a DNL 75 dBA and above is considered “normally unacceptable”.

For commercial and office uses, which are generally less noise-sensitive, a noise environment of DNL 67 dBA or less is considered “normally acceptable”, while a noise environment between DNL 67 and 75 dBA is considered “conditionally acceptable” and a DNL 75 dBA and above is considered “normally unacceptable”. For Industrial and manufacturing uses, a noise environment of DNL 70 dBA or less is considered “normally acceptable”, while a noise environment between DNL 70 and 75 dBA is considered “conditionally acceptable” and a DNL 75 dBA and above is considered “normally unacceptable”.

In this context, “normally acceptable” is defined as satisfactory for the specific land use, assuming that normal conventional construction is used in buildings. “Conditionally acceptable” means that new construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh-air supply systems or air conditioning will normally suffice. “Normally unacceptable” means that new construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

Richmond Noise Ordinance

The City of Richmond also regulates exterior noise levels through enforcement of the Community Noise Ordinance (Chapter 9.52.100 of the Richmond Municipal Code). Table 4.10-3 presents the maximum allowable exterior noise levels for long-term operational sources contained in the Community Noise Ordinance. The noise ordinance regulates only operational noise from stationary sources because cities and counties do not have regulatory authority over noise from mobile sources (transportation noise). Transportation noise is regulated at the state and federal level by noise limits placed on vehicle manufacturers. The factors that are considered when determining whether the ordinance is violated include: a) the level, intensity, character, and duration of the noise; b) the level, intensity, and character of the background noise; and c) the time when, and the place and zoning district where, the noise occurred.

The Richmond noise ordinance also prohibits construction or demolition work at any time between the hours of 7 p.m. and 7 a.m. on weekdays or 6 p.m. and 8.30 a.m. on weekends and legal holidays in any residential or commercial zoning district or adjacent to any noise-sensitive uses so as to create a noise disturbance or cause any violation of this chapter. Where technically and economically feasible, construction activities are required to be conducted in such a manner that the maximum sound levels at affected properties will not exceed those listed in Table 4.10-4.

**TABLE 4.10-3
MAXIMUM ALLOWABLE EXTERIOR NOISE STANDARDS FOR SPECIFIED LAND USES, dBA**

Zoning District	Maximum Noise Level, in dBA, not to be exceeded more than 30 minutes in any hour.		Maximum Noise Level, in dBA, not to be exceeded more than 5 minutes in any hour
	Measured at property line or district boundary	Measured at any boundary of a residential zone	Measured at any boundary of a residential zone between 10 p.m. and 7 a.m. ^a
Single Family Residential	60	---	---
Multi Family Residential	65	---	---
Commercial	70	60	50 or ambient noise level
Light Industrial and Office ^b	70	60	50 or ambient noise level
Heavy and Marine Industrial ^b	75	65	50 or ambient noise level
Public Facilities and Community Use	65	60	50 or ambient noise level
Open Space and Recreational Districts	65	60	50 or ambient noise level

^a Restricted hours may be modified through condition of an approved conditional use permit.

^b For M-1 and M-2, the measurement will be at property lines. For M-3 and M-4, the measurement will be at the boundary of the district.

NOTES:

1. The standard limits set forth above shall be reduced by 5 decibels if the noise contains a steady, pure tone such as a whine, screech or hum, or is an impulsive sound such as hammering or riveting, or contains music or speech.
2. The exterior noise limits for any source of noise within a residential zone shall be reduced by 10 dBA between 10 p.m. and 7 a.m. The exterior noise limits for any noise source in any other zone other than a residential zone shall be reduced between 10 p.m. and 7 a.m. so that when measured at the property line of a "noise-sensitive use", the noise does not exceed 50 dBA.

SOURCE: Section 9.52.100 of the Community Noise Ordinance, Richmond Municipal Code.

**TABLE 4.10-4
MAXIMUM ALLOWABLE RECEIVING NOISE STANDARDS FOR TEMPORARY CONSTRUCTION OR
DEMOLITION ACTIVITIES, dBA**

Receiving Land Use	Weekdays 7 a.m. to 7 p.m.	Weekends including legal holidays, 9 a.m. to 8 p.m.
Short Term Operation (less than 15 days)		
Single Family Residential	75	60
Multi Family Residential	80	65
Commercial and Industrial	85	70
Long Term Operation (15 days or more)		
Single Family Residential	60	55
Multi Family Residential	65	60
Commercial and Industrial	70	65

NOTES:

1. The standard limits set forth above shall be reduced by 5 decibels if the noise contains a steady, pure tone such as a whine, screech or hum, or is an impulsive sound such as hammering or riveting, or contains music or speech.
2. The exterior noise limits for any source of noise within a residential zone shall be reduced by 10 dBA between 10 p.m. and 7 a.m. The exterior noise limits for any noise source in any other zone other than a residential zone shall be reduced between 10 p.m. and 7 a.m. so that when measured at the property line of a "noise-sensitive use", the noise does not exceed 50 dBA.

SOURCE: Section 9.52.110 of the Community Noise Ordinance, Richmond Municipal Code.

Ground borne Vibration Regulations

There are no widely adopted standards for acceptable levels of ground vibration generated by construction activities. However, the U.S. Department of Transportation has identified a “vibration damage threshold” of 0.20 inch per second for fragile buildings and 0.12 inch per second for extremely fragile historic buildings (Federal Transit Administration 1995). In addition, the Transportation Research Board suggests maximum allowable peak particle velocities from pile driving for various structure types and conditions (Transportation Research Board 1997), as summarized in Table 4.10-5.

**TABLE 4.10-5
MAXIMUM VIBRATION CRITERIA FOR STRUCTURES**

Structure and Condition	Limiting Peak Particle Velocity, in/sec
Historic buildings, certain other old buildings	0.5
Residential structures	0.5
New residential structures	1.0
Industrial buildings	2.0
Bridges	2.0

SOURCE: Transportation Research Board, 1997.

4.10.3 Noise Significance Criteria and Methodology

Significance Criteria

Based on Appendix G of the *CEQA Guidelines*, a project may be deemed to have a significant effect on the environment with respect to noise 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 groundborne vibration or groundborne 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.

For the assessment of construction noise impacts, the standards in the Richmond noise ordinance would be used (Section 9.52.110 of the Community Noise Ordinance in the Richmond Municipal Code.). The noise ordinance regulates the allowable hours for construction and demolition work and sets forth guidelines for maximum allowable construction-related noise levels affecting single-family, multi-family, and commercial and industrial areas (shown in Table 4.10-4). Since construction is anticipated to take more than 15 days, the applicable standards for this project are 60 dBA on weekdays and 55 dBA on weekends and legal holidays at residential neighborhoods in the vicinity of the project site. The Richmond Noise Ordinance also provides a different set of noise standards for short-term construction activities of less than 15 days, which would not apply to this project.

For the purposes of this analysis, consideration was given to the fact that the Proposed Project consists of a number of individual component projects; furthermore, even the larger component projects would have distinct phases. Because of the nature of noise generation and transmission and the large distances (approximately 2,500 feet) involved between the most Proposed Project construction sites and the residences (sound receptors), only the noisiest of construction activities – pile driving – or a particular combination of an unusually large number of relatively loud noise sources operating together would be loud enough to be readily perceived outside of the Refinery. As a result, for the purposes of the noise analysis, construction noise effectively consists only of episodes of pile driving noise, which would occur only at irregular intervals during the overall construction of some Proposed Project components. The total duration of the construction would be a number of years, but pile driving would occur relatively infrequently throughout that construction; this would justify treating each episode as falling under the long-term construction standards of the Richmond Noise Ordinance.

A change in noise levels of less than three dBA is not discernible to the general population; an increase in average noise levels of three dBA is considered barely perceptible, while an increase of five dBA is considered readily perceptible to most people (Caltrans, 1998).

To assess changes in the ambient noise environment due to Proposed Project operation, the following significance criteria take into account both the absolute change in noise levels due to a project and the relationship between the resultant noise level and the County's noise/land use compatibility standards. Where the resultant noise level would remain "normally acceptable" for the affected land use, a change of 5-DNL or more would be considered significant. Where the resultant noise level would be in the range described as "conditionally acceptable" or "normally unacceptable," a change of 3-DNL or more over existing noise levels would be considered significant, and where the resultant noise level would be "clearly unacceptable," any increase in noise over existing levels would be considered significant. In this case, the ambient noise level at potentially affected uses (residential areas to the south of the Refinery) are already within the normally unacceptable range. Therefore, based on the noise/land use compatibility guidelines found in the Noise Element of the City's General Plan, a 3-DNL increase at the residential uses would be considered significant for operational impacts.

CEQA Guidelines Appendix G topics that will not be discussed further in this EIR

Review and comparison of the Proposed Project to the environmental setting clearly shows that the Proposed Project would create no impacts related to the following environmental topics listed in CEQA Guidelines Appendix G.

- 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.**

There are no public use airports or private airstrips located within a two-mile radius of the project site, nor is the site located within an airport land use plan. Therefore the Proposed Project would not expose people to excessive noise levels associated with aircraft operations. There would be no impact.

The remaining criteria are discussed in Section 4.10.4, *Noise Impacts and Mitigation Measures*, under Impacts 4.10-1 through 4.10-4, and Section 5, *Cumulative Impacts*, below.

4.10.4 Noise Impacts and Mitigation Measures

4.10.4.1 Construction Noise

Impact 4.10-1: Construction activities associated with the Proposed Project would intermittently and temporarily generate noise levels above existing ambient levels in the project vicinity over the duration of the construction period. This would be a significant impact.

Proposed Project construction would begin in 2007 and would be completed in 2015. Construction noise levels at and near locations on the Proposed Project site would fluctuate depending on 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, the distance between construction activities and the nearest noise-sensitive uses, and the existing noise levels at those uses. As discussed earlier, the nearest sensitive receptors that could be affected by Proposed Project noise are situated approximately 2,500 feet to the south of the most Proposed Project component sites except for three replacement tanks located 700 to 1,400 feet the western end of Point Richmond. Construction-related material haul trips would raise ambient noise levels along haul routes, depending on the number of haul trips made and types of vehicles used. In addition, certain types of construction equipment generate impulsive noises (such as pile driving), which can be particularly intrusive. Specific data on the types and numbers of pieces of construction equipment that would be operating on-site

during different phases of Proposed Project construction are not available at this time. Therefore, Table 4.10-6 shows typical noise levels during different construction stages.

**TABLE 4.10-6
TYPICAL COMMERCIAL CONSTRUCTION NOISE LEVELS**

Construction Phase	Noise Level ^a (dBA, L _{eq} at 50 feet)
Ground Clearing	84
Excavation	89
Foundations	78
Erection	85
Exterior Finishing	89

^a Estimates correspond to a distance of 50 feet from the noisiest piece of equipment associated with a given phase and 200 feet from the other equipment associated with that phase.

SOURCE: U.S. Environmental Protection Agency, Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances, December 1971.

Table 4.10-7 shows typical noise levels produced by various types of construction equipment. Noise levels during the noisiest construction activities (pile driving) could reach 101 dBA at 50 feet.

**TABLE 4.10-7
TYPICAL NOISE LEVELS FROM CONSTRUCTION EQUIPMENT**

Construction Equipment	Noise Level ^a (dBA, L _{eq} at 50 feet)
Dump Truck	88
Portable Air Compressor	81
Concrete Mixer (Truck)	85
Scraper	89
Jack Hammer	88
Dozer	85
Paver	89
Generator	81
Pile Driver	96-101
Backhoe	80

SOURCE: FTA, 2006.

Noise from construction activity generally attenuates (decreases) at a rate of 6 to 7.5 dBA per doubling of distance. Conservatively assuming an attenuation of 6 dBA per doubling of distance, pile driving could lead to maximum noise levels of 67 L_{eq} at the nearest sensitive receptors located approximately 2,500 feet from the construction site at the Refinery. This would exceed the noise standards in the Richmond Noise Ordinance for construction activities greater than 15 days (See Table 4.10-4). Given that daytime ambient noise levels at receptors in the Point

Richmond neighborhood to the south of the Refinery are in the range of 62 to 81 dBA, these predicted construction noise levels may periodically be audible over the existing ambient noise. Therefore, construction noise from pile driving would be considered a potentially significant impact.

Construction of the Proposed Project would primarily take place during the day. There are no plans to work a night shift to construct the Proposed Project. However, in the event that weather or other factors significantly impact the project construction schedule, Chevron may decide some work activities will be necessary at night. Because there are cost increase and logistics issues raised by performing work at night, plus additional worker safety considerations and precautions that must be taken, the decision to work at night is a significant one, and Chevron would only undertake work at night if absolutely necessary, and for only as long as necessary and in consultation with the City. Work would be limited to ensure minimal noise generation and lighting/glare potential. In the event that such night work would be performed for the Proposed Project, there would potentially be a minor and temporary increase in nighttime noise levels at the Refinery facility during the construction period. Noise from these construction activities would be more perceptible at night given the lower ambient noise levels at sensitive receptors during nighttime because noise levels during other construction phases would attenuate to levels lower than the ambient noise level during daytime, during nighttime, the attenuated noise level could still be perceptible at the local sensitive receptors. Although temporary in duration, this would be a potentially significant impact. Implementation of the following mitigation measures would reduce these impacts to a less than significant level.

For construction of the three replacement tank components between 700 and 1,400 feet from sensitive receptors (T-954, T-1451, and T-1504),³ there would be no pile driving activities required, the tanks would not be constructed at the same time, and tank construction would only be performed during daytime hours (See Section 3.4.3.5, *Replacement and New Tanks*). Some construction activities (such as excavation, or exterior finishing) at these tanks could also be potentially significant for short periods of time; however, the distances to sensitive receptors would have to be much closer - between 400 to 800 feet depending on the type of activity and the duration of the construction activity being conducted. Furthermore, a small hill, part of the Office Hill Tank Field, lies between the two closest tanks T-1451 and T-1504 and the nearest sensitive receptors in western Point Richmond. Because the exact duration phases of construction and types of equipment used for these phases is not known, this impact would be potentially significant without some mitigation. However implementation of Mitigation Measure 4.10-1b would reduce this potential impact to a less-than-significant level.

Chevron would require the contractor to implement the following mitigation measures throughout the duration of construction activity to reduce noise impacts of pile driving operations and other noise generating activities on nearby sensitive receptors:

Mitigation Measure 4.10-1a: Over the duration of pile driving activities, Chevron shall require the construction contractor to implement the following mitigation measures:

³ At approximately 700 feet, tank T-1451 is the closest to the nearest sensitive receptor.

- Pile driving activities shall be limited to daytime hours between 7 a.m. and 6 p.m. on weekdays. Pile driving shall be prohibited during weekends and on state and federal holidays.
- Chevron shall designate a construction compliance and complaint manager(s) for the project for the duration of the construction activities. The City of Richmond shall mail telephone contact information of the compliance and complaint manager(s) and designated City of Richmond staff to business persons and residents situated within the MFR-1 Multi-family Residential Zone and C-2 General Commercial Zone located North of Golden Gate Avenue.
- If pile driving takes place within 2500 feet of a residence or commercial site, Chevron and designated City of Richmond staff shall monitor sound levels at the multi-family residential and commercial sites to determine if pile driving activity causes the City's noise impact significance levels to be exceeded.
- If monitoring determines that pile driving causes the City's noise impact significance levels to be exceeded (65 dBA when measured at the MFR-1 Multi-family Residential Zone boundaries or within the boundaries of the MFR-1 Multi-family Residential Zone, 70 dBA for C-2 General Commercial) Chevron shall implement all feasible measures as needed to reduce the noise impacts from pile driving. These noise reducing measures may include: alternate methods of pile driving, pre-drilling of pile holes, the use of more than two pile drivers to significantly reduce the total time (as determined by the Planning Director) required for driving piles, erecting temporary plywood noise barriers that block the line of sight between the impact point of pile driving and nearby residential receptors, and other measures. If Chevron does not agree with the time-line determined by the Planning Director for significantly reducing pile driving noise the matter shall be resolved by the City Council.

Mitigation Measure 4.10-1b: Construction contractors shall be required to ensure that construction equipment is well tuned and maintained according to the manufacturer's specifications, and that the equipment's standard noise reduction devices are in good working order.

Significance after Mitigation: Given the distance separating the noise sources from the sensitive receptors, implementation of Mitigation Measures 4.10-1a and 4.10-1b would reduce impacts related to construction to a less than significant level.

Impact 4.10-2: Vibration from construction equipment could cause a temporary nuisance during construction. This would be a less than significant impact.

Construction activities from the Proposed Project would generate ground vibrations. Vibration from construction is caused by general equipment operations and is usually highest during pile driving, soil compacting, jack hammering and construction related demolition activities. While vibration may be sometimes noticeable outdoors, it is almost exclusively an indoor problem.

Although it is conceivable for ground-borne vibration from construction projects to cause building damage, the vibration from construction activities is almost never of sufficient amplitude to cause even minor cosmetic damage to buildings. The primary concern is that the vibration can be intrusive and annoying to building occupants.

Though transmission of vibration is highly dependent on the soil type at the construction site, the type of equipment used, and the structure of the building receptor, generally, construction vibration, even the levels generated by such activities as pile driving, attenuates to a level below the threshold of perception within 500 feet from the source. As discussed in Impact 4.10-1 above, the nearest sensitive receptors that could be affected by vibration from most Proposed Project's construction sites are situated approximately 2,500 feet to the south of the Refinery. The only exception being replacement tanks T-954, T-1451, and T-1504 are located approximately 700 to 1,400 feet west from the nearest sensitive receptors in western Point Richmond. Therefore, the impact of construction vibration from the Proposed Project on nearby sensitive receptors would be less than significant. Implementation of Mitigation Measures 4.10-1a and 4.10-1b would also serve to further reduce vibration impacts from construction activities.

Mitigation: None required.

Impact 4.10-3: Increased vehicle traffic to and from the Refinery during the construction period would increase ambient noise levels at receptors along the travel route. This would be a less than significant impact.

The traffic study for the Proposed Project analyzed impacts of project construction on the traffic conditions at nearby intersections (See Appendix C). Traffic conditions at eleven intersections in the area were studied for existing (2005), peak construction period (2008) with and without project construction traffic and cumulative (2025) conditions. During peak construction activity in 2008, traffic at the 11 analyzed intersections would increase by up to 68% over existing (2005) conditions.⁴ The maximum increase would occur at the intersection of Castro Street and I-580 westbound ramps during the morning peak hour. The increase in traffic over 2008 base conditions would be a maximum of 50% at the intersection of Richmond Parkway / Gertrude Avenue during the morning peak hour. Since, due to the logarithmic nature of sound, a doubling of traffic volume (100 percent increase) results in an increase of 3 dBA, and since the increase in traffic along all affected roadway segments would be less than 42 percent, the associated increase in noise levels would be well less than 3 dBA. For that reason, the change in roadside noise level due to project construction related traffic would not be perceptible over existing conditions. Therefore, this impact would be less than significant.

Mitigation: None required.

⁴ See Tables 4.16-6 and -7.

4.10.4.2 Operational Impacts

Impact 4.10-4: Operational noise from the equipment to be installed as part of the Proposed Project could increase noise levels at nearby noise receptors. This impact would be less than significant.

Operational activities associated with the Proposed Project that would generate noise primarily include the replacement of existing equipment and installation of additional noise-generating equipment that would be installed to modernize and optimize the operation of the Refinery. In the long-term (i.e., project buildout), the project operations would result in the creation of approximately 10 new jobs and therefore only a few additional employee trips to the Refinery would be generated. The estimated operational increase in the number of truck roundtrips per day is 15 trips for sulfur transport and 7 trips for oxygen transport, for a total of 22 trips. Since, due to the logarithmic nature of sound, a doubling of traffic volume (100 percent increase) results in an increase of 3 dBA, and since the increase in traffic along all affected roadway segments would be about 0.4 percent (See Section 4.16, *Transportation and Traffic*) this impact would be less than significant.

The Proposed Project would locate the new and modified process equipment within the process area of the Refinery and would not introduce new noise sources close to the perimeter of the site (i.e., closer to off-site sensitive receptors).

The types and numbers of equipment that would be installed at the Refinery as part of the Proposed Project are shown in Table 4.10-8. This equipment would be similar to units already in operation at the Refinery. Although the noise emission characteristics for the specific noise sources that would be constructed or modified are not available, it is expected that the new equipment would have noise characteristics similar to those of the existing equipment. Table 4.10-9 shows noise levels associated with the use of typical equipment, such as pumps, compressors, cooling fans, etc., used at a Refinery.

Generally, individual noise levels for most of the new and modified equipment to be installed as part of the Proposed Project would not exceed 85 dBA at three-feet from the source (Chevron, 2005). In some cases, achieving this level of sound at that distance would require that engineering controls (such as mufflers on heavy equipment exhausts or on air release valves) and administrative controls be implemented. Engineering controls would be installed on most noise generating equipment to reduce noise level to meet the overall OSHA worker exposure standards (85dBA averaged over an eight-hour period) on-site. Administrative controls are defined as changes in the work schedule or operations, which reduce noise exposure. If engineering solutions cannot reduce the noise, administrative controls such as increasing the distance between the noise source and the worker or rotation of jobs between workers in the high noise area should be used if possible. In cases where available engineering and administrative controls are not adequate to meet these standards, workers are required to wear hearing protection. Based on data provided by Chevron, the noisiest equipment has been assumed to generate noise levels of 105 dBA at 10-feet from the source (Chevron, 2005). A noise level of 105 dBA at 10 feet would

**TABLE 4.10-8
OPERATING EQUIPMENT TO BE INSTALLED AS PART OF THE PROJECT**

Type of Equipment	Number of Units	Horsepower Rating Per Unit
Hydrogen Plant		
PSA3 Feed/Tail Gas/SMR Feed compressors/Motors (3)	3	8500
ID Fan/Motor (2)	2	2000
FD Fan/Motor (2)	2	1000
HP BFW Pumps/Motors (4, 2 normally running)	4	1250
MP BFW Pumps/Motors (2)	2	750
Reformed Gas ACHX Motors (4 fans/ACHX; 8 total)	8	50
Cooling Water Pumps/Motors (2, 1 normally running)	2	1750
Glycol ACHX (1 Unit) 2 fans	2	15
Glycol Pumps/Motors (2, 1 running)	2	100
N ₂ Recirculation Compressor/Motor (1)	1	800
RPG Condensate Pumps (2, 1 running)	2	100
Cooling Tower (contains 3 fans)	3	150
Ammonia Pumps (2, 1 running)	2	50
Penthouse Blowers (4)	4	100
Steam Turbine Generator (1)	1	24,000
Reformer		
Products Condenser (16 fans)	16	30
First Stage Suction Drum (4 fans)	4	20
Recontact Cooler # 1 (6 fans)	6	30
Debutanizer Condenser (6 fans)	6	25
Recontact Cooler # 2 (6 fans)	6	40
Charge Pump	2	160
Separator Pumps	2	492
Debutanizer Overhead Pumps	2	25
Circulating Water Pumps	2	135
Recycle Compressor	1	15,000
First Stage Net Gas Compressor	1	15,000
Second Stage Net Gas Compressor	1	15,000
SCR-Induced Draft Fan	1	200
Regenerator		
Regeneration Blower	1	750
Cooler Blower	1	200
Lift Gas Blower	1	200
Fines Removal Blower	1	200
Air Dryer Package	1	0 (Note A)
Oxygen Stripper Overhead Condenser (2 fans)	2	20.5
Oxygen Stripper Bottoms Transfer Pump	1	20
Oxygen Stripper Feed Pump	1	90
Oxygen Stripper Reflux Pump	1	15
Cogeneration Unit		
Gas Turbine Package	1	73,000 (Note B)
Chiller Package	1	1,200
Cooling Water Pump	1	100
Relief/Blowdown Pump	1	10
Water Injection Forwarding Pumps (NOx Control –CTG)	2	10

TABLE 4.10-8 (continued)
OPERATING EQUIPMENT TO BE INSTALLED AS PART OF THE PROJECT

Type of Equipment	Number of Units	Horsepower Rating Per Unit
Cogeneration Unit (cont.)		
Chemical Injection Pumps	3	3
Ammonia Air Blower	2	10
Boiler Feed Water Pumps	2	1,250
Condensate Pumps	3	30
LPG Recirculation Pumps	2	15
Natural Gas Compressor	1	700
FCC Feed Hydrotreater		
TKC Charge Pumps (replacement)	1	5,000
TKC Charge Pumps	1	5,000 (NOTE C)
VGO Cold Feed Booster Pumps	2	250 (NOTE D)
Fractionator Bottoms Pumps	2	800
Fractionator Overhead Stripped Water Injection Pumps	2	2
Fractionator pump around pumps	2	200
Fractionator Reflux Drum Vapor Cooler (4 fans)	4	30
H2S Absorber Feed Cooler (4 fans)	4	30
TKC Recycle Compressor	1	5,000
Lean DEA Booster Pumps	2	2,200
Power Recover Turbine	1	930
New No. 6 H ₂ S Plant		
Lean DEA Transfer Pumps	2	700
Sour Water Pumps	2	5
Regenerator Reflux Pumps	2	20
Skimmed Oil Pump	1	5
Amine Sump Pump	1	20
Fresh Amine Transfer Pump	1	5
Makeup Amine Transfer Pump	1	5
Antifoam Injection Pump	1	10
DEA Fin-Fan Cooler	8	25
Regenerator Condenser Fin-Fan Cooler (8 fans)	1	120
Caustic Circulation Pump	2	20
Spent Caustic Loading Pump	1	11
Caustic Transfer Pump (FCC)	1	40 (Note D)
Existing SRU Area		
Degassing System Sulfur Pumps (No. 1 & 2 SRU)	2	20
Degassing System Sulfur Pumps (No. 3 SRU)	1	20 (Note D)
Sulfur Transfer Pump	1	15
Degassing System Steam Ejectors	3	9Note F)
SO ₂ Circulation Pumps	6	25 (Note D)
Condensate Pumps	2	25
High Pressure Boiler Feed Water Pumps	2	125 (Note E)
Low Pressure Boiler Feed Water Pumps	2	150 (Note E)
Sulfur Loading Rack Pumps	2	30 (Note D)
Sulfur Loading Rack Vent Gas Blower	1	10
Sulfur Loading Rack Caustic Scrubber Bottoms Pump	1	5
Sulfur Loading Rack Caustic Scrubber Feed Pump	1	5
Spare Air Blower (No. 3 SRU)	1	800

TABLE 4.10-8 (continued)
OPERATING EQUIPMENT TO BE INSTALLED AS PART OF THE PROJECT

Type of Equipment	Number of Units	Horsepower Rating Per Unit
SRU Sour Water Concentrator		
Sour Water Feed Pumps	2	75 (Note D)
Stripped Water Pumps	2	40 (Note D)

GENERAL NOTE: In most instances involving pumps with spares, only the pump or the spare would run at any one time.

NOTE A: The Air Package has no moving parts; noise only when operating.

NOTE B: The Gas Turbine would be housed within an enclosure. The noise level would be less than of equal to 85 dBA 3-ft outside.

NOTE C: Existing – no change.

NOTE D: Replace existing pump motor with larger motor.

NOTE E: Replace existing pump motor with smaller motors but add 1 motor.

NOTE F: Replace existing ejector with larger ejector. Ejector has no moving parts, noise when venting.

SOURCE: Chevron, 2007.

TABLE 4.10-9
TYPICAL NOISE LEVELS FROM INDUSTRIAL EQUIPMENT, dBA

Equipment	Horsepower	Noise Level at 3 feet	Noise Level at 2,500 feet
Pumps	<100	88–91	28–35
Pumps	400	94	34
Air Cooler	25	85	25
Cooler Fan	30	85	25
Compressor	60	97	39
Compressor	370	82 (50 feet)	48

SOURCE: Hoover and Keith, Noise Control for Buildings, manufacturing Plants, Equipment and Products, 1994.

attenuate to 57 dBA at 2,500 feet from the source, which is roughly the distance between the nearest residential receptors and the nearest Proposed Project noise source. This would be less than the standard in the noise ordinance for residential uses (See Table 4.10-3). As stated earlier, ambient noise level in the most affected residential area of Point Richmond was measured to be 71 dBA, DNL. Since the noise generated by the Proposed Project equipment would attenuate to less than 60 dBA at the receptors, this noise would not be audible over the existing noise at these receptors. Thus, no significant noise impacts would be expected during project operation.

In addition to the noise generated by the operation of new equipment, the Proposed Project could result in a slight increase in the frequency and magnitude of flaring events due to release from the Refinery relief and blowdown system. The Refinery relief and blowdown system provides a means for recovery of gases and liquids that are relieved by the process units to maintain safe operating pressures. Gases and liquids may flow through the relief and blowdown lines to accumulators and liquid knockout drums. The system is designed with a liquid seal and gas vapor recovery compressor to minimize flaring events. Typically, gases are recovered and used in the Refinery fuel gas system. Liquids are cooled and reprocessed. In the event the Refinery relief and

blowdown recovery system experiences a volume of gas vapor greater than 200,000 SCF/hr (capacity of the flare gas vapor recovery compressor) or non-routine unit depressurizing, the relief and blowdown recovery system would vent to the Refinery flare(s) for safe disposal of the gases. The noise generated during a flaring event can be attributed to three different mechanisms: 1) “Combustion Roar” that occurs as a flame oscillates from “shortage of air” to having “excess air”; 2) “Steam Turbulent Induced Noise” due to turbulence that occurs as the high pressure steam mixes with ambient air and 3) “Jet Noise” that occurs due to the turbulence as the gas jet exiting the burner mixes with the ambient air.. The controlling features in flare noise generation are the ability of the burner to provide continuous combustion air, the steam exit velocity and the gas exit velocity. Studies have measured noise levels of 80 dBA at a distance of approximately 170 meters (560 feet) from the base of the flare during (Dinn, 1998).

The frequency of these flaring events cannot be anticipated. The Refinery reported 268 occasions where flare gasses flowed to a flare in 2005 and 325 occasions in 2006. Of these flare events, only 26 in 2005 and 15 in 2006 required additional reporting to the BAAQMD. The difference in flaring events between 2005 and 2006 is primarily due to additional planned and controlled maintenance activities to help ensure the safe and reliable operation of the Refinery, and not unplanned process interruption. Most flaring events were minor in duration and size, and would likely have been imperceptible to the public. Between January 2005 through April 2007, only one noise complaint, on January 19, 2007 was reported to the Refinery (Piersante, 2007). The source of the noise was not determined, although the Chevron investigated the complaint and took noise readings in the requested area. The source could not be identified. As a precautionary measure Chevron reduced the LSFO flare flow rate.

There is no routine flaring during normal operation at the Refinery. The BAAQMD Regulation 12, Rule 12 (amended April 5, 2006) required Chevron to prepare and implement a Flare Minimization Plan (FMP) by August 1, 2006. The FMP defines a series of measures intended to reduce flaring to the extent that is feasible without compromising safety and necessary refinery operations and practices. The key tools utilized are planning to minimize flaring, coupled with evaluation of the cause of any flaring events that do occur. The FMP also examines the costs and benefits of potential equipment modifications to increase flare gas recovery (Chevron, 2007). The BAAQMD has recently (March 2007) released the FMP for public review and comment. See also Sections 4.1, *Aesthetics*, and 4.2, *Air Quality*, for further discussions of flaring.

The new Hydrogen Plant Proposed Project would include one new flare, approximately 195 feet tall that would be used for startup service and for temporary upset situations related to the feed system. The new flare would be located in the eastern portion of the Refinery, in the general vicinity of other Refinery flares.

The Proposed Project could result in minimal changes in flaring at the Refinery, which are short duration events. All Proposed Project facilities and equipment would be designed such that they would not add any load to the Refinery flare in the event of a Refinery-wide power failure. A Refinery-wide power failure is the limiting design case for the Refinery flares and related facilities (relief and blowdown systems). Therefore, though the Proposed Project would add a

new flare to the system, implementation of the new FMP at the Refinery would reduce flaring frequency and magnitude for the Refinery as a whole and the Proposed Project, and thus the resulting noise from flaring events, would be less than significant.

Mitigation: None required.

References – Noise

Bender, W. L., Report on Estimated Airblast and Blast-Related Vibration at the Lincoln Project, Placer County, California. Green Valley, AZ, 1996.

Caltrans, Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects, October 1998.

City of Richmond, Richmond General Plan, Volume One, August 1994.

Chevron, Response to ESA Data Request #1: Item N-1 – List of Noise-Producing Equipment, 2005.

Chevron. 2007. *Flare Minimization Plan*, Chevron Products Company – Richmond Refinery revised March 20, 2007.

Dinn, T. Effect of Flow Parameters on Flare Stack Generator Noise. Proceedings of the Alberta Energy and Utilities Board Conference, Banff, Alberta, Canada, April 1998.

Federal Transit Administration. Transit Noise and Vibration Impact Assessment. Washington, DC: U.S. Government Printing Office, 1995.

Federal Transit Administration (FTA). 2006. *Transit Noise and Vibration Impact Assessment*, May 2006.

Piersante, Mark, Personal Communication, May 7, 2007.

Transportation Research Board. *Dynamic Effects of Pile Installations on Adjacent Structures—A Synthesis of Highway Practice*. Washington, DC: U.S. Government Printing Office, 1997.

4.11 Population and Housing

The effects related to Population and Housing from the implementation of the Proposed Project would be less than significant:

- The Proposed Project would not displace existing housing or any existing population.
- The Proposed Project would not result in a substantial increase in population.

4.11.1 Introduction

This section sets forth existing regional and local employment, population, and housing conditions and analyzes potential direct and indirect impacts related to construction and operation of the Proposed Project.

4.11.2 Setting

4.11.2.1 Existing Conditions

Population Growth

From 1990 to 2000 the population of Richmond grew by 13 percent to a total of 99,216 (U.S. Census Bureau, 2006). This population increase was slightly lower than the 17 percent growth the City experienced in the previous decade. Richmond's steady population growth over the last 20 years resulted from intense residential development in the El Sobrante, Hilltop, Brickyard Cove, and Marina Bay planning areas. The growth rate in Richmond¹ from 1990 to 2000 was slightly lower than in Contra Costa County as a whole, which experienced an 18 percent increase during the decade. The project site is located within census tract 3780, which had a population of 2,895 in 2000 (U.S. Census Bureau, 2006).

ABAG projects that the population of the City of Richmond will grow from 100,500 in 2005 to 105,100 in 2015, an increase of 4.6 percent. ABAG projects a higher growth rate of about 8.5 percent for Contra Costa County during the same ten-year span (2005 – 2015), from 1,016,300 in 2005 to 1,102,300 in 2015. ABAG projects that the population of the City of Richmond will reach 119,900 (a 19.3 percent increase from 2005) and that the population of the County will increase to 1,244,800 (a 22.5% increase from 2005) by 2030 (ABAG, 2004).

¹ Richmond currently ranks as the third most populous city in Contra Costa County, behind Concord and Antioch. Increases in Richmond's current and anticipated population from 2000 through 2030 will likely remain steady. In absolute numbers, the current and anticipated population increases in Richmond total 19,400 persons between 2005 and 2030 (inclusive)

Household Size and Number

The average household size in Richmond in 2000 was 2.82 persons per household, which was slightly higher than the Contra Costa County average of 2.72 persons per household (U.S. Census Bureau, 2006). Average household size has increased in both Richmond and in Contra Costa County since 1990, when it was 2.63 and 2.64, respectively (U.S. Census Bureau, 2006).

There are currently approximately 35,280 households in the City of Richmond, and 368,770 households in Contra Costa County. ABAG projects a steady increase in the total number of households in the City of Richmond to 35,910 in 2010, 38,890 in 2020, and 42,800 in 2030 (ABAG, 2004).

Employment

During the early 1990s, Richmond, like much of the San Francisco Bay Area, experienced a decrease in overall employment due to a national economic recession and the closure of local military bases. As the local and regional economy strengthened toward the middle and end of the decade, the number of employed residents in Richmond increased by almost 9 percent from 1995 to 2000, and ABAG projected steady growth in the future. ABAG projects that the number of jobs in Richmond will increase from 39,290 in 2005 to 42,620 in 2010 (8.5 percent growth), 51,820 in 2020 (31.9 percent growth from 2005), and 61,090 in 2030 (55.5 percent growth from 2005). The number of jobs in Contra Costa County is expected to grow from 373,000 in 2005 to 406,010 in 2010 (9 percent growth), 472,830 in 2020 (26.8 percent growth from 2005), and 543,860 in 2030 (45.8 percent growth from 2005) (ABAG, 2004).

According to Census 2000, employed Richmond residents in 2000 totaled 42,769; 39 percent of whom worked within Contra Costa County. The Chevron Richmond Refinery currently employs approximately 1,170 full-time permanent employees and approximately 400 contract workers (Piersante, 2005).

The Proposed Project would result in the temporary employment of construction workers during the construction period. Richmond's General Plan Policy ED-A.8, which seeks to "[e]nhance Richmond's employment base by reducing the out-migration of Richmond's work force through providing professional-level employment opportunities, and creating employment opportunities for blue-collar workers..." would apply to the Proposed Project. The Proposed Project therefore presents employment opportunities, both in the construction and in the operation of the Proposed Project, for qualified applicants who are residents of Richmond.

4.11.2.2 Regulatory Setting

City of Richmond General Plan

Economic Development Element

The City of Richmond General Plan Economic Development Element provides a statement of the goals and policies of the City of Richmond relating to economic development. Economic

Development Element goals and policies that would be applicable to the Proposed Project include the following:

Goal ED-A: Maintain and increase the number of new permanent private sector jobs available to city residents; encourage new jobs with increased pay scales; alleviate unemployment and underemployment of residents.

Policy ED-A.1: Promote commercial and industrial development to create and maintain the maximum job opportunities for area residents.

Policy ED-A.8: Enhance Richmond's employment base by reducing the out-migration of Richmond's work force through providing professional-level employment opportunities, and creating employment opportunities for blue-collar workers impacted by plant closures.

Goal ED-G: Retain and encourage upgrading and expansion of existing industrial development.

Policy ED-H.1: Encourage and expedite the development of lands designated in the Land Use Element for industry, while recognizing the need for buffering adjacent commercial and residential uses.

(City of Richmond, 1994).

Growth Management Element

Adoption of the Growth Management Element of the City of Richmond General Plan reflects the City of Richmond's intent to establish a comprehensive, long-range program that will match the demands for public facilities generated by new development with plans, capital improvement programs, and development mitigation programs. Goals and policies that would be applicable to the Proposed Project include:

Goal GM-E: Provide a reasonable opportunity for people to live and work within a defined area which generally encompasses the City's sphere of influence (SOI).

Policy GM-E.1: Strive to maintain a jobs-housing balance² within the Planning Area as a method of potentially reducing commute trip lengths.

(City of Richmond, 1994)

4.11.3 Population and Housing Significance Criteria and Methodology

Significance Criteria

California Environmental Quality Act (CEQA) *Guidelines* Appendix G states that a project would have a significant agricultural resource-related impact if it would:

² A jobs-housing balance is a goal to be achieved by local governments to attain an equal number of jobs and housing units in their jurisdiction. The notion of balancing jobs and housing is quantitative as well as qualitative (jobs available in the community should also match the labor force's skills, and housing should be available at prices that workers in the area can afford). A jobs-housing balance is an integral part of smart growth planning and can reduce vehicle miles traveled, thus alleviating regional traffic congestion and air pollution. It can also improve the overall quality of life and efficiency of the community so more time can be spent at home or at work.

- 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;
- c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere.

CEQA Guidelines Appendix G topics that will not be discussed further in this EIR

Review and comparison of the Proposed Project to the environmental setting clearly shows that the Proposed Project would create no impacts related to the following environmental topics listed in CEQA Guidelines Appendix G.

- b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere;**

The Proposed Project would be constructed entirely on Refinery property. No housing would be displaced. There would be no impact.

- d) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere.**

The Proposed Project would be constructed entirely on Refinery property. No housing would be displaced. There would be no impact.

4.11.4 Population and Housing Impacts and Mitigation Measures

Impact 4.11-1: The Proposed Project could result in direct population growth within the City of Richmond. This would be a less than significant impact.

While the Proposed Project would result in the addition of only 10 new permanent jobs at the Refinery, project construction would require an average of 300 construction workers and up to 750 workers during a peak six-month period in 2007.

It is anticipated that the construction workforce would be drawn primarily from the construction labor pool available in Richmond and the rest of the Bay Area. All current Bay Area residents would be expected to commute rather than move. Therefore, that portion of the new construction jobs that would be filled by current Bay Area residents would have no impact on population or housing in Richmond. In addition, a fraction of the construction workforce would be drawn to the Bay Area on a temporary basis. Because it would be temporary and minimal given the total population of the area, this potential temporary population growth would be a less-than-significant impact, even if it all came to Richmond. It is expected that any workers that

temporarily relocate would prefer rental housing due to the temporary nature of the work. Given that the greater Bay Area had a housing vacancy rate of 6.8% in 2004, meaning that 179,588 units were unoccupied (ABAG, 2004), it is clear that housing would generally be available to meet the temporary increase in demand. Therefore, the impact on housing resulting from the temporary population increase would be less-than-significant.

The potentially significant effects on the environment of project construction, including traffic generated by construction workers commuting to the project sites, are analyzed in the other sections of Chapter 4 of this EIR.

Mitigation: None required.

References – Population and Housing

Association of Bay Area Governments (ABAG), 2004. *Projections 2005*, December 2004.

City of Richmond, 1994. *Volume One of the Richmond General Plan, Goals, Policies, Guidelines, Standards, and Implementation Programs*, August 1994.

Piersante, Mark, 2005. Chevron, personal communication, November 28, 2005.

U.S. Census Bureau, 2006. <http://factfinder.census.gov>, accessed October 6, 2006.

4.12 Public Health

Public exposure to toxic air contaminant (TAC) emissions can result in health risks. However, the incremental health risks from the Proposed Project fall below the criteria established by the BAAQMD for CEQA projects that emit toxic air contaminants (TACs). The public health effects related to the construction and operation of the Proposed Project would be less than significant.

- Construction activities from the Proposed Project would increase emissions of TACs, mainly from diesel-powered construction equipment and trucks throughout the construction period. The predicted offsite concentrations of TACs from construction emissions would be less than the BAAQMD CEQA significance thresholds and exposure to TACs from construction emissions would be a less than significant impact. No additional mitigation measures would be required.
- The operation of the Proposed Project would result in a less than significant cancer risk to workers and the public and would not cause any acute or chronic non-cancer hazard from TACs. The magnitudes of both these risks would fall below the significance thresholds. The health risks from the Proposed Project would therefore be less than significant. No additional mitigation measures would be required.

4.12.1 Introduction

This section evaluates the health risks from exposure to toxic air contaminants (TACs) related to the Proposed Project. Health risks would result from exposure to toxics, primarily from inhalation of airborne toxics that would be emitted as a result of the construction or operation of the Proposed Project.¹ The incremental risk of cancer and the hazard of other adverse health effects from exposure to non-carcinogenic substances emitted from the Proposed Project are reported.

The potential adverse public health effects associated with the Refinery are the carcinogenic or adverse non-carcinogenic health effects in the community from exposure to TACs, that are believed to have health impacts but for which there are no corresponding quantitative ambient air quality standards.

Some TACs are also included as part of the criteria pollutants: volatile organic compounds (VOCs) and particulate matter (PM). Benzene, formaldehyde, and toluene are TAC species that are also VOCs. TAC species that are contained in PM include toxic heavy metals, such as lead, cadmium, and mercury, as well as large organic molecules (e.g., polycyclic aromatic

¹ Although people can be exposed to toxic substances by other pathways, such as ingestion in food or drinking water or skin contact, for the Proposed Project the only substantive exposure pathway for members of the public would be by inhalation of gaseous or particulate emissions. For related discussions of other potential exposure pathways, see also Sections 4.3 *Air Quality*, 4.4 *Biological Resources*, 4.8 *Hydrology and Water Quality* and 4.13 *Public Safety*.

hydrocarbons) that are formed in the combustion process. TACs are generated by industrial processes such as petroleum refining, petrochemical manufacturing, electric utilities, and chrome plating operations, as well as commercial operations such as gasoline stations and dry cleaners. Motor vehicle exhaust is also an important source of TACs.

4.12.2 Setting

Existing TAC Concentrations

Ambient air levels of TACs are measured at several stations in the region by the Bay Area Air Quality Management District (BAAQMD). The monitoring station nearest to the Refinery is in Richmond. Table 4.12-1 summarizes measured concentrations of carcinogenic TACs for the year 2002, which is the most recent year for which certified data are available from BAAQMD.

These measured levels generally reflect TAC levels in the area, although there may be some higher levels close to ground-level sources of TACs. Table 4.12-1 also shows estimates of the carcinogenic health risks from lifetime exposure to these concentrations of TACs. The health risks were estimated by applying the cancer unit risk factor for that pollutant to the measured concentration of that pollutant.

The Unit Risk Values were established by the California Office of Environmental Health Hazard Assessment (OEHHA). The total risk at the Richmond monitor is estimated to be 166 in a million. A large portion of the cancer risk is due to benzene and 1,3 butadiene which are emitted principally from motor vehicles. These risks are essentially identical to the Bay Area average of 162 in a million (BAAQMD, 2004). The TAC concentrations and the cancer and non-cancer health risks are relatively uniform for all of the BAAQMD stations that ring the Bay.

The BAAQMD reports that there has been a decline in cancer risk in the Bay Area region over the last decade, mainly because of the decline in the ambient benzene levels with the advent of CARB Phase 2 reformulated gasolines. Phase 2 gasolines have considerably lower concentrations of benzene and other related aromatic compounds. As a result, the calculated cancer risk of 162 in one million for the region is about 45% lower than the risk that was estimated in the mid-1990s.

However, the risks shown in Table 4.12-1 for Richmond, and within the larger Bay Area do not include all of the entire general risk to the public from airborne TACs, mainly because an important TAC, diesel particulate matter (DPM), is not included. DPM is a mixture of over 30 different toxic chemicals, and data for only a portion, mainly polycyclic aromatic hydrocarbons (PAHs), is measured by the California Air Resources Board (CARB) at some air quality monitoring stations. Measurements of PAHs have not been taken at the Richmond monitor station since 1997. CARB has estimated statewide levels of DPM by relying on measurements of surrogate substances, such as carbon black, that are related to diesel exhaust. From these statewide measurements, CARB has determined that risks from exposure to DPM make up about 70% of the total risks from TACs (BAAQMD, 2004). Applying this factor to the Bay Area values above yields a combined cancer risk estimate of approximately 540 in a million.

**TABLE 4.12-1
AVERAGE AMBIENT CONCENTRATIONS OF CARCINOGENIC TACS MEASURED AT BAAQMD
MONITORING STATION, 1065 7TH STREET, RICHMOND**

Compound	Concentration		Unit Risk ^a (µg/m ³) ⁻¹	Cancer Risk (per million)
	(ppb) ^b	(µg/m ³) ^b		
Gaseous TACs ^c				
Acetaldehyde	0.74	1.15	2.2 x 10 ⁻⁶	3.1
Benzene	0.44	1.41	2.9 x 10 ⁻⁵	40.8
1,3-Butadiene	0.1	0.22	1.7 x 10 ⁻⁴	37.6
<i>para</i> -Dichlorobenzene	0.15	0.90	1.1 x 10 ⁻⁵	9.9
Carbon Tetrachloride	0.11	0.69	4.2 x 10 ⁻⁵	29.1
Ethylene dibromide	0.01	0.08	7.1 x 10 ⁻⁵	5.5
Ethylene dichloride	0.05	0.20	2.1 x 10 ⁻⁵	4.2
Formaldehyde	2.22	2.7 3	6.0 x 10 ⁻⁶	16.4
Perchloroethylene	0.06	0.41	5.9 x 10 ⁻⁶	2.4
Methylene Chloride	0.27	0.94	1.0 x 10 ⁻⁶	0.9
MTBE	0.61	2.20	2.6 x 10 ⁻⁷	0.6
Chloroform	0.02	0.10	5.3 x 10 ⁻⁶	0.5
Trichloroethylene	0.04	0.21	2.0 x 10 ⁻⁶	0.4
Particulate TACs ^c	(ng/m ³) ^b	(µg/m ³) ^b		
Chromium (Hexavalent)	0.10	1.00 x 10 ⁻⁴	0.15	15.0
Total Risk for All TACs				166.4

^a Unit Risk is the probability of contracting cancer if one is constantly exposed to an average concentration of one microgram per cubic meter of the specific substance. Multiplying the Unit Risk of a compound by its concentration in micrograms per cubic meter gives its cancer risk per million. These Unit Risk values are from the California Office of Environmental Health Hazard Assessment (OEHHA).

^b ppb is part per billion; ($\mu\text{g}/\text{m}^3$) is microgram per cubic meter or millionth of a gram per cubic meter; (ng/m^3) is nanogram per cubic meter or billionth of a gram per cubic meter

^c All values are from BAAQMD 2002 monitoring data for the Richmond station (BAAQMD, 2004), except those in **bold**, which were not measured at Richmond. The values in **bold** are the 2002 averages of the CARB monitoring sites in San Francisco, San Jose, Fremont, San Pablo, and Concord. In calculating average concentrations, samples less than the limits of detection (LOD) were assumed to be equal to one-half of the LOD. Risks are calculated for the carcinogenic TACs for which routine sampling was performed by the BAAQMD and CARB.

Two other groups of TACs that have not been routinely monitored in ambient air are polychlorinated dioxins and furans, which are referred to collectively as dioxins. Monitoring of dioxins began in 2001 at stations in Crockett, Livermore, Oakland, Richmond, San Jose, and San Francisco. Based on monitoring data gathered during 2002, the calculated inhalation cancer risk associated with dioxin exposure in the Bay Area (using the OEHHA cancer potency factor) is about one in one million.

Regulatory Setting

TACs are regulated under both state and federal laws. Federal laws use the term “Hazardous Air Pollutants” (HAPs) to refer to the same types of compounds that are referred to as TACs under

State law. Both terms encompass essentially the same compounds. Under the 1990 Clean Air Act Amendments, approximately 190 substances are regulated as HAPs.

With respect to State law, in 1983 the California legislature adopted Assembly Bill 1807 (AB 1807), which establishes a process for identifying toxic air contaminants and provides the authority for developing retrofit air toxics control measures on a statewide basis. Air toxics in California may also be regulated because of another state law, the Air Toxics “Hot Spots” Information and Assessment Act of 1987, or Assembly Bill 2588 (AB 2588). Under AB 2588, TACs from individual facilities must be quantified and reported to the local air pollution control agency. The facilities are then prioritized by the local agencies based on the quantity and toxicity of these emissions, and on their proximity to areas where the public may be exposed. High priority facilities are required to perform a health risk assessment, and if specific risk thresholds are exceeded, they are required to communicate the results to the public in the form of notices and public meetings. Depending on the health risk levels, emitting facilities can be required to implement varying levels of risk reduction measures.

BAAQMD is responsible for administering Federal and State regulations related to TACs. Under Federal law, these regulations include National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technology (MACT) for affected sources. BAAQMD also administers the state regulations AB1807 and AB 2588 which were discussed above. In addition, the Agency requires that new or modified facilities that emit TACs perform air toxics screening analyses as part of the permit application. TAC emissions from new and modified sources are limited through the air toxics new source review program, which superseded the BAAQMD Risk Management Policy, in BAAQMD Regulation 2, Rule 5 for New Source Review of Toxic Air Contaminants. Sources must use the Best Available Control Technology for Toxics (T-BACT) if an individual source cancer risk of greater than 1 in a million or a chronic hazard index greater than 0.20 is identified in health risk modeling.

4.12.3 Public Health Significance Criteria and Methodology

Significance Criteria

The significance criteria for this analysis were developed from the first of the eight criterion presented in California Environmental Quality Act (CEQA) Guidelines Appendix G, Section VII Hazards and Hazardous Materials. The significance of health risks from the Proposed Project depends upon the increased likelihood of contracting cancer from exposure to the TACs or of having adverse health effects from exposure to noncarcinogenic TACs.

Cancer Health Risk

Cancer risk is defined as the probability of developing cancer from exposure to carcinogenic substances over a lifetime. Cancer risks are expressed as increased chances *in one million* of contracting cancer, and it often incorporates more than one exposure pathway (i.e., inhalation, dermal contact, ingestion of contaminated soil, and infant ingestion of breast milk due to the

mother's cumulative exposure). Overall cancer risks are determined by summing the individual risk for each pathway and for each TAC.

The significance threshold for the maximum lifetime cancer risk has been established by several regulations and agencies to be 10 in one million. This includes the regulation under AB 2588, as well as Proposition 65, both of which require public notification if the incremental risk equals or exceeds 10 in one million. BAAQMD CEQA Guidelines also recommend that the cancer risk significance threshold for a project be 10 in a million. This criterion is expressed as:

- a.1) Create a cancer risk of 10 in a million to the public from TACs from the Project.

Non-Cancer Health Risk

Non-cancer adverse health risk, both for acute (short-term) and chronic (long-term) risk, is measured against a hazard index, which is defined as the ratio of the predicted incremental exposure concentration from the Proposed Project to a published threshold concentration level that could cause adverse health effects, which are established by OEHHA. The ratio (referred to as the Hazard Quotient) of each non-carcinogenic substance that affects a certain organ system is added to produce an overall Hazard Index for that organ system. Overall Hazard Indices are calculated for each organ system. If the overall Hazard Index for the highest-impacted organ system is greater than one, then the impact is considered to be significant. The significance threshold of an HI greater than one is defined as the significance thresholds in the BAAQMD CEQA Guidelines and is the threshold value that requires public notification in the AB 2588 regulation and in Proposition 65. This criterion is expressed as:

- a.2) Create a Hazard Index greater than 1.0 from public exposure to TACs from the Project.

4.12.3.2 Methodology

Health risks from the Proposed Project were determined by first calculating the changes in TAC emissions from the Refinery as a result of the Proposed Project and then by comparing the emissions changes to the Trigger Levels established by BAAQMD. If the emission estimates exceeded the Trigger Levels, then the emissions were incorporated into a dispersion model to determine the incremental offsite TAC concentrations and corresponding health risks. The results of this health risk assessment were then compared to the significance thresholds for cancer and non-cancer health indexes discussed above. Emissions were calculated by ENSR Corporation, submitted to BAAQMD for review and modified after consultation with BAAQMD. The dispersion modeling and estimation of health risks was conducted by the BAAQMD following a protocol that satisfies the analysis requirements of CEQA and BAAQMD Regulation 2, Rule 5 for New Source Review of Toxic Air Contaminants. The emissions calculations and health risk modeling were reviewed in detail prior to including those results in the EIR.

4.12.4 Public Health Impacts

4.12.4.1 Construction Impacts

Impact 4.12-1: Construction activities from the Proposed Project would increase emissions of TACs, mainly from diesel-powered construction equipment and trucks. The predicted offsite concentrations of TACs from construction emissions would be less than the CEQA significance thresholds and for that reason, exposure to TACs from construction emissions would be a less than significant impact.

TAC emissions during construction consist of DPM, mainly from construction equipment and trucks that are involved in construction activities. Table 4.16-3 of Section 4.16, *Transportation and Traffic*, reports that construction-related truck traffic would peak in the first quarter of 2008. The daily average truck trips during the peak year of construction is estimated to be 114 trips per day. DPM exhaust emissions were calculated for trucks traveling to and from the Refinery during the peak construction year using the CARB emission model EMFAC 2002. These emissions were input to the EPA screening model (i.e., SCREEN3) to calculate possible worst-case offsite concentrations at offsite receptors. The maximum predicted incremental carcinogenic health risk at offsite receptors from diesel construction equipment was estimated to be about one in a million, and the maximum chronic hazard index was estimated to be less than 0.002. The estimate for maximum carcinogenic risk was made according to BAAQMD requirements where it is assumed that construction would continue over a 70-year period, even though construction emissions from this project would be temporary. As a result, the predicted impacts from construction are likely to be overestimated by a substantial margin. Actual risks would be considerably lower and would be less than significant.

Mitigation: None required.

4.12.4.2 Operational Impacts

Impact 4.12-2: Public exposure to toxic air contaminant emissions from the Proposed Project would result in an increase in health risks. The increases in health risks would result from exposure to carcinogenic and non-carcinogenic substances emitted during the operation of the Proposed Project. The cancer risk and non-cancer hazards fall below the significance thresholds. The increases in health risks from the Proposed Project would therefore be less than significant.

TAC emissions from the Proposed Project under operations would occur as a result of the operation of new equipment and facilities. In addition, TAC emissions reductions would occur from shutdown and modifications of existing Refinery facilities. It is the net change in emissions from the overall Refinery that would result in offsite impacts.

TAC Emissions from Combustion

TAC emissions were calculated by combining the operating parameters and fuel usage for the particular equipment with published TAC emission factors. The emission factors, or rates at which emissions would occur, were obtained from a report, *Air Toxic Emission Factors for Combustion Sources Using Petroleum Based Fuels, Final Report, Vol. II*, published by Energy and Environmental Research Corporation (EERC, 1998). The net emission changes of TACs at the Refinery from the combustion operations as a result of the Proposed Project are summarized in Table 4.12-2. That Table also shows the BAAQMD specified Trigger Levels which, if exceeded, would require that health risks be estimated at offsite receptors. These Trigger Levels were defined by BAAQMD at very low levels to ensure that, even under worst case meteorological conditions and short receptor distances, offsite impacts from all pollutants below the trigger levels would not exceed significance levels. Table 4.12-2 shows that several pollutants would exceed the Trigger Levels, and a Health Risk Assessment of the changed emissions was carried out to determine the offsite impacts to Public Health.

Fugitive Emissions of TACs

Fugitive emissions from the Proposed Project would result mainly from leakage from valves, flanges, pump seals, and compressor seals related to the Proposed Project. The TACs included in those fugitive emissions would include mainly toxic substances that occur in hydrocarbons associated with the new units. Fugitives would also include ammonia and hydrogen sulfides associated with the leakage from components related to the Proposed Project. The new sources are the Hydrogen Plant replacement, the Catalytic Reformer Replacement, the Power Plant replacement, and Hydrogen Purity Improvements. Fugitive emissions from these new processes would be netted against those fugitive emissions reductions that would result from shutting down the existing Hydrogen Plant, the existing No. 4 and No. 5 Rheniformers, and the existing Number One Power Plant.

Section 4.2, *Air Quality*, describes and discusses fugitive emissions that would occur under the operation of the Proposed Project. As noted above, TACs are associated with VOCs, and TAC emissions occur roughly in proportion to these fugitive emissions. A brief description of the effects that these fugitive emissions changes have on TAC emissions from the Project is given below:

Hydrogen Plant Replacement – With the replacement of the Hydrogen Plant, VOCs in fugitive emissions would be reduced by the replacement of older units. In addition, there would be no major changes in the composition of gases in the stream with the Hydrogen Plant replacement. Hence, it is expected that Hydrogen Plant replacement would reduce emissions of TACs.

Catalytic Reformer Replacement – With the replacement of the reformer, fugitive VOC emissions would be reduced because valves and flanges would be replaced with newer equipment. Also, since there would be no major change in the composition of gases in the stream, there would be no increases in emissions of TACs and it is expected that replacement of the reformer would reduce emissions of TACs.

TABLE 4.12-2
NET TAC EMISSIONS FROM COMBUSTION SOURCES RELATED TO THE RENEWAL PROJECT

TAC	Emissions, lb/yr Total Project Net	BAAQMD Toxic Risk Screen Trigger Level, lb/yr	Toxic Risk Screen Triggered? Y/N
Acetaldehyde	2.67E+02	7.20E+01	Yes
Ammonia @ 5 ppm slip	3.92E+04	1.90E+04	Yes
Ammonia @ 10 ppm slip	7.84E+04	1.90E+04	Yes
Arsenic	1.48E+01	2.50E-02	Yes
Benzene	4.77E+02	6.70E+00	Yes
Benzo(a)pyrene	1.56E+00	4.40E-02	Yes
Benzo(b)fluoranthene	7.06E-07	4.40E-02	No
Benzo(k)fluoranthene	4.21E-01	4.40E-02	Yes
Beryllium	0.00E+00	4.40E-02	No
1,3-Butadiene	-3.78E+01	1.10E+00	No
Cadmium	1.73E+01	4.60E-02	Yes
Chromium (hexavalent)	0.00E+00	1.30E-03	No
Copper	7.35E+01	4.6E+02	No
Dibenz(a,h)anthracene	0.00E+00	4.4E-02	No
Formaldehyde	1.94E+03	3.3E+01	Yes
n-Hexane	-4.05E+02	8.3E+04	No
Hydrogen sulfide	2.97E+01	8.1E+03	No
Indeno (1,2,3-cd)pyrene	1.80E+00	4.4E-02	Yes
Lead	8.54E+01	1.6E-01	Yes
Manganese	1.19E+02	7.7E+01	Yes
Mercury	3.14E+00	5.8E+01	No
Methanol	-1.26E+00	1.2E+05	No
Naphthalene	-0.382E+1	2.7E+02	No
Nickel	1.65E+02	7.3E-01	Yes
Phenol	9.53E+01	8.7E+03	No
Phosphorus	0.00E+00	1.4E+01	No
Selenium	3.42E-01	9.7E+01	No
Styrene	-1.43E+01	1.4E+05	No
Toluene	-3.74E+02	3.9E+04	No
Xylenes	-1.65E+03	5.8E+04	No
Zinc	3.63E+02	6.8E+03	No

SOURCE: BAAQMD Permit Application, Chevron Renewal Project, 2005.

Power Plant Replacement – The existing and replacement power plants use mainly natural gas and Refinery fuel gas in their fuel streams with each stream containing very small concentrations of TACs. Thus, a change in units would not significantly increase TAC emissions from the Power

Plant replacement. However, additional amounts of ammonia, a TAC, would be stored and used to control NO_x emissions from the replacement power plant units. The ammonia emissions from this process would occur because some ammonia escapes without reacting with the NO_x; this unreacted ammonia is referred to as “ammonia slip”. Typical ammonia concentrations in exhaust, from ammonia slip, range from 5 ppm to 10 ppm. Based on the expected ammonia injection rate for the new units, the estimated ammonia slip emissions from the new unit would be 25 to 50 tons per year. This estimated range exceeds the BAAQMD Trigger Level of 9.5 tons per year. Therefore, the health risks from exposure to ammonia at offsite receptors were evaluated.

Hydrogen Purity Improvements – The principal TAC associated with the hydrogen stream is hydrogen sulfide, H₂S. The Proposed Project would require the addition of an Amine Absorber to remove gaseous H₂S from the stream and bind it in the amine solution. Consequently there would be less H₂S gas available to be released as a fugitive emission. Although there would be additional equipment for handling the H₂S feed to the sulfur recovery units allowing for more fugitive emissions, the concentration of hydrogen sulfide in the gas stream would be lower due to the removal of H₂S gas by the new amine unit. Consequently, there would be no increase in fugitive H₂S emissions.

New and Replacement Tanks – The Proposed Project would also include new and replacement tanks. These tanks, along with the Refinery streams obtained from Chevron are identified below:

Tank ID	Tank Description	Stream
Tank T-298	Sour Water Replacement	Recovered Oil
Tank T-3108	Gas Oil	Alaska North Slope Crude
Tank T-4005	Gas Oil	Alaska North Slope Crude
Tank T-4004	Diesel	Diesel
Tank T-398	TKN Feed Replacement	Diesel, Hydrodesulfurization
Tank T-954	Gasoline Tank	Gasoline, Conventional
Tank T-4006	Gas Oil Swing Tank	Alaska North Slope Crude
Tank T-4007	HCO Spare/Swing Tank	Heavy Vacuum Gas Oil
Tank T-4008	DAO	Hydrocracker Feed
Tank T-4009	DHT	Diesel
Tank T-3228	CCR Reformate	Reformate
Tank T-4012	HNC Gas Oil	Alaska North Slope Crude

Tank Emissions

Emissions of individual TACs for the tanks were estimated by Environmental Resource Management (ERM, 2006) for the DEIR. These emissions were estimated by multiplying the total VOC emissions per tank by either the liquid mass fraction (w_i) or the vapor mass fraction (v_i) of each TAC in each applicable refinery stream, following the equation below:

$$TAC_i = VOC_T \times [w_i \text{ or } v_i]$$

$$v_i = [(VP_i)/(VP_{mix})] \times [w_i] \times [(MW_{liq})/(MW_{vap})]$$

where,

TAC_i = emissions of an individual TAC from a given tank
VOC_T = total VOC emissions from the given tank
VP_i = vapor pressure of pure TAC_i
VP_{mix} = vapor pressure of the mixture in the given tank
MW_{liq} = liquid-phase molecular weight of the mixture in the given tank
MW_{vap} = vapor-phase molecular weight of the mixture in the given tank

Values for w_i were taken directly from the PERF 04-05 Refinery Stream Speciation, provided by Chevron. For the calculation of v_i (using the above equations derived from Raoult's Law), values for VP_i, VP_{mix}, MW_{liq}, and MW_{vap} were also supplied by Chevron for the Refinery Stream Speciation. The exceptions to the above were the following values:

Recovered Oil: VP_{mix} = 5.8 psia MW_{vap} = 48
Reformate: VP_{mix} = 11.0 psia MW_{vap} = 60

For fixed roof tanks, vapor mass fractions (v_i) were used to speciate TACs, since TACs would come from displaced vapor space. For internal or external floating roof tanks, liquid mass fractions (w_i) would apply to withdrawal losses due to evaporation of liquid from the tank wall as the roof slides, but vapor mass fractions (v_i) would also apply to rim seal and deck fitting losses since these would be released from vapor spaces in equilibrium with the liquid, consistent with the EPA TANKS model. Since VOC emissions supplied by Chevron were total, the split between the withdrawal versus other losses per tank was estimated. Benzene and naphthalene were the first and second most important contributors, respectively, to cancer risk estimates. Therefore, when benzene was present in the refinery stream, the phase (liquid or vapor) with higher mass fraction of benzene was selected for multiplication with the total VOC. When benzene was not present, naphthalene was, so the phase with the higher naphthalene mass fraction was used (which, in all these cases, was the liquid phase due to the low volatility of naphthalene). The estimated TAC emissions per tank are summarized in Table 4.12-3. Also, see Appendix F.

Other TAC Emission Sources

Dioxins and other chlorinated compounds would form in the new Continuous Catalyst Regeneration (CCR) Reformer and could be released to the environment. To prevent this, Chevron would install the Chlorsorb process to capture any chlorinated compounds that would form from the catalyst generation and to add a catalyst filter on the CCR Reformer gas vent. The Chlorsorb process would reduce the release of the chlorine to the catalyst regeneration operation, thus reducing the amount of fresh chloride agent that would be needed for the process and reducing the amount of chlorinated compounds that could be released. In addition, the catalytic filtration system would control any dioxin emissions that would be released downstream of the Chlorsorb unit.

The supplier of the control unit specifies that dioxin emission concentrations from the vent gas would be less than 0.05 ng/m³ of exhaust gas. Based on the expected flow rate from the unit, the maximum annual emissions of dioxins would be 3.73 X 10⁻⁵ lb/yr. The BAAQMD prepared a Health Risk Screening Assessment (HRSA) for the proposed project, and included these dioxin emissions with the other TAC emissions

**TABLE 4.12-3
SUMMARY OF TAC EMISSIONS FROM TANKS**

	T-298	T-3108	T-4005	T-4004	T-398	T-954	T-4006	T-4007	T-4008	T-4009	T-3228	T-4012
Chemical	Sour Water	Gas Oil	Gas Oil	Diesel	TKN Feed Tank	Gasoline	Gas Oil Swing	HCO Spare / Swing	DAO Production	DHT	CCR	Gas Oil
Benzene	4.25E-06	1.13E-04	1.13E-04	0.00E+00	0.00E+00	2.23E-03	4.51E-05	0.00E+00	0.00E+00	0.00E+00	1.06E-02	1.80E-03
Cresols	3.42E-07	0.00E+00	0.00E+00	2.08E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.31E-06	0.00E+00	0.00E+00
Cumene	5.84E-07	0.00E+00	0.00E+00	2.00E-05	8.05E-07	2.59E-04	0.00E+00	0.00E+00	0.00E+00	2.07E-06	5.28E-04	0.00E+00
Ethylbenzene	4.68E-06	6.83E-06	6.83E-06	4.71E-05	8.63E-07	1.60E-03	2.73E-06	1.15E-06	0.00E+00	2.50E-06	7.55E-03	1.09E-04
Methanol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.47E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
n-Hexane	1.44E-04	1.69E-04	1.69E-04	3.30E-04	0.00E+00	2.31E-03	6.75E-05	0.00E+00	0.00E+00	1.38E-06	4.99E-03	2.70E-03
Naphthalene	3.23E-08	7.78E-08	7.78E-08	7.07E-06	6.04E-06	5.23E-04	3.11E-08	1.15E-06	2.24E-06	1.47E-05	6.90E-04	1.24E-06
Phenol	2.93E-08	0.00E+00	0.00E+00	2.16E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E-05	0.00E+00	0.00E+00
Styrene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.47E-04	0.00E+00
1,2,4-Trimethylbenzene	8.99E-07	1.93E-06	1.93E-06	8.42E-05	3.62E-06	3.66E-03	7.71E-07	1.73E-06	0.00E+00	1.94E-05	8.58E-03	3.08E-05
2,2,4-Trimethylpentane	9.10E-06	0.00E+00	0.00E+00	8.54E-05	0.00E+00	3.39E-03	0.00E+00	0.00E+00	0.00E+00	1.04E-06	0.00E+00	0.00E+00
Toluene	5.42E-05	7.76E-05	7.76E-05	2.14E-04	1.84E-06	9.06E-03	3.10E-05	1.44E-05	0.00E+00	4.31E-06	3.65E-02	1.24E-03
Xylenes	1.79E-05	2.22E-05	2.22E-05	1.73E-04	2.93E-06	8.48E-03	8.87E-06	4.03E-06	1.27E-06	1.05E-05	3.73E-02	3.55E-04
Ethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.78E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Propane	5.35E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.01E-05	0.00E+00	6.33E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Propylene	6.75E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Butane	3.93E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.06E-03	0.00E+00	2.88E-06	0.00E+00	0.00E+00	2.03E-04	0.00E+00
Cyclohexane	1.61E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

The regenerator vent gas would also contain hydrogen chloride and chlorine, both TACs. The estimated emissions of hydrogen chloride are 9,876 lbs/yr, and for chlorine, the estimated emissions are 1420 lbs/yr. The estimated hydrogen chloride emissions exceed the BAAQMD Trigger Level of 1,400 lbs/yr. Since hydrogen chloride emissions would exceed the Trigger Level, they have the potential to materially increase the health risk that would result from the Proposed Project. The offsite impacts are addressed in the Health Impacts Section below.

Health Risk Impacts From TAC Emissions

The incremental carcinogenic and non-carcinogenic health risks from the Proposed Project were determined through dispersion modeling of the Proposed Project TAC emissions and applying OEHHA toxicity factors to the predicted TAC concentrations. For all stationary sources related to the Proposed Project, except for the proposed new tanks, the health risks were modeled by BAAQMD in a Health Risk Screening Analysis as required by Regulation 2, Rule 5 for New Source Review of Toxic Air Contaminants. The ISCST3 model was used, along with the ARB model HARP to calculate chronic and acute risks. Five years of meteorological data and rural dispersion coefficients were used in the modeling. Results of the health risk assessment are summarized in Table 4.12-4. The table shows that the Proposed Project's maximum incremental cancer risk, estimated to be 2.8 in a million, would occur northeast of the plant in the leased quarry property, where there are no actual receptors – workers or residents.

**TABLE 4.12-4
SUMMARY OF INCREMENTAL HEALTH RISKS FROM OPERATION OF THE PROPOSED ENERGY
AND RENEWAL PROJECT^a**

Type of Estimated Health Impact	Cancer Risk (per million)	Chronic Hazard Index	Acute Hazard Index
Maximum Exposed Individual Worker	0.6	0.05	-
Maximum Offsite Impact (Residence)	Negative values	0.08	0.4
Maximum Offsite Impact (Nonresidence) ^a	2.8	0.18	0.5

^a Does not include impacts from new storage tanks

^b There are no residences or sensitive receptors at this location.

SOURCE: Modeling performed by BAAQMD in June 2006. See Appendix F.

Table 4.12-4 shows that the maximum incremental cancer risk for workers adjacent to the Refinery would be estimated to be 0.6 in a million. Finally, Table 4.12-3 also shows that there would be a reduction in the incremental cancer risks at the residential locations that surround the Refinery. Table 4.12-4 also shows that the maximum non-carcinogenic hazard index would be 0.09 and the maximum acute hazard index would be 0.4. Since these hazard indices would be less than 1.0, the Proposed Project's acute and chronic health impacts would be less than significant. In addition, the modeled 30-day average lead ambient air concentrations from the Proposed Project would be 0.0017 µg/m³ for a non-residential location, and 0.00005 µg/m³ for a residential location. These levels are extremely low and are well below the level that could result in increasing the percentage of children at or above the blood lead level significance threshold of 10 µg/dl.

The HRA modeling done by BAAQMD did not include proposed new tanks from the Proposed Project. Health risk modeling of the new tanks was conducted by ERM using the ISCST3 model to supplement the HRA from BAAQMD. The maximum incremental lifetime cancer risk from the proposed new and replacement tanks was calculated to be 1.26 in one million. The chronic noncancer hazard index was estimated to be 0.0018, and the acute noncancer hazard index was estimated to be 0.0027.

Although the location of the maximum impact from the BAAQMD analysis was not the same as the location of the maximum impact from the additional tanks analysis (See Figure 4.12-1), a conservative estimate of the worst-case impact would be obtained by adding these two maxima. For cancer impacts, this sum would be 4.06 in a million, which is well below the CEQA significance threshold of 10 in a million. In addition the acute and chronic hazard indices for the combined impacts would be well below the hazard index significance threshold of 1.0. Thus, the impacts would be less than significant. Figure 4.12-1 shows the locations of the maximum cancer risk predictions from the two health risk analyses.

In addition to the TAC emissions from project stationary sources described above, DPM emissions related to the Proposed Project would occur from diesel trucks delivering product to and from the Refinery. The Traffic Section of the DEIR reports that there would be a total of 34 additional trucks per day from the Proposed Project, including 20 trucks transporting liquid sulfur from the facility and 14 trucks delivering liquid oxygen to the site. DPM emissions from these trucks would occur only when the trucks are entering and leaving the site, because their engines would be turned off when unloading product. DPM emissions from the additional truck traffic entering and leaving the Proposed Project site, estimated from the ARB Emissions model EMFAC2002, are very small (0.005 lb/day). The incremental cancer risk at offsite receptors would therefore be very small, well below 0.1 in a million, and also less than significant. Total daily DPM emissions are estimated to be very small (0.005 lb/day).

Mitigation: None required.

References – Public Health

Bay Area Air Quality Management District, *Toxic Air Contaminant Control Program: Annual Report 2002*, December 2004.

Bay Area Air Quality Management District, *EIR Health Risk Screening Analysis, Chevron Products Company, Energy Plant and Hydrogen Plant Renewal Project*, June 27, 2006.

California Air Resources Board, *HARP User Guide*, December 2003.

Chevron, *Authority to Construct and Permit to Operate Application for Chevron Richmond Renewal Project*, June 17, 2005 and supplements. Final supplement received April 18, 2007.

Environmental Resources Management (ERM), *Screening-Level Health Risk Assessment for Proposed New and Replacement Tanks*, Report to Chevron, July 21, 2006.

Energy and Environmental Research Corporation (EERC), *Air Toxic Emission Factors for Combustion Sources Using Petroleum Based Fuels, Final Report, Vol. II*, August 14, 1998.



SOURCE: Environmental Resource Management, July 21, 2006

Chevron Energy and Hydrogen Renewal Project . 205166

Figure 4.12-1
Maximum Cancer Risk Locations
Chevron Richmond Refinery

4.13 Public Safety

The risks to Public Safety from the implementation of the Proposed Project were evaluated in the context of possible accidental releases of acutely hazardous substances, explosion or fire.

- As long as the Proposed Project components are designed to applicable codes and industry guidelines, and as long as the facility operators maintain the strict safety practices required by the California Accidental Release Prevention (CalARP) Program, the impacts from plausible accidents would be less than significant.

No additional mitigation measures would be needed.

4.13.1 Introduction

Refinery operations involve the processing and handling of substances that are classified as combustible and/or flammable with the potential for fires and explosions. Refinery operations also involve the processing and handling of substances that are acutely toxic with the potential of releasing toxic vapors. The risk to the public is measured in terms of the likelihood or probability of an accident and the severity of the consequences of an accident. Refinery practices that handle these substances are subject to strict process safety management programs to prevent and mitigate potential accidents.

In addition, the Refinery generates hazardous wastes that are subject to regulations covering the safe storage and disposal of these wastes.

4.13.2 Setting

Existing Conditions

The Chevron Refinery is configured to include buffer zones around sources of hazardous substances (see Figure 3-2). As described in detail in Section 4.9, *Land Use*, immediately surrounding the Refinery are nearly all industrial lands except for the residential communities of Point Richmond to the south, Atchison Village to the southeast, North Richmond to the northeast, and the Iron Triangle to the east. The closest distances from the sources of acutely hazardous substances to offsite residents (sensitive receptors) range from 2,100 feet to 5,000 feet. Major thoroughfares include Interstate I-580, which cuts through the Refinery's southern border and Castro Street, which cuts through the southeastern border.

General Refinery Hazards

Oil refineries handle, store and process large quantities of flammable materials and acutely toxic substances. Accidents related to these substances can result in public exposure to heat radiation from a fire, blast overpressure from an explosion, or airborne exposure to acutely hazardous

substances. These hazards can result from operations at the Refinery or during transportation of hazardous materials to and from the Refinery.

Fires, which are caused by ignition of flammable materials, can result in exposure to heat radiation. The heat decreases rapidly with distance from the flame. Refinery fires generally pose little risk to the public, mainly because they are typically confined to the vicinity of the equipment from which the flammable release would occur.

Explosions can occur if flammable vapors and gases are ignited or when a flammable substance is released at high temperatures, and usually under elevated pressure. Impacts of an explosion are expressed in terms of a sudden increase in pressure above ambient pressure, resulting from a blast or shock wave. The types of explosions associated with refineries can include a vapor cloud explosion (VCE) and a boiling liquid vapor cloud explosion (BLEVE). A VCE occurs when a flammable gas is mixed with air and then encounters an ignition source. VCEs are very rare, because they require that sufficient air be combined with the flammable gas before ignition, thus resulting in an explosive mixture. Instead, a more common event would be a flash fire in which ignition occurs before mixing with atmospheric air. Such fires do not result in an explosion that could cause damaging overpressure. A BLEVE would occur when a confined flammable liquid vessel ruptures from excess pressure because of heating. The result is a rapid expansion of the material as it is exposed to ambient pressure and subsequent ignition of the released liquid aerosol and vapors. Such an event can occur if there is an external fire that engulfs a vessel containing a flammable liquid. BLEVEs are also very rare.

Airborne exposure can occur with a release of a substance from the Refinery that is acutely hazardous, such as ammonia, hydrogen sulfide or sulfur dioxide, or any harmful byproducts which may occur from a fire. A release can be a threat if a harmful concentration of the gas reaches offsite receptors.

Hazardous Substances Handled at the Refinery

The Chevron Refinery is listed on the Government Code § 65962.5 of the Resources Conservation and Recovery Information System (RCRIS) of hazardous waste generators. Wastes generated are stored and disposed of in accordance with applicable regulations.

The Richmond Refinery submits a Hazardous Waste Source Reduction Report (also known as the Waste Minimization Plan) once every four years under the Hazardous Waste Source Reduction and Management Review Act of 1989 (also known as SB 14). The most recent SB 14 report was submitted in 2003 for the reporting year 2002. The next report is due September 1, 2007.

Any hazardous waste streams that are pre-treated on-site and then subsequently discharged to a publicly-owned treatment works (POTW) or to receiving water under a National Pollution Discharge Elimination System (NPDES) permit are referred to as Category A wastes. The Richmond Refinery did not report any Category A wastes in the last two SB 14 reporting cycles. All other waste streams subject to SB 14 are referred to as Category B wastes. For all Refinery

Category B wastes, a total of 10 million pounds were reported for 1998 and 8.6 million pounds for 2002. There were four major waste streams:

- *API Separator Sludge and Primary/Secondary Sludges.* 5.85 million pounds were generated in 1998, and 1.73 million pounds were generated in 2002. Some oily sludge was processed at the sister El Segundo Refinery as coker unit feed.
- *Spent FCC Catalyst.* 235,000 pounds were generated in 1998, and 2.3 million pounds were generated in 2002. The entire quantity in 2002 was planned for use as substitute feedstock in a cement kiln, thus exempting it as a waste.
- *Spent Hydroprocessing Catalyst.* 2.5 million pounds were generated in 1998 and about 2 million pounds generated in 2002. Approximately 10% of this quantity was reduced by sending it off-site for regeneration and re-use.
- *Arsenic-Contaminated Process Equipment Solids.* 205 pounds were generated in 2002. This waste stream occurs only once every eight to ten years during Refinery maintenance.

The amount of hazardous waste disposed of was reduced by more than 75% from 1986 to 1998 through source reduction, recycling, treatment, and material substitution. From 1998 to 2002, the amount of hazardous waste routinely generated was reduced by 20% due to recycling and classification of carbon as non-hazardous waste.

The units at the Refinery that would be directly affected by the Proposed Project generate approximately 377 tons of Hazardous Waste annually. Some of the hazardous wastes consist of spent catalysts that are sent offsite for processing, reclaiming and regeneration. The remaining hazardous wastes are sent offsite for disposal in an appropriate landfill. Table 4.13-1 summarizes the hazardous wastes generated by the existing facility.

Existing Safety Management Systems

The Refinery stores and processes materials that are classified as acutely toxic and/or flammable, and that could pose hazards during process upset conditions. Historically, the petroleum industry has addressed concerns about potential catastrophic accidents by developing design standards intended to minimize either the likelihood of these events or the consequences of these events. In recent years, federal and State regulations have taken an increasingly active role in requiring facilities to assess and document these risks as well as take further action to reduce them. Following is a brief description of how the existing Refinery addresses safety issues.

Design

As an industrial facility handling hazardous chemicals, the Chevron Refinery must be constructed and operated to certain codes and standards, which are enforced via administrative mechanisms such as internal audits, design reviews, and building inspections. Some of the main design standards include: the American Petroleum Institute Recommended Practice 750, Codes of Management Practices of the Chemical Manufacturers, American National Standards Institute B31.1: Power Piping, American National Standards Institute B13.3: Petroleum Refinery Piping, National Fire Prevention Association 30, and the Uniform Building Codes. These design codes

**TABLE 4.13-1
HAZARDOUS WASTES GENERATED AT THE EXISTING FACILITY**

Plant / Vessel	Composition	Disposition	Hazardous Waste?	Average Generation Rate (tons/yr)
1. Hydrogen Plant Catalyst				
Hydrogen Reforming Catalyst	Ni / CaO / Al ₂ O ₃	Metals Reclamation	Yes	13
Hydrodesulfurization (HDS) Catalyst, First Stage	Cobalt / Molybdenum	Landfill	Yes	1.3
Hydrodesulfurization (HDS) Catalyst, Second Stage	Zinc Oxide (ZnO)	Landfill	Yes	8.1
High Temperature Shift Converter (HTSC) Catalyst	Cr ₂ O ₃ / ZnO / Al ₂ O ₃	Metals Reclamation or Landfill	Yes	17.8
Low Temperature Shift Converter (LTSC) Catalyst	Copper Oxide / ZnO / Alumina (Al ₂ O ₃)	Metals Reclamation or Landfill	Yes	33
Methanator Catalyst	NiO	Metals Reclamation	Yes	8.0
Selective Catalytic Reduction (SCR) Catalyst	Vanadium Pentoxide / Titanium Dioxide	Landfill	Yes	4.6
Total Hydrogen Plant Catalyst				85.8
2. Reformer Catalyst				
No. 4 Rheniformer Catalyst Inventory Replacement	Pt	Metals Reclamation	Yes	15
No. 5 Rheniformer Catalyst Inventory Replacement	Pt	Metals Reclamation	Yes	14
Sulfur Absorber	Cu / Zn	Metals Reclamation or Landfill	Yes	14
Total Reformer Catalyst				43
3. MEA-related				
MEA solution	Monoethanolamine	Recycle	Yes	216
MEA-contaminated material	Monoethanolamine	Landfill or Incineration	Yes	1.4
Arsenic-contaminated material	Arsenic	Landfill	Yes	1.6
Total MEA-Related				219
4. Utilities Plants				
No. 1 Power Plant	Various	Landfill	Yes	4.7
Other Cogeneration	Undefined	Landfill or Recycle	Yes	1.8
Total Utilities Plants				6.5
5. Distillation and Reforming				
Chloride Absorber	Activated Alumina	Landfill	Yes	23
Total Distillation and Reforming				23
Total Existing Facility				377.3

SOURCE: Chevron report in compliance with RCRA, 2004

and industry standards undergo regular evaluation and upgrading to improve safety and reliability. Whenever new facilities are built, they must meet these improved design codes and industry standards. The new facilities benefit from the improvements in safety and reliability that result from meeting improved codes and standards.

Inspections

In order to ensure integrity, safety and regulatory compliance, the Chevron Refinery maintains and conducts various inspection programs. Inspection and testing procedures, including establishing the frequency of testing for the critical equipment involving acutely hazardous substances, were developed and documented by the Equipment Reliability group at the Refinery. The procedures and frequency of inspection and testing are based on the Manufacturer's recommendations, good engineering practice, operating history, and failure prediction and prevention analyses. Equipment inspectors, along with the engineering and operating departments, review the results of each inspection or test to ascertain that the equipment is within the acceptable limits and to determine if the frequency of the inspections should be adjusted to ensure safe operations. Equipment outside of acceptable limits is removed, repaired, or replaced, unless protective measures and continuous monitoring can be appropriately performed until the deficiencies are corrected. Inspection and test results are maintained for the life of the equipment.

Training

The Refinery conducts a safety-training program for all employees, and the training program is focused on specific procedures and safe work practices. New employees are given safety indoctrinations, and affected employees receive annual refresher training in the following areas:

- Injury reporting procedures;
- Emergency reporting procedures;
- Safety hazard reporting procedures;
- Use of personal protective equipment;
- The company's Emergency Plan and Organization;
- Location and use of respiratory equipment;
- Use of hand-held fire extinguishers;
- Location and use of fire hoses;
- Safety procedures to be used in the event of a release or potential release of a hazardous material;
- Chemicals and wastes present at the facility and their associated hazards;
- Information labels, forms, and Material Safety Data Sheets (MSDS);
- Proper methods of handling hazardous materials;
- Reporting of adverse health and environmental effects;
- Use, capabilities, and locations of emergency response equipment and supplies;
- The facility's Emergency Response Plan;
- Procedures for the control of a toxic and hazardous materials release;
- Reporting and notification procedures;
- Procedures for coordinating with emergency response organizations; and
- OSHA HAZWOPER training

In addition to safety training, the Refinery conducts an operator-training program to ensure operator competence. The program provides training in policies and procedures, safety and health hazards, and task specific procedures and practices. All operator trainees must successfully complete a Basic Training Program, prior to working as an operator. The program includes basic

training in the areas of distillation, refining, chemistry, physics, environmental screening, maintenance, instrumentation, and specific safety hazards. Once a trainee has completed the Basic Training Program, assignment to an operating area is made and a Development Department Trainer continues the instruction of the trainee.

When new equipment or processes are installed, a Department Trainer conducts training sessions similar to those given to operator trainees, to familiarize the trainees with the new equipment and/or processes. It is the responsibility of the Development Department to maintain training records for all operators. These measures are described in more detail below.

Emergency Response Capabilities

The Chevron Refinery maintains an emergency response program designed to protect worker and public safety, as well as the environment. As part of the Emergency Response Program, there is a written plan for responding to accidental chemical releases, including procedures for notifying the public and local emergency response agencies. The program also includes the maintenance, inspection, and testing of emergency response equipment.

The Chevron Refinery has emergency response teams that are trained and equipped to respond to fires, rescues, hazardous material releases, and other emergencies that could occur at the Refinery. These teams are managed by the Manager of Fire, Security and Field Safety, whose responsibility it is to ensure that the Emergency Response Plan is implemented and followed in the preparation for and response to plant emergencies.

As part of the Emergency Response Program, the Chevron Richmond Refinery works with local emergency responders in preparing for and responding to emergencies. This includes conducting emergency drills with the Richmond Fire Department and/or Contra Costa County Health Services on potential fires and/or hazardous materials releases.

The Chevron Refinery is a member of an industrial mutual aid organization, the Petrochemical Mutual Aid Organization (PMAO), and has responded to emergencies at other oil facilities and chemical plants that are members of the PMAO. The Refinery also provides assistance to the City of Richmond Fire Department for events outside of the Refinery when requested by the City Fire Department.

Accident History

The most recent Risk Management Plan (RMP) was prepared for the Refinery in October 2006 (Chevron 2006), in compliance with the California Accidental Release Prevention Program (CalARP). The RMP reported accidents that have occurred at the Chevron Refinery in the previous five years. These accidents, supplemented with information on a more recent incident, are summarized below:

- **01/15/2007, 5:18 a.m.**, a fire occurred at the #4 Crude Unit when a thinned carbon steel section of the 4-inch-diameter wash-oil swing-out spool failed, releasing a mixture of wash-oil, vacuum gas oil and vacuum residual. A level 2 alert was issued by the Richmond Refinery at 5:22 a.m., followed by a level 3 siren at 5:30 a.m. In order to not accumulate larger quantities of unburned fuel, several small

fires continued in a controlled manner until 2:14 p.m. One employee was treated for minor burns by the Chevron Fire Department and by an outside hospital. That employee was released and returned to work the same day. Another employee received on-site treatment and returned to work the same day. Monitoring conducted by the Refinery in the neighboring community showed no evidence of adverse air quality levels. Subsequent corrective action included upgrading the metallurgy of the swing-out spool and replacing a gate valve. In addition, other similar gate valves in the #4 Crude Unit were replaced with more modern technology.

- **10/21/2003, 12:40 a.m.**, while disconnecting a railcar, a momentary release of ammonia occurred at the Isomax Area Business Unit (ABU), spraying onto an employee. This resulted in burns to the employee's face and neck. The release did not result in offsite consequences.
- **08/09/2003, 2:37 p.m.**, lube oil pump difficulties at the Isomax ABU resulted in the depressurizing of process equipment to the relief systems and flare. Incomplete combustion at the flare led to visible smoke and release of odorous emissions to off-site receptors leading to complaints of odors. This did not result in an unsafe offsite consequence.
- **10/21/2002, 6:00 a.m.**, three 115 kV flashovers occurred at the Standard Oils Switching Station (SOSS) Bus No. 2. The flashovers caused an upset condition in the high voltage electrical system. Following that, at 7:10 AM, a single flashover occurred on Bus No. 2 at the SOSS. Six circuit breakers opened and electrical power was lost at both CoGen units, as well as power to Substations 1 and 2. Both Cogen units tripped on "flame out" causing a high pressure steam shortage throughout the Refinery, and the Fluid Catalytic Cracker (FCC) shut down. During this event, Substations 2 and 4 continued to supply power to a portion of the Refinery. There was no release of hazardous substances to offsite receptors.
- **01/31/2002, 12:07 p.m.**, a release of H₂S occurred when a process upset occurred at the Number 4 sour gas plant in the Isomax ABU, causing the No. 3 Sulfur Recovery Unit (SRU) in the Cracking ABU to shut down. These occurrences caused the process gases to be routed to the SRU stack and safety flare in the Isomax and Distillation and Reforming units. Two plant operators in the SRU were exposed to H₂S and natural gas during the restart of No. 3 SRU. The Emergency Management Team responded to the incident and determined that the workers were not harmed and could return to work immediately. There were no unsafe offsite consequences.

Regulatory Setting

There are a number of federal and state regulations that focus on reducing the risks from chemical hazards, some of which include:

- California Accidental Release Prevention (CalARP) Program,
- U.S. Occupational Safety and Health Administration (OSHA) Process Safety Management (PSM) Rule,
- U.S. EPA Accidental Release Prevention/Risk Management Plan (RMP) Rule,
- California OSHA Injury and Illness Prevention Program, and
- City of Richmond Industrial Safety Ordinance.

These 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. Key aspects of these regulations as they apply to the Proposed Project are described below.

Process Safety Management (PSM)

The federal Occupational Safety and Health Administration (OSHA) adopted a rule in 1992 known as Process Safety of Highly Hazardous Chemicals which addresses the prevention of catastrophic accidents. The requirements of the PSM rules are directed primarily at protecting workers within the facility. One of the key components of the required PSM systems is the performance of process hazard analyses, which are assessments to anticipate causes of potential accidents and to improve safeguards to prevent these accidents.

Management of Change (MOC)

In order to comply with the Process Safety Management requirements, the Chevron Refinery has established procedures for the Management of Change (MOC). The purpose of these procedures is to ensure that changes to process chemicals, technology, equipment, facilities, or critical procedures do not cause plant facilities to be operated outside of their design limits or introduce new hazards to plant operations.

The Chevron Refinery has a written MOC procedure which satisfies the requirements of Section 2760.6 of the California Accidental Release Prevention (CalARP) program. The MOC work process covers all changes to the following:

- Process chemicals (i.e., raw materials, intermediate products, solvents);
- Technology (i.e., operating parameters, catalysts, operating rates);
- Equipment (i.e., materials of construction, equipment specifications); and
- Procedures (i.e., emergency response, maintenance, operations).

The MOC work process does not apply to “replacement in kind”, which is an exact replacement, since the MOC process is satisfied by the established design specifications.

Spill Prevention and Countermeasure Control Plan (SPCC)

In compliance with the U.S. Pollution Prevention Act of 1990, the Refinery maintains a Facility Response Plan and SPCC Plan for existing operations. This Plan is updated every three years.

Industrial Safety Ordinance

Because incidents have occurred at industrial facilities in Contra Costa County since the adoption of state and federal safety programs, Regulation 450-8 has been added to the County Code of Regulations (Contra Costa County, 2004). This regulation applies to facilities within an unincorporated area of the County, and it requires reviews, inspections, and audits that supplement existing federal and state safety programs, as well as the imposition of additional safety measures to protect public health and safety from accidental releases. The County Ordinance does not apply to the Chevron Refinery, since it is located in the incorporate city of Richmond. However, the City of Richmond has adopted an Industrial Safety Ordinance (Municipal Code Chapter 6.43, RISO) that is identical to the County’s Industrial Safety Ordinance. Modifications to the County regulation are being considered to require worker skills training and testing for onsite contract workers, oil refinery safety training and skills testing, drug

and alcohol testing, and reporting of contractor safety records. Presumably the City of Richmond would incorporate any changes in their ordinance that may be adopted by the County.

Pipeline Safety Regulations

The U.S. Pipeline and Hazardous Materials Safety Administration (PHMSA), Office of Pipeline Safety (OPS) issues and enforces the Pipeline Safety Regulations, *49 CFR Parts 190-199*, implementing the Federal Pipeline Safety Law, *49 USC § 60101 et seq.*, to ensure the safety of interstate and intrastate pipelines transporting hazardous liquids, natural gas, and other flammable, corrosive and toxic gases. *Part 192* of the *Pipeline Safety Regulations* regulates the in pipeline transportation of natural gas and other gases, including hydrogen, which is transported as a compressed flammable gas. In addition to regulating gathering and transmission, PHMSA regulates the distribution or storage of hydrogen gas by pipeline (*49 CFR § 192.3*). States may enforce safety standards on intrastate pipelines if the State has been certified by PHMSA under *49 USC § 60105*.

Risk Management Plan

The 1990 Clean Air Act Amendments require that facilities utilizing Extremely Hazardous Substances (EHS) in excess of specified threshold quantities prepare a Risk Management Plan (RMP). The Refinery's RMP includes three main components: (1) hazard assessment; (2) release prevention planning; and (3) emergency response planning. The California Accidental Release Prevention (CalARP) Program was finalized in 1997 as California's version of the Federal Risk Management Program. This Plan is updated when there are changes that would affect the use or storage of extremely hazardous substances. The most recent RMP was prepared for the facility in October 2006. Upon completion of the Proposed Project and prior to commencement of operation, the RMP must be updated to include the changed processes. In addition, the Hazardous Materials Business Plan would have to be updated.

The 2006 RMP shows that the following Extremely Hazardous Substances are generated or used at the Refinery, and the potential for accidental release of these substances to the environment were evaluated in the RMP:

- Hydrogen sulfide
- Ammonia
- Flammable hydrocarbons
- Sulfuric acid mixed with hydrocarbons

The RMP assesses the offsite consequences of such releases, and describes the safety and emergency response measures that are adopted to ensure safe operation of the facility.

After the Proposed Project components are installed at the Refinery, a revised RMP must be carried out to satisfy the CalARP Program. The RMP requires that a detailed hazards and operability study (HAZOP) of the changed components be carried out. The RMP also requires a revised offsite consequence analysis of plausible accidents. The new RMP must also include a revised accident prevention and training program as well as pre-startup safety reviews and safety

requirements for contractors conducting hot work activities. The RMP must cover accidents that might happen from the Proposed Project that have been identified in the HAZOP.

4.13.3 Public Safety Significance Criteria and Methodology

Significance Criteria

The significance criteria for this analysis were developed from criteria presented in California Environmental Quality Act (CEQA) Guidelines Appendix G, Section VII Hazards and Hazardous Materials. The Proposed Project would result in a significant impact to public safety 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 substances or waste within one-quarter mile of an existing or proposed school.
- d) Be located on a site that is identified on a list of hazardous material 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, the project would result in a safety hazard for people residing or working in the project area.
- f) For a project located within two miles of a private airstrip, the project would result in a safety hazard for people residing or working in the project area.
- g) Impair the implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.
- h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires.

The analysis of whether the Proposed Project would create a significant hazard to the public or the environment through the routine transport, use or disposal of hazardous materials (item a, above) are presented in Section 4.12, *Public Health*, of this EIR. The remaining items are discussed in this Section.

In addition to the CEQA criteria above, noncompliance with applicable regulations, generally accepted petroleum industry practices or design codes, or exceedance of applicable risk criteria would indicate a potential for significant hazards to members of the public off-site. Hence, the Proposed Project would have a significant impact to public safety if it would:

- be in noncompliance with any design code or regulation or nonconformance with National Fire Protection Association standards.
- be in nonconformance with regulations or generally accepted industry practices related to operating policies and procedures concerning design, construction, security, leak detection, spill containment or fire protection.
- result in an increased risk of fatality or serious injury or significant exceedance of the EPA risk management exposure level of concern (LOC) at off site receptors.

With regard to accidental releases of acutely hazardous materials, the potential significance of any potential upset or accident is judged by the likelihood of occurrence of an upset and the resulting severity of impacts if an upset occurred due to the Proposed Project. These changes (i.e., the likelihood of increased upsets and the potential associated risk) are measured relative to existing conditions. Existing conditions are reflected in the CalARP RMP that was prepared for the existing plant in October 2006 (Chevron, 2006).

An impact from an explosion or fire would be considered significant if the significance thresholds for blast and thermal impacts, as defined by the RMP Guidelines as a level of concern (LOC), would be exceeded (USEPA, 1999). For toxic chemicals, an impact would be significant if the offsite concentration from an accidental release would exceed the Emergency Response Guideline (ERPG-2) concentration, which is considered the threshold level of concern (LOC) by the American Industrial Hygienist Association (AIHA, 2006).

CEQA Guidelines Appendix G topics not discussed further in this EIR

Review and comparison of the Proposed Project to the environmental setting clearly shows that the Proposed Project would create no impacts related to the following six environmental topics listed in Section VII, Hazards and Hazardous Materials, of CEQA Guidelines Appendix G. The following reasoning supports this conclusion:

c. Would the Project emit hazardous emissions or handle hazardous or acutely hazardous substances or waste within one-quarter mile of an existing or proposed school?

The Proposed Project facilities would lie entirely within the existing Refinery and would not be within one-quarter mile of an existing or proposed school. There would be no impact.

d. Would the Project be located on a site that is identified on a list of hazardous material sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment?

Government Code Section 65962.5 is commonly referred to as the “Cortese List.” There are no currently listed sites on the Cortese List for the Refinery. The Proposed Project would be constructed entirely within the existing Refinery, where no public access is allowed. Within the Refinery process areas various levels of contamination by hazardous materials may exist; however, as discussed in detail in Section 4.9, *Hydrology and Water*

Quality, the movement of these hazardous materials offsite is prevented by structural and procedural control measures. For these reasons, the presence or absence of hazardous materials on the site would not result in risks to the public or to the environment. Therefore there would be no impact.

e. Would the Project be located within an airport land use plan or within two miles of a public airport, and therefore result in a safety hazard for people residing or working in the project area?

The Proposed Project site is not within an airport land use plan and is not within two miles of a public airport. The Proposed Project would not result in an airport or aircraft-related safety hazard for workers at the Refinery or people in Richmond. Therefore, there would be no impact.

f. Would the Project be located within two miles of a private airstrip, and therefore result in a safety hazard for people residing or working in the project area?

The Proposed Project is not located within two miles of a private airstrip. There would be no resulting hazard and therefore, no impact.

g. Would the Project impair the implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

The Proposed Project would be integrated into the Refinery's emergency plans, described in Section 4.12.2, above. There is nothing to suggest that the Proposed Project would in any way impair or interfere with these plans, no impact.

h. Would the Project expose people or structures to a significant risk of loss, injury or death involving wildland fires?

The major components of the Proposed Project would be constructed entirely within the existing processing areas of the Refinery, many of which are barren or paved. Tanks would be constructed on graded pads in the tank farms. Although dry vegetation exists in areas of the Refinery, its growth is controlled to limit fire potential. The Refinery has its own fire protection measures, including buffers between the process areas and fence lines, but also is served by the Richmond Fire Department, as noted in Section 4.16, *Public Services*. There would be no added exposure to wildland fire hazards. There would be no impacts from exposure to wildland fires.

There would be a potential for impacts to occur under the two remaining significance criteria listed above. The potential impacts that could occur during the routine transport, use or disposal of hazardous materials are discussed in Section 4.12 *Public Health*, and in Section 5.2, *Cumulative Impacts*. Potential hazards to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment are grouped and discussed generally here under two broad impact statements,

Impacts 4.13-1 and 4.13-2, in Section 4.13.4, *Impacts and Mitigation Measures*, and in Section 5.2, *Cumulative Impacts*.

4.13.4 Public Safety Impacts and Mitigation Measures

Construction Impacts

Impact 4.13-1: Accidents could occur during construction or demolition activities. Hazardous materials would be used and either consumed, recycled or disposed of as hazardous waste during the construction of the Proposed Project and demolition of decommissioned units. This would be a less than significant impact.

The accidents that would occur during the construction phase are expected to be minor accidents confined to actual construction events, and would not be expected to have significant effects on the public and environment. As described in Chapter 3, *Project Description*, most process units and facilities would be decommissioned¹ while others, including a number of storage tanks, would be demolished. In addition, minor demolition (e.g., pipe supports, piping) would be required in a number of locations. These demolition activities could involve asbestos containing materials (ACM), mainly insulation and gaskets. The removal, handling, transport, and disposal of ACM would be performed in accordance with established procedures and the applicable regulatory requirements (National Emission Standards for Hazardous Air Pollutants or NESHAP, and BAAQMD rules and regulations). The work would be performed and overseen by certified ACM workers. The removal methods may include the use of negative pressure, glove bags, wet methods, or other acceptable methods that are geared to minimize airborne concentrations of asbestos. The ACM would be transported in covered vehicles and disposed at appropriately licensed facilities. Proposed Project construction activities also could generate sandblasting grit containing lead paint from paint removal activities and from paint application activities. As with ACM, these waste materials would be handled, stored, transported, and disposed in accordance with applicable regulatory requirements. Since the construction activities would be conducted under the above regulatory constraints, which are geared to protect both onsite workers and the offsite public, the impacts to hazards would be less than significant.

It is estimated that approximately 500 cubic yards of potentially hazardous soil would be excavated prior to and during the construction of elements of the Proposed Project. Approximately 110,000 cubic yards of clean engineered fill would be imported for grading and geotechnical purposes at the various Proposed Project component sites including those projects evaluated for cumulative impact considerations. The exact characteristics of soil for the purpose of determining disposal requirements cannot be determined until it is excavated. Soil determined to be hazardous would be sent to offsite hazardous waste disposal facilities. Transportation offsite would be in trucks with end dump trailers with roll-off bins. About 20 cubic yards would be transported in each vehicle. During transit, hazardous waste soil would be covered to prevent

¹ As noted in Chapter 3, *Project Description*, demolition of the major units is expected to be delayed indefinitely after decommissioning, except for demolition of the old tanks to be replaced, as discussed in Section 3.5. Demolition would occur within the five-year timeframe of this Master EIR.. See the discussions in Chapter 3, *Project Description*, and in Chapter 5, *Cumulative Impacts*.

entrainment into the air while the vehicle travels on public roads. Non-hazardous soil would be reused on site or would be sent offsite as a designated waste, as required by regulations.

Mitigation: None Required.

Operational Impacts

Impact 4.13-1: Hazardous materials would be used and either consumed, recycled or disposed of as hazardous waste during the operation of the Proposed Project. This would be a less than significant impact.

Since the designs of the units of the Proposed Project are not yet final, a comprehensive hazard and operability study cannot be carried out at this stage. However, the expected changes in the types and quantities of hazardous materials and the expected changes in risks at the Refinery, as a result of the Proposed Project, can be estimated using conservative worst case assumptions by building on the RMP that was prepared for the entire Refinery in 2006 and incorporating the changes that would occur as a result of the Proposed Project. When the Proposed Project design is refined and prior to commencement of operations, the RMP for the Refinery would be revised to incorporate the changes resulting from the Proposed Project. Applicable training programs and plans dealing with emergencies would be modified in the revised RMP to include the Proposed Project components. These actions would ensure that the risk of accidents would be minimized.

Hazardous Materials from Project Operation

Petroleum refining operations inherently involve the routine use, transport, and disposal of hazardous materials. Because the Proposed Project would involve mainly replacement units using identical or similar technologies, the waste streams generated from the new units would be very similar to those currently generated. Thus, there would be no new categories of hazardous wastes generated. Table 4.13-2 summarizes the changes in hazardous materials used at the Refinery that would be associated with the Proposed Project.

**TABLE 4.13-2
CHANGES IN HAZARDOUS WASTE AND RECYCLED MATERIAL GENERATION**

Hazardous Waste / Recycled Material Generation	Existing ^a (tons/year)	With Project (tons/year)	Change (tons/year)
Hydrogen Plant Catalyst	85.8	200	114
Reformer Catalyst	43	43	0
MEA and MEA-contaminated Material	219	0	-219
Distillation and Reforming	23	23	0
Utilities Plants	6.5	12.3	5.8
Total – Existing / Project / Difference	377	278	-99

^a See Table 4.13-1 for a more detailed breakdown of the existing hazardous materials use.

Changes in hazardous waste generation rates resulting from the Proposed Project operation generally would fall into three categories:

- Spent catalysts
- Elimination of MEA
- Wastes from utilities plants

Each of these is discussed below.

Spent Catalysts

Average generation rates for spent catalysts are primarily dependent upon two factors – unit catalyst inventory and catalyst life. The generation rates for spent catalyst change as a result of changes in the hydrogen plants and reformers.

Hydrogen Plant spent catalysts. The Low Temperature Shift Converter and Methanator and their catalysts are eliminated in the new Hydrogen Plant design. However, the inventory of the two hydrodesulfurization (HDS) vessel catalysts is larger in the new units, and one of these catalysts must be replaced at a more frequent interval. Catalyst usage for Selective Catalytic Reduction systems is higher due to larger furnaces and because both hydrogen trains would use selective catalytic reduction (SCR) (vs. only one of the existing trains). Thus, the replacement of the hydrogen plant is expected to result in an estimated net increase of 114 tons per year in generation of spent catalyst. Most of the material would be sent offsite for reclamation of precious metals, while the remainder would be transported to a secure landfill that is licensed to accept these wastes.

Reformer spent catalysts. Reformer spent catalyst generation rate would be expected to be essentially unchanged as a result of the Proposed Project. With the Continuous Catalytic Regeneration (CCR) Reformer, spent catalyst generation due to complete catalyst replacement would be slightly decreased, but there would be additional generation of *catalyst fines*, or fine particulates of catalyst. These two effects essentially offset each other, resulting in no net increase. The Reformer catalyst would continue to be sent offsite for reclamation of precious metals.

In addition, the chloride absorber that now removes chloride from the product hydrogen from the Rheniformers would continue to be used with the new CCR Reformer. The Reformer contains approximately 28 tons of catalyst that would be landfilled at the end of its life, which ranges from one to two years. Since the throughput capacity of the new CCR Reformer would be approximately the same as the capacity of the two existing Rheniformers, and since the quantity of hydrogen that would be generated would be similar, the catalyst life in the chloride absorber would be similar to existing conditions. Therefore, there would be no change in hazardous waste generated from this source (See Table 4.13-2).

Other spent Catalysts. The lives of several other fixed-bed catalysts (*e.g.*, hydrocracker, lube oil hydrocrackers and finishers) could be increased slightly due to improved hydrogen purity, while catalyst life at the FCC Feed Hydrotreater could be reduced slightly due to higher throughput.

Although the process design has not progressed to a sufficient point to allow quantification of these potential effects, there is likely very little change in catalyst life and in disposal of spent catalyst.

Elimination of MEA

An important environmental benefit of the Proposed Project is the elimination of the use of the amine solvent monoethanolamine (MEA) that has been used to separate hydrogen from carbon dioxide. In addition, arsenic, which is now used as a corrosion inhibitor in the MEA, would also be eliminated. In the new Hydrogen Plant, the hydrogen-carbon dioxide separation would occur through the use of pressure swing adsorption (PSA), which is a solvent-free process. Based on Richmond Refinery manifest records over the five-year period 2000-2004, the Refinery generated an average of 216 tons per year of spent MEA. An additional 3 tons per year of MEA is generated with arsenic-contaminated material (*e.g.*, filters, insulation, etc.). As a result of the Proposed Project, it is expected that this MEA and arsenic waste would be nearly eliminated.

Wastes from Utilities Plants

As part of the Proposed Project, the No. 1 Power Plant would be decommissioned and replaced by a new CoGen unit. Based on Richmond Refinery manifest records over the five-year period 2000-2004, the No. 1 Power Plant generated an average of 4.7 tons per year of hazardous wastes. Other CoGen-related hazardous wastes are estimated to be approximately 1.8 tons per year, giving a total of 6.5 tons per year.

For the new CoGen unit, the wastes are divided into SCR catalyst waste and other wastes. Based on differences in furnace firing duties, it is estimated that there would be a 7.3 ton/year increase in used SCR catalyst. The new CoGen unit would additionally generate 5.0 tons of other CoGen-related hazardous wastes for a total increase of 12.3 tons per year.

Table 4.13-2 shows that, while there would be an increase in some hazardous wastes generated at the Refinery as a result of the Proposed Project, mostly due to an increase in spent catalyst from the new Hydrogen Plant, there would be a net decrease in total quantities of hazardous wastes generated at the Refinery as a result of the Proposed Project. In addition, the type of waste that would be increased (solid spent catalyst from SCR) would be much less hazardous than the waste being eliminated (liquid spent MEA containing arsenic), and the consequences of an accidental spill of solid waste during transport would be less. Thus, the impacts would be less than significant.

Mitigation: None Required.

Impact 4.13-2: Possible accidental releases of acutely hazardous substances that might result from the Proposed Project during its expected life were evaluated, and none were found to cause an unsafe offsite impact. This would be a less than significant impact.

The Proposed Project involves a number of modifications to existing Refinery processes, along with the addition of some new processes. Potential changes in hazards were identified by incorporating the proposed changes in equipment related to the Project with the analysis that was reported in the RMP for the existing facility in 2006.

The Proposed Project would not result in changes in existing operations that involve sulfuric acid mixed with hydrocarbons. So, there would be no change in impact from this process. The Proposed Project would also not add any new Extremely Hazardous Substances (EHS) that are not currently present in the Refinery. However, the Proposed Project would result in an increase in the use of hydrogen, due to the construction of a new Hydrogen Plant, the shutdown of the existing hydrogen plant and the construction of a new hydrogen recovery unit. The CalARP regulation lists hydrogen as an EHS solely because it is a flammable gas; hydrogen is not considered an acutely toxic substance by the regulation. The impacts from potential thermal exposure to an ignited accidental release of hydrogen must be evaluated in an RMP if the amount of hydrogen stored or used onsite exceeds 10,000 pounds, which it would with the Proposed Project. Aside from its flammability hazard, hydrogen at high temperatures and pressures, as it would be at the Refinery, can degrade metals leading to a potential hazard. Chevron's proposed modifications are not novel with regard to the levels of hydrogen, pressures, or temperatures as compared to those already found at the Refinery, and the designer and builder of the hydrogen plant would be required to follow the guidelines established by the American Petroleum Institute concerning the types of metals to be used for hydrogen service (API, 2004). The API Guidance recommends that certain chromium-molybdenum alloys be used to prevent degradation of the metal by hydrogen. Selection of the correct materials would be necessary to maintain the operational safety margins for piping and pressure vessels, such as ASME Pressure Piping and Pressure Vessel Codes. Chevron would also follow applicable recommendations set forth in other industry guidelines regarding handling of hydrogen. In order to avoid the possibility that a small release would escalate into a much larger event with the potential to cause off site impact, Chevron would install fire and leak detection monitoring around the Hydrogen Plant and hydrogen piping.

Chevron has selected the firm, Praxair, to design and build the new Hydrogen Plant. Praxair has considerable experience in designing, building, and operating hydrogen plants. Praxair has built 18 hydrogen plants throughout the world. There have been no reported incidents at any of these plants that caused measurable impacts at offsite locations (Praxair, 2007).

As discussed earlier in this section, Chevron would be required to prepare an RMP for the project changes. The RMP requires that potential hazards from the Project be analyzed in detail and that potential effects of accidents must be minimized through design changes and other measures defined in the RMP process. The RMP also requires that an inspection and maintenance program be implemented to assure that the related pipelines, including those related to hydrogen transport, are safe for their duty.

Hydrogen is an RMP-regulated (flammable) substance with a threshold quantity of 10,000 lbs. If the flammable quantities of a process exceed the threshold quantity, the plant must prepare a new RMP to cover those substances that exceed that threshold quantity. The current Refinery RMP

does not include the existing Hydrogen Plant because there are less than 10,000 lbs of flammables in them.

Praxair has estimated that there would be about 30,000 lbs of flammable substances (including hydrogen, hydrocarbon, and inerts) in the proposed Hydrogen Plant. Since hydrogen would be consumed as it is generated, there would be no storage facilities for hydrogen. The 30,000 lbs of flammable substance in the new Hydrogen Plant would be small when compared to other flammables that are used and stored on the Refinery site, which for some processes includes as much as 174,000 pounds of flammable substances. The 2006 RMP analyzed the offsite consequences of accidental releases of these larger quantities of flammable substances and determined that none of these other, much larger, releases would have distances to the thermal LOC that reaches an off-site receptor. Even using the extremely conservative assumption that all 30,000 lbs of the flammable substances in the new Hydrogen Plant would be released and burned, the thermal exposure at offsite receptors would be less than the thermal LOC for the larger event.

The sections below discuss each of the other extremely hazardous substances used at the Refinery and: 1) describe how and where they would be used for processes related to the Proposed Project, 2) estimate the increase or decrease in quantities of such materials due to the Proposed Project, and 3) discuss the potential off-site impacts of these EHSs from the Project.

Hydrogen Sulfide

Crude oils contain sulfur that is typically removed to make petroleum products. The removal occurs as the various cuts are made from crude oil, either to prevent contamination of catalyst used in Refinery processes or to meet product sulfur specifications, and the removal can be in the form of Hydrogen Sulfide (H_2S). Sulfur removal commonly occurs in units called hydrotreaters, where a mixture of hydrocarbons and hydrogen are heated together and then fed to a process vessel containing a reaction catalyst. The catalyst promotes a chemical reaction between the hydrogen and hydrocarbons and binds with and removes sulfur molecules from the hydrocarbons by forming H_2S gas.

Hydrogen sulfide is subsequently removed from the gaseous stream in an H_2S absorber tower. In the H_2S absorber tower, the gas is contacted with an amine solution which is typically diethanolamine (DEA). The DEA solution that contains the absorbed H_2S is then pumped to DEA regenerators, where the H_2S is removed from the DEA so that the DEA can be reused. This regeneration releases a gas stream containing a high-concentration of H_2S gas. The gas is then processed in the Sulfur Recovery Units (SRUs) to recover elemental sulfur. Currently, the H_2S absorbers and DEA regenerators are located near one another at the Refinery, within the process unit. For the Proposed Project, the new H_2S absorber would be located at the process unit, and the new DEA regenerator would be located at the SRUs. See Figures 3-2 and 3-14. In this new configuration, the long pipe run would contain liquid DEA with H_2S dissolved in it, rather than H_2S gas which is in the existing system. For this new system, a potential accident would involve a liquid leak rather than a gas release.

In the new system H_2S would be generated in the DEA Regenerator overhead system, including the condenser and reflux drum, in the new Emergency Scrubber, and in the new piping from the

Regenerator to the SRUs. Due to the proximity of these systems to the existing SRUs, the new H₂S piping runs would be shorter than the existing system. Further, the new Regenerator system would operate at relatively low pressure (19 psig design). Therefore the quantity of H₂S in the gaseous form would be very low, about 100 pounds.

The baseline inventory of H₂S in the Refinery is reported in the CalARP Program document to be 18,260 pounds. For the Proposed Project, the largest single amount of H₂S in the gas phase would be 40 pounds in the DEA Regenerator reflux drum.

Impacts from Increased Hydrogen Sulfide. The largest single amount of H₂S gas (40 pounds) occurs in the DEA Regenerator Reflux Drum. A release from this vessel would most likely be caused by a leak rather than a catastrophic failure. The RMP for the existing operation shows a potential gaseous release of 200 pounds of H₂S with the level of concern (LOC) concentration reaching a distance of 2,600 feet from the release. The RMP states that the nearest offsite receptor is 4,300 feet, and the release under the existing operations would not cause an adverse impact.

A release of H₂S from the Proposed Project would be considerably lower than existing conditions, assuming that a release would be under similar conditions as an event from the existing units. By scaling this event to the 200 pound release for the existing operations, the distance where an LOC could be reached would be about 520 feet. Since this distance is within the Refinery boundaries, it would not present an increased risk to the public (off-site receptors). Thus the impact would be less than significant.

Should a larger spill of rich DEA occur in a location that could enter the process sewer, it could also release some H₂S before the solution cools and/or would be diluted by other process sewer streams. The rich DEA liquid would then flow to the wastewater treatment plant. In accordance with Bay Area Air Quality Management District regulations, the API separators upstream of the wastewater treatment plant are covered and would not allow a direct emission point for H₂S. Any hydrogen sulfide remaining downstream of the API Separators would be consumed in the bioreactor. Therefore, releases of rich DEA that enter a process sewer may release some H₂S vapor at a slow rate from the process sewer line prior to being consumed in the wastewater treatment plant. Such emissions are not expected to result in concentrations of H₂S that would pose an increased risk to off-site receptors.

Ammonia

Crude oil also contains various nitrogen compounds. These compounds are converted to ammonia (NH₃) in the hydrotreaters. The ammonia is dissolved in the hydrotreater sour water and is recovered as anhydrous ammonia in one of two sour water plants. The Refinery collects the ammonia in pressurized vessels. Most of the ammonia is sold as product, but a portion of the ammonia is injected into Refinery process or utility heaters as required by the BAAQMD to reduce emissions of NO_x from these sources to gaseous nitrogen.

In the Proposed Project, the existing Hydrogen Plant would be deactivated. The “A” Train of this unit has a Selective Catalytic Reduction (SCR) System that uses anhydrous ammonia to reduce stack emissions of NO_x from furnace burners by using NH₃ to react with NO_x to form N₂ and

H₂O. The ammonia that is used in the existing SCR system is delivered through a 2-inch pipe header from the pressurized ammonia storage vessels. The delivery system would be deactivated, and it includes small sections of ¾ inch piping connecting the header to the Hydrogen Plant. The amount of ammonia at the Refinery would be reduced by approximately 1,468 pounds with the shutdown of the hydrogen trains.

The Proposed Project would increase anhydrous ammonia storage and use in five new SCR systems as follows:

- Two systems for the new Cogen units (estimated 2,946 pounds)
- One system for each of two trains of the new Hydrogen Unit (estimated 213 pounds each, 426 pounds total)
- One system for the new CCR Reformer unit (estimated 393 pounds).

In addition, two new 4-inch pipelines containing anhydrous ammonia would be installed within the Refinery. One of these lines would run from the ammonia storage area to the new Hydrogen Plant. The purpose of this new line would be to provide the flexibility for future use to feed ammonia to the hydrogen plant if additional hydrogen is needed. The second new line would run from the ammonia storage area to the SRUs to allow use of ammonia as a feedstock for those units. Although either or both of these process options may not ultimately be selected, the new piping for both is included in the EHS inventories to provide the highest-inventory (worst case) for evaluation.

The inventory of NH₃ for the new units described above is approximately 20,488 pounds. The net NH₃ inventory increase after shut down of the existing hydrogen train SCR system is approximately 19,020 pounds.

The largest single ammonia storage vessel added by the Proposed Project would be the 4 inch process line from the ammonia storage area to the SRUs, if constructed. This would be about 2,760 feet and would contain approximately 9,381 pounds of ammonia.

Impacts from Increased Ammonia. As stated above, the largest single amount of new NH₃ storage from the Proposed Project would occur because of the new process line from the product ammonia storage area to the SRUs and would contain 9,381 pounds. This is in comparison to the 220,000 pounds of ammonia storage that already exist at the Refinery in three storage vessels and related pipelines. The quantity of ammonia that could be released from the additional pipeline would be much smaller than the ammonia release scenarios that were evaluated in the 2006 RMP for the existing facility, and the potential impacts from a release from the new pipeline would be much lower than those that were reported in the RMP. Since the RMP reported that the offsite consequences from an accidental ammonia release would be less than significant, the offsite consequences from an ammonia release from the new pipeline would also be less than significant. Thus, the impact from the Project would be less than significant.

Flammable Hydrocarbons and Hydrogen

Locations in Refinery. Flammable hydrocarbons exist throughout the Refinery. New inventories of listed flammable hydrocarbons and hydrogen include the natural gas feed lines to the new hydrogen trains, the hydrogen lines attached to the new hydrogen trains, the product hydrogen compression facilities, the liquefied petroleum gas (LPG) product line from the new CCR Reformer, and new LPG lines to provide the new CoGen gas turbines the capability to combust LPG.

Flammable Hydrocarbon and Hydrogen Quantities. An existing 2" LPG line associated with the Rheniformers would be deactivated, resulting in a reduction in LPG inventory of 282 pounds. A second existing 6" LPG product header would be utilized by the new CCR Reformer instead of being deactivated along with the existing Rheniformer Units. A 6" branch line at the new Reformer unit would be added with a total length of about 720 feet. The existing 6" LPG product header would also be used to carry LPG to the gas turbines at the new CoGen facilities. To accomplish this, two 4" branch lines would be added from this line, and each line would be about 400 feet long.

Total new inventory of LPG would be approximately 7,353 pounds, for a net increase of 7,070 pounds. The largest single containment would be 4,862 pounds within the 6" header from the new Reformer. Additional natural gas inventory is estimated at 126 pounds (feed line to the new Hydrogen Plant) and additional hydrogen inventory at 644 pounds.

Impacts from Increased Flammable Hydrocarbons and Hydrogen. The largest single amount of flammable hydrocarbons would occur as LPG in the 6-inch process line from the new Reformer and would contain 4,862 pounds. Table 2-3 of the 2006 RMP of the existing facility identifies several scenarios with releases of flammable hydrocarbons. For flammable hydrocarbons, the distance to the LOC is based on heat or a lower flammability limit rather than a toxic level. The RMP shows a 12,000 pound release of flammable hydrocarbons (from C-1650) to have a distance to a thermal LOC of 1,000 feet and a 3,100 pound release (from V-3590) to have a distance to thermal LOC of 620 feet. Thus the maximum release of 4,862 pounds from the Proposed Project would have a distance to a thermal LOC between 620 and 1,000 feet. The distance to an off-site receptor from the new Reformer area is about 3,000 feet. Therefore, a potential accidental release of LPG from the Proposed Project would not result in an offsite impact that would reach the thermal LOC. Consequently, the impact from such an event would be less than significant.

This analysis assumed a worst case in which the largest possible amount of flammable substance was assumed to be released. Other components of the Proposed Project, containing smaller quantities of additional hydrocarbons and located in other parts of the Refinery may be closer to the fence line. However, the released quantities from these smaller events would not contain enough energy to result in a significant offsite thermal impact. This conclusion is based upon the general rule that the distances to the LOC for thermal impacts from these smaller releases are much smaller than the distance for the Worst Case Scenario described above. In addition, for each of the major project additions, the estimated or verified Worst Case Scenario Overpressure Level of Concern (OLC), as determined in the 2006 RMP for similar quantities of flammables at the

existing Refinery would not reach any off-site receptors. Therefore, offsite receptors would not be exposed to safety hazards from such events and the impacts from such events would be less than significant.

The Proposed Project includes a new Hydrogen Plant to manufacture hydrogen and PSA equipment to increase the purity of the hydrogen used in processes throughout the Refinery. The accident risks of the 30,000 pounds of hydrogen that would be involved in the new Hydrogen Plant and in the handling and use of increased quantities of higher-purity hydrogen have been considered in this analysis.

As described in Section 5.2.3.2, *Other Refinery and Pipeline Projects*, Praxair, the operator of the new Hydrogen Plant also proposes to develop an underground hydrogen pipeline that would extend from the Chevron Refinery to the Shell Martinez Refinery with a spur that would extend to the property boundary of the ConocoPhillips Refinery. Praxair also proposes to construct a replacement backup natural gas pipeline to serve the new Hydrogen Plant and the Chevron Refinery.

Terrorism

Sabotage is one of the Public Safety issues that are evaluated when a Risk Management Plan is updated. To minimize sabotage or terrorism, various precautionary measures have been adopted. The standard security for the Refinery to minimize these events includes a chain link fence surrounding the entire facility with controlled gate entrances, third party security guards at all entrance locations, roving security guards, identification badges required for entry by all personnel, Refinery personnel must authorize visitors before entry to the facility, and general awareness training for all employees.

Since the September 11, 2001 terrorist attacks, a security protocol program has been developed and adopted for the Chevron Refinery consistent with the national alert color code system. Dependent upon the current alert level certain additional security measures are activated. These activities may include, stationing additional security guards at critical locations, additional sheriff patrols, restricted parking, restricted access, additional vehicle searches, and other sensitive security measures to protect the facility. Because of these precautions, the threat from terrorism would be minimized, and the addition of the Proposed Project at the Refinery would not increase the threat. Thus, the impact would be less than significant.

Mitigation: None Required.

References – Public Safety

American Industrial Hygiene Association (AIHA), *Emergency Response Planning Guidelines*, November 2006.

American Petroleum Institute (API), *Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants*, Sixth Edition, February 2004.

ChevronTexaco, *Second 30 Day Follow-up Report to Contra Costa Health Services on the Community Warning System Level 3 Event*. March 19, 2007.

ChevronTexaco, *California Accidental Release Prevention (CalARP) Program, ChevronTexaco Richmond Refinery*, Submitted to Contra Costa Health Services, Hazardous Materials Programs, June 2004.

Contra Costa County, Proposed Ordinance Code Chapter 450-8 on Industrial Safety, as Amended in 2004, January 28, 2004.

Lamphier-Gregory, *Chevron LPG Spheres Project Initial Study*, August 2001.

Praxair, Private Communication with Bob Chamberlin of Chevron, email sent April 18, 2007.

United States Environmental Protection Agency (US EPA), *Risk Management Program Guidance for Offsite Consequence Analysis*. Office of Solid Waste and Emergency Response. EPA-550-B- 99-009. April 1999.

4.14 Public Services

The effects of Public Services related to the implementation of the Proposed Project would be less than significant with implementation of mitigation measures identified in this EIR.

- The Proposed Project would not significantly affect the Richmond Police Department's ability to provide police protection services to the Proposed Project site and City of Richmond.
- The Proposed Project would not significantly affect the ability of the Richmond Fire Department to provide mutual aid fire suppression and emergency response services to the Refinery or to serve other parts of the City.
- The Proposed Project would not significantly affect the ability of the West Contra Costa School District to adequately provide educational services to residents of the City of Richmond. The Proposed Project would not significantly affect other public services such as libraries or hospitals.

4.14.1 Introduction

This section discusses local conditions for Public Services, including Police, Fire, Emergency Medical Services, Schools and other public services. The section also analyzes the potential impacts to these services which are related to or result from constructing and operating the Proposed Project.

4.14.2 Setting

Existing Conditions

Police Protection

The Plant Protection Department of the Refinery handles security response for the Refinery. Plant Protection is responsible for maintaining access control into and out of the Refinery; conducting internal traffic control; investigating internal motor vehicle accidents, thefts, drug and alcohol cases; and conducting contraband inspections. Plant Protection utilizes a contract security guard service inside the facility to assist primarily with access control and security (Piersante, 2007). During the morning and afternoon peak traffic periods when major Refinery turnarounds are occurring, and also during large construction projects such as the Proposed Project, Plant Protection hires (on an overtime basis), the Richmond Police Department to provide traffic control at contractor gates (Piersante, 2007).

The City of Richmond (City) Police Department received approximately 64 calls for assistance to the Refinery during 2005 (McBride, 2007a). The types of incidents to which the department

responds are typically incidents having to do with burglaries, thefts, stolen vehicles, annoying telephone calls, labor strikes, and death investigations (McBride, 2007).

The Richmond Police Department is located at 401 27th Street. The staffing varies depending on the time of day and day of week. Most personnel work during normal business hours, with the fewest working on weekends, swing shift and graveyard. The Department's current authorized strength is 206 sworn personnel (McBride, 2007). Of the department's fifteen police beats, one covers the geographic area in which the Refinery is located. Approximately 1.03% of that beat's activities are associated with serving the Refinery on an active or stand-by basis (McBride, 2007a).

Depending on availability of personnel and the type of call, the Police Department's response to calls is based on a system of priorities. It maintains a response time of three to five minutes or less for top priority calls (robberies in progress, imminent danger to life, etc.).

Fire Prevention and Protection

The Plant Protection Department of the Richmond Refinery also operates the Refinery's fire department. The City of Richmond Fire Department responds to fire and emergency medical events at the Refinery only when called by the Chevron Fire Department. This happens six or fewer times a year. When called, the Richmond Fire Department responds with three engines, one truck, and a Battalion Chief. In most instances in which the City Fire Department is called, it is to stand by a Chevron Fire Station while Chevron firefighters are handling the emergency. Over the last ten years the City Fire Department has actually helped control an emergency on five occasions (Ayers, 2005).

The Chevron Fire Department consists of 38 uniformed personnel. This organization is supplemented by a 75-person volunteer fire brigade. All of these people are trained to deal with emergencies associated with an oil refinery. The department has 21 vehicles equipped to respond to fire emergencies. These vary from fire engines to quick-attack vehicles. Over the last three years, the average response time to any location in the Refinery has been two minutes or less (Ayers, 2005).

Chevron follows nationally recognized fire prevention standards. These include, but are not limited to, those of the American Petroleum Institute, Uniform Fire Code, Uniform Building Code, and National Fire Protection Association. The Refinery Fire Department also does fire-prevention inspections and audits and reviews all plans for new construction or modifications to ensure all recognized fire prevention codes and standards are being followed (Ayers, 2005).

The current staffing of the Richmond Fire Department is 82 personnel. This figure includes the Fire Prevention Bureau, administrative and secretarial staff. The Department comprises seven engine companies and one truck company (Perez, 2007).

The three stations that are the first responding units to a Chevron fire incident are Station 61, at 108 W. Richmond in Pt. Richmond; Station 62, at 1065 7th Street; and Station 67, at

1131 Cutting Boulevard. Each of the three stations is staffed with three firefighters. The response time is between two and five minutes (Perez 2007).

In addition to responding to fire, rescue, and emergency medical incidents at the Refinery, the Richmond Fire Department makes routine and regular fire inspections there. Chevron pays an annual fee to the City to cover the costs of fire inspections and permits. A fire inspector is assigned to the Refinery and inspects bi-monthly for Uniform Fire Code inspections, eight hours a quarter for State-mandated hazardous materials inspections, and as needed by contractors doing contract work in the Refinery (Perez, 2007). The \$62,643 which Chevron currently pays for plan checking and inspection activities supports approximately one-half of the salary of a fire inspector. The amount of work involved in inspecting the proposed improvements could increase the time required of the inspector by an additional one-half (to full-time) (Perez, 2007). The City has indicated that it would be necessary to increase the annual Fire Department permit fee to cover contractual services costs associated with the increased workload precipitated by the Proposed Project (Perez, 2007). The fee increase would amount to at least an additional \$100,000, which would be used to supplement the additional cost of providing fire plan checking and fire inspection services for the existing Chevron Inspection Program (CIP) (Perez, 2007).

The City has indicated that the potential demands of code compliance inspections on the Richmond Fire Department could be reduced if a streamlined code review and compliance process were instituted. It is recommended that Chevron and the City develop and institute a streamlined code review and compliance process for the Proposed Project. That process should include coordinated plan review to ensure that complete and timely plans were submitted in accordance with City requirements, and also include the grouping of inspections with existing site visits.

Emergency Medical Service

The Chevron Refinery Fire Department currently has 35 trained California Certified Emergency Medical Technicians (EMTs). The minimum number of EMTs on duty at any given time is four, with as many as 12 to 15 on duty during the normal work week, Monday through Friday.

The Richmond Fire Department provides emergency medical service to the Chevron Refinery as a back-up to Chevron's Fire Department. The only time the Richmond Fire Department assists Chevron is if the incident is greater than the Chevron department can handle itself, or if Chevron staff are unable to respond. The Richmond Fire Department does not have data on how many of the six or fewer calls per year are medical emergencies (Perez, 2007).

The Chevron Fire Department responds to an average of approximately 185 calls per year. Approximately 100 calls per year can be classified as industrial accidents. Of this number, 75% to 80% are minor incidents such as particles in eyes, minor sprains, bee stings, etc. The other 20% to 25% are injuries of a more serious nature, such as broken bones, severe sprains, back injuries, head trauma or burns (Ayers, 2005).

When required, Regional Ambulance Service provides transportation to local hospitals or John Muir Hospital in Walnut Creek, the County's trauma center. The cost of the transportation is paid for by Chevron. Further discussion of Chevron's on-site safety procedures and response is discussed in Section 4.14, Public Safety.

Schools

The Proposed Project is located in the Washington Elementary Attendance Area, which feeds to Portola Middle School, and Kennedy High School. With the exception of Washington Elementary, the middle and high school have sufficient capacity to house students from new development; however, Washington elementary is project to be 10 students over its capacity in 2009-10. Therefore, students from any new development would need to be transferred to another elementary school within the Kennedy High School Attendance Area. The District does have a transfer policy in place for all of its schools. West Contra Costa Unified School District is not aware of any impact on the emergency plan for the school district (Blalock, 2005).

Other Public Services and Facilities

Other public facilities in the community include medical facilities, parks and libraries. There is one hospital located in Richmond, including the 50-bed Kaiser Foundation Hospital, Richmond Campus, at 901 Nevin Avenue. However, there are eight hospitals in Contra Costa County, and the next closest hospital is the Doctors Hospital of San Pablo. The closest library is the Richmond Public Library at 325 Civic Center Plaza. Parks and trails are discussed in Section 4.15, *Parks and Recreation*.

Regulatory Setting

Richmond General Plan and Zoning Ordinance

Applicable General Plan goals and policies pertaining to the Proposed Project are discussed under the Land Use section (Section 4.9) of this EIR. The Richmond Zoning Ordinance (Section 15.04.330.040) requires a Conditional Use Permit for petroleum refining and related industries. Zoning Ordinance Section 15.04.820 (Commercial and Industrial Provisions) stipulates industrial design guidelines for design, construction, and maintenance of fencing and landscaping. Finally, Zoning Ordinance Section 15.04.840 (Performance Standards) is intended to ensure that the uses and activities shall occur in a manner to protect public health and safety and do not produce adverse impacts on surrounding properties or the community at large.

4.14.3 Public Services Significance Criteria and Methodology

California Environmental Quality Act (CEQA) *Guidelines* Appendix G states that a project would have a significant impact to Public Services if it would result in substantial physical impacts associated with the provision of 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:

- Fire protection
- Police protection
- Schools
- Parks
- Other public facilities

On the basis of these criteria, implementation of the Project would result in a significant impact if it would increase the demands on the police and fire departments such that they were unable to maintain acceptable levels of service without a substantial need for new, altered, or expanded police or fire service facilities or equipment.

For the *Richmond Police Department*, an acceptable level of service involves a less than five minute response for “priority-one” calls and 15 minutes for “priority-two” calls. Priority-one calls involve incidents that require an immediate police response in order to preserve life or where an immediate response would be essential to apprehend a felony suspect when a felony is less than five minutes old (McBride, 2007).

For the *Richmond Fire Department*, an acceptable level of service involves responding to all emergencies within six minutes or less 85% of the time (Perez, 2007).

The physical effects on public roadways due to the traffic involved in the construction of the Proposed Project is considered in Section 4.16, *Traffic and Transportation*, under Impact 4.16-3.

4.14.4 Public Services Impacts and Mitigation Measures

Impact 4.14-1: Police Protection. During the construction phase, the Proposed Project could result in an increase in the number of incidents necessitating calls to the Richmond Police Department and an increased need for the Richmond Police Department to deploy traffic control personnel. This would be considered a less than significant impacts with included mitigation measures identified below.

Although the Police Department was not able to estimate how much of an increase in calls to the Police Department during the construction period would be caused by the Proposed Project, both Chevron and the Department acknowledge that there would most likely be some increase. The current employee base of 1,500 employees is projected to be increased by approximately 750 workers at the peak of construction, a 50% increase. A proportionate 50% increase in the current average 60 calls per year would result in approximately 30 additional calls to the Police Department during the peak year of construction and a proportionately smaller addition during the rest of the construction period.

In addition to an increase in calls for such incidents as burglaries, thefts, and stolen vehicles, traffic control could become an issue for the Police Department during the construction period because of the increased traffic by construction employees and trucks. Construction traffic effects are discussed in Section 4.16, *Traffic and Transportation*.

Since the Proposed Project would not necessitate an increase in permanent employees, there would be no need for improved facilities and no long-term impacts on the Police Department.

Mitigation Measure 4.14-1a: During the construction phase, Chevron shall hire additional contract security officers as necessary to compensate for the increase in personnel on site. The addition of these security officers would offset any additional demand for police services that would be created by the Proposed Project.

Mitigation Measure 4.14-1b: Chevron shall impose rules and regulations with respect to the conduct of their personnel who will be involved in the Proposed Project. These rules shall be designed to reduce the need for calls to the Richmond Police Department. Staff from the Richmond Police Department have indicated that Chevron is typically quite strict in its rules and regulations that must be followed by employees with respect to such activities as speeding and drinking. Chevron shall impose these same requirements on the contractors who would be involved in the Proposed Project. Chevron shall continue to work with the Richmond Police Department as it has done in the past (McBride, 2007).

Mitigation Measure 4.14-1c: Implement Mitigation Measures 4.16-1 through 4.16-4 (See Section 4.16, *Traffic/Transportation*) to reduce the demand for help from the Richmond Police Department for traffic-related issues.

Significance after Mitigation: Less than significant.

Impact 4.14-2: Fire Protection and Prevention. The Proposed Project would contribute to the ongoing need for the Richmond Fire Department to provide mutual aid to the Refinery. Mutual aid assistance by the Richmond Fire Department could reduce the duration of fires and thus reduce emissions releases from those fires. To effectively provide mutual aid, the Richmond Fire Department needs heavy rescue training and heavy rescue equipment to respond to fires and their associated environmental impacts, including emissions of air pollutants and hazardous materials releases. This would be considered a less than significant impact with the included mitigation measure identified below.

The effects of the Proposed Project on City fire services are of particular concern to staff from the Richmond Fire Department (RFD). The RFD works with the Chevron Richmond Refinery and with Contra Costa County Health Services in preparing for and responding to emergencies¹. This includes conducting emergency drills with the Refinery and/or Contra Costa County Health Services to prepare for fires and/or hazardous materials releases. The ability of the Fire Department to provide such mutual aid services depends on the levels of staff training and the equipment available to it.

The RFD training regarding elevations, trench rescue, confined space rescue, and high angle rescues relates to risks associated uniquely with both the existing and the proposed new facilities at the Chevron Refinery. The City has not provided an estimate of the costs associated with such training and equipment (Perez, 2007).

¹ See also the description of Chevron's Emergency Response Program in Section 4.13 Public Safety.

The proposed project includes replacing its current Refinery firehouse building, which was constructed prior to 1950. This component of the Proposed Project would involve construction of a 25,000 square-foot seismically safe firehouse to adequately protect critical Refinery communications and emergency response equipment. The proposed new firehouse would help reduce Chevron's need to rely on services and equipment from the City of Richmond Fire Department. Building permits from the City of Richmond would be required as well as a Design Review application and hearing with City of Richmond Design Review Board.

Mitigation Measure 4.14-2: Chevron and the City's Fire Department shall establish an agreement to address the extent of training in the area of industrial firefighting as part of the Proposed Project. This agreement shall cover 1) Training, Travel and per diem costs for Richmond Fire Department personnel to attend the Chevron Corporate Fire Training program at either Texas A&M University, the University of Nevada, Reno or equivalent. Training shall be conducted annually. Chevron shall commit to training 6-12 RFD members per year. This will allow for the training of each RFD member on a rotation basis. Chevron and RFD will continue their mutual training programs on an annual basis at both the Richmond Refinery and Richmond Fire Training Facility.

Significance after Mitigation: Less than significant.

Impact 4.14-3: The Proposed Project would not result in an increase in need for other public services such as schools or libraries. This would be a less than significant impact.

Schools

Implementation of the Proposed Project would not affect the ability of the West Contra Costa Unified School District to adequately provide educational services to residents of Richmond. Because the Proposed Project does not include a residential component, and the temporary construction workers are not expected to increase the City's population, no additional children would be anticipated to enroll in Richmond Schools because of the Proposed Project. Therefore, no new school facilities would be necessary to serve the proposed Project, so no adverse environmental impacts from facility construction and operation would occur.

Libraries

The Project would not directly or indirectly induce substantial population growth in the area (See Section 4.11). Because the existing local labor pool is anticipated to be adequate for the construction activities, and adequate numbers of construction workers currently reside within commuting distance, there would be no substantive increase in use of existing library services. Therefore, no additional constraints would be placed on any current public services providers such as libraries as a result of the Project. No adverse physical impacts associated with providing new or altered library facilities would occur.

Mitigation: None required.

Impact 4.14-4: The Proposed Project could result in an increase in the number of calls to the Richmond Fire Department during the construction phase of the Proposed Project, and possibly more assistance calls for medical emergencies. This would be considered a less than significant impact.

According to staff from the Richmond Fire Department, it is difficult to identify the increase in calls to the Fire Department resulting from implementation of the Proposed Project. However, it is expected that given the projected increase in the number of workers, an increase in medical emergencies during the construction period would also be expected. Given the current system, Chevron has the primary responsibility for responding to medical emergencies, and would, in most instances, handle the problems involving medical emergencies that would be associated with the additional personnel (Perez, 2007).

On the basis of the projected increase in construction workers and the current annual number of calls to the Fire Department for both fire and medical emergencies, it is estimated that there would be approximately an additional eight calls to which the Richmond Fire Department would be required to respond for medical emergencies during the peak year of construction. As noted previously, there are no records on how many of the calls to the Richmond Fire Department are for emergency medical incidents rather than fires. This projected level of increased response would not affect the Fire Department significantly (Perez, 2007).

Hospitals

The Proposed Project would not directly or indirectly induce substantial population growth in the area (See Section 4.11). Because the existing labor pool is anticipated to be adequate for the construction activities, and adequate numbers of construction workers currently reside within commuting distance, there would be no substantial increase in use of existing hospital services. Therefore, no new physical facilities associated with hospitals would be needed as a result of the Project, and no adverse physical impacts associated with the provision of new or altered hospital facilities would occur.

Mitigation: None required.

References – Public Services and Utilities

- Ayers, Mark. Chevron Fire Chief, e-mail communication, December 3, 2005.
- Blalock, Adrienne, Director of Bond facilities, West Contra Costa Unified School District, Personal Communication, November 22, 2005.
- McBride, Eugene, Captain, Richmond Police Department, Personal Communication, April 24, 2007.
- McBride, Eugene, Captain, Richmond Police Department, Personal Communication, April 26, 2007a.
- Perez, Don, Fire Marshall, Richmond Fire Department, Personal Communication, April 9, 2007
- Piersante, Mark. Chevron Contractor, Personal Communication, May 1, 2007

4.15 Parks and Recreation

Construction and operation of the Proposed Project would result in effects related to Parks and Recreation that would be less than significant and would not require mitigation measures:

- The construction of the Proposed Project would not increase the use of nearby neighborhood parks or increase demand by construction workers for use of the proposed segments of the Bay Trail along Western Drive.
- None of the physical changes occurring with the implementation of all components of the Proposed Project would affect the proposed Bay Trail alignment.

4.15.1 Introduction

This section discusses regional and local parks and recreational facilities and analyzes the potential impacts related to constructing and operating the Proposed Project.

4.15.2 Setting

4.15.2.1 Existing Conditions

Regional Parks

Within Alameda and Contra Costa Counties, the East Bay Regional Park District (EBRPD) manages 94,500 acres; 59 regional parks, recreation areas, wilderness, shorelines, preserves and land bank areas; 29 regional inter-park trails; 1,150 miles of trails within parklands; freshwater swimming areas, boating and/or stocked fishing lakes and lagoons and a disabled accessible swimming pool; 40 fishing docks; three bay fishing piers; 235 family campsites; 42 youth camping areas; two golf courses; 2,082 family picnic tables; 1,707 group picnic tables; interpretive and education centers; and 18 children's' play areas. Ninety percent of EBRPD's lands are protected and operated as natural parklands (EBRPD, 2005).

Regional parks within approximately five miles of the project site include:

- **Brooks Island.** The 373-acre Brooks Island in San Francisco Bay is located to the south of the project site just off the Richmond Inner Harbor. The Island is open for limited group guided tours and provides hiking trails and field archery ranges.
- **Miller/Knox Regional Shoreline.** This 295-acre area, located about 1 mile south of the project site, includes a shoreline picnic area and swimming beach area on Dornan Drive in Point Richmond.
- **Point Isabel.** Point Isabel is a 21-acre landscaped park, located about 4 miles to the southeast of the project site at the west end of Central Avenue in Richmond. Amenities include jogging trails and picnic areas.

- **Point Pinole Regional Shoreline.** Point Pinole is a 2,315-acre parkland, located approximately 4 miles to the northeast of the project site next to the cities of Richmond, San Pablo, and Pinole. The park includes hiking, bicycling, and horse trails and a 1,250-foot fishing pier.
- **Tilden Park.** Tilden Park is a 2,077-acre regional park that provides amenities such as pony rides, a carousel, hiking trails, swimming and picnicking, a botanical garden, a gold course, and a nature area and farm. Tilden Park is located to the east of the project site in the Berkeley Hills.
- **Wildcat Canyon.** Wildcat Canyon Regional Park is a 2,428-acre park that has hiking, biking, and equestrian trails, and picnic facilities. It is located to the northeast of the project site to the north of Tilden Park.

(EBRPD, 2005)

Local Parks

The City of Richmond's Recreation and Parks Department manages the City's recreation and cultural programs and services. The Department oversees the operations of eleven community centers, a marina, aquatics programs, senior programs, youth programs, sports leagues and fitness centers, adult programs, arts programs, performances by the Oakland East Bay Symphony, festivals, after school programs, education programs, mentor programs, youth city government, disabled programs, and a convention center.

Neighborhood parks within the vicinity of the Proposed Project site include Atchison Park (4.3 acres), located approximately 0.5 miles to the east of the project site at Bissell Avenue and Curry Street; Washington Park (2.51 acres), located approximately 0.5 miles to the southeast of the project site at 110 E. Richmond Avenue at Garrard Boulevard; Nevin Park and Community Center (4.38 acres), located approximately 1 mile to the east of the project site at 598 Nevin Avenue at 6th Street; and Lucas Park (7.14 acres), located approximately 1.25 miles to the northeast of the project site at the terminus of Lucas Avenue near 10th Street (City of Richmond, 1994a).

San Francisco Bay Trail

Senate Bill 100, authored by Bill Lockyer, was passed into law in 1987, and directed the Association of Bay Area Governments (ABAG) to develop a plan for a "ring around the Bay," including a specific alignment for the Bay Trail. The Bay Trail, which includes approximately 240 miles of the alignment provides easily accessible recreational opportunities for outdoor enthusiasts, including hikers, joggers, bicyclists, and skaters. It also offers a setting for wildlife viewing and environmental education, and it increases public respect and appreciation for the Bay. It also has transportation benefits, providing a commute alternative for cyclists and connections to numerous public transportation facilities.

Depending on the location of its segments, the Bay Trail consists of paved multi-use paths, dirt trails, bike lanes, sidewalks, or city streets signed as bike routes. Near the Richmond Refinery, a designated Bay Trail segment is planned from the Point Richmond neighborhood to the Richmond/San Rafael Bridge and north along the shoreline of Point San Pablo Peninsula passing

through Point Molate and the Winehaven Historic District around Point San Pablo to the Point San Pablo Yacht Harbor. Chevron owns a significant portion of this property from north of I-580 to Point Molate and substantial Refinery infrastructure exists in this area that presents post 9/11 security issues. Caltrans has built a Bay Trail segment under the Richmond/San Rafael Bridge that connects the south side of the toll plaza with Western Drive on the north side of I-580 (see Figure 4.15-1); however, it is difficult for pedestrians/bicyclists to access the south side of the Toll Plaza area, and there is no trail continuing north to Points Molate and Pinole. Completed portions of the Bay Trail exist along Garrard Boulevard and Cutting Boulevard (Beyaert, 2005). See Figure 4.15-1 for more complete information regarding existing and planned trails in the vicinity of the Refinery.

During the public scoping period for this EIR (June-July 2005), the bulk of comments received on the Notice of Preparation were concerned with local Bay Trail issues. Many of the letters were from the Trails for Richmond Action Committee (TRAC) or supporters of TRAC's views. Specifically these comments state that for consistency with adopted plans and to compensate for presumed adverse transportation, air quality and recreational impacts of the Proposed Project, TRAC recommends that Chevron be required to provide public access easements, and build and maintain Class I Bay Trail segments connecting:

1. the bus stop at the intersection of Castro Street and Tewksbury Avenue with the existing trail on toll plaza area, and
2. the north side of I-580 and the south side of the Richmond San Rafael Bridge corridor with the City of Richmond's former Point Molate Naval Fuel Depot via the planned Bay Trail shoreline route.

CEQA requires mitigation for environmental impacts that are found to be significant. The mitigation measures must be "roughly proportional" to the impacts of the Proposed Project (See CEQA Guidelines § 15126.4). The City is unable to find that completion of the proposed Bay Trail segments would mitigate any of the significant effects on the environment identified in this EIR. As shown on Figures 3-3 and 4.15-1, Proposed Project components near the proposed Bay Trail alignment south of I-580 would consist of replacing existing tanks with in existing tank fields (the Office Hill Tank Field). This would not create any new obstruction affecting the existing or proposed alignment of the Bay Trail. Furthermore, in order to route the Bay Trail through this same area to connect it with the southern side of the Caltrans segment under the Richmond/San Rafael Bridge, the proposed Bay Trail alignment would be required to pass through Chevron's existing tank field and other critical Refinery infrastructure. Chevron contends that this would represent a security risk to the Refinery.¹ With regard to the impacts of the Proposed Project

¹ Comments received during the scoping period cite a July 31, 2001 study, *Feasibility Study of Bay Trail Routes to the Point San Pablo Peninsula*. The commenters contend that Chevron's safety issues could be addressed; however, Chevron contends that this report was prepared in the pre-9/11 security environment and that post-9/11 security concerns now cannot be addressed by the methods suggested in the feasibility study (Squatriglia, 2007). Recently, the Richmond City Council passed Resolution 34-07 (March 20, 2007) requesting the California State Lands Commission, as part of its approval of the Chevron Long Wharf lease renewal, to require Chevron to provide public easements for the proposed Bay Trail segment as suggested in the July 31, 2001 Feasibility Study. The State Lands Commission declined to adopt the requested mitigation because the Long Wharf facilities would not be an

identified in this EIR, there is no relationship between these impacts and the proposed Bay Trail. Long-term impacts to traffic would be less than significant. Temporary impacts to air quality, noise and traffic would result from construction activities. However, these construction impacts would be of limited duration and would be mitigated to a less-than-significant level with the adoption of mitigation measures identified in this EIR. Completion of the Bay Trail would not have the effect of further lessening any of these temporary construction impacts. Thus, the requested measure is not applicable to the Proposed Project and will not be considered further in this document. For further discussion of the Bay Trail, please see the discussion of Impact 4.9-2 in Section 4.9, *Land Use, Plans, and Policies*.

Chevron Refinery On-Site Recreational Facilities

The Refinery has a rod and gun club located on the northern portion the site. The club has extensive recreational facilities including a marina on San Pablo Bay and these facilities (Health Quest gym, Rod & Gun Club and sports leagues) are available to long-term, full-time contractors. Access to the Rod & Gun Club has been reduced and restricted for employees, contractors, and other visitors post-9/11 for security reasons.

4.15.2.2 Regulatory Framework

City of Richmond General Plan

The Richmond General Plan contains policies pertaining to recreation and parks within its Community Facilities Element and Growth Management Element. In addition, the Growth Management Element contains performance standards that would be applicable to the Proposed Project. Performance standards implement the goals and policies of the Growth Management Element. The General Plan states that “[a]ll new development shall be approved only if...performance standards are met.”² These relevant policies and performance standards are set forth below.

Policies

Policy CF-A.4: Protect public recreation and park areas and facilities against encroachment or acquisition for other public or private uses.

Policy CF-A.7: Ensure that sufficient land is available to meet the existing and future needs for regional shoreline recreation.

Policy CF-A.8: Promote the development of regional and local urban trails and collaborate with regional, County, and other local public agencies and with nonprofit and private groups to develop urban trail systems.

impediment to the proposed Bay Trail, the proposed project would not involve changes that would result in a land use plan or policy impact, and the Commission does not have jurisdiction outside the leased premises. (State Lands Commission, Final EIR for Chevron Long Wharf Marine Terminal (Feb. 2007), Response to Comment 3-1.) In addition, the Long Wharf project site is differently situated from the Office Hill Tank Field (i.e., along the shoreline), and the site-specific health and safety and security concerns are not the same.

² These performance standards apply only to capital facilities and exclude personnel requirements and operating materials.



SOURCE: Track 2005

Chevron Energy and Hydrogen Renewal Project . 205166

Figure 4.15-1
Recreation Facilities Within the Vicinity of the Project Site

Policy CF.D.2: Encourage developers to provide dedicated public park land, trails, and facilities instead of in lieu fees.

Policy OSC-O.1: Provide access to shoreline parks by...hiking trails, and biking trails...to ensure that all residents are able to utilize the shoreline parks.

Policy OSC-O.2: Urge the development of public access points in order to make Richmond's open space visible to large numbers of people.

Policy OSC-O.3: Encourage free public access in areas of proposed shoreline development.

Policy OSC-O.5: Provide maximum feasible access to the Richmond shoreline.

Policy OSC-S.5: Provide public access where a local or regional trail is planned or located.

(City of Richmond, 1994b)

Guidelines for the West Shoreline Area

Community Facilities Element, page CF-11: Encourage the creation of a recreational corridor along the western shore of Point San Pablo through trail connections between parks and commercial recreation sites.

Open Space and Conservation Element, page OSC-13: Establish a public access trail plan line from Point Richmond to Point San Pablo including a pedestrian trail from Keller Beach to the Richmond-San Rafael Bridge and a bicycling trail from I-580 along Western Drive to the tip of Point San Pablo.

(City of Richmond, 1994b)

Performance Standards

The Growth Management Element sets forth performance standards related to recreation and parks including the provision of a city park acreage standard of 3 acres of park per 1,000 population, or 0.003 acres per person. This includes city-developed and -planned park sites and recreational trails, but does not include recreation center space, regional park acreage, or other jurisdictions' facilities (City of Richmond, 1994b).

Contra Costa County Transportation Authority Bicycle and Pedestrian Plan

On December 17, 2003, the Contra Costa Transportation Authority adopted its first ever Countywide Bicycle and Pedestrian Plan. The Authority designed the CBPP to outline bicycle and pedestrian needs for Contra Costa; refine the Authority's goals and strategies as they apply to bicycling and walking; encourage local efforts to improve the environment for bicycling and walking in the communities of Contra Costa; and spur greater interest in and support for bicycling and walking generally.

The CBPP establishes five goals:

- Expand, improve, and maintain facilities for bicycling and walking;
- Improve safety for bicyclists and pedestrians;

- Encourage more people to bicycle and walk;
- Support local efforts to encourage walking and bicycling; and
- Plan for the needs of bicyclists and pedestrians.

The Plan contains the same planned bicycling trail near the Richmond Refinery as identified by the Bay Trail Plan (see Figure 4.15 -1) (Contra Costa Transportation Authority, 2003).

San Pablo Peninsula Open Space Study

The San Pablo Peninsula Open Space Study designates a portion of the Refinery to include a class I recreational trail and a class II recreational trail along the Bay. The following recommendations included in the Study that are applicable to recreation facilities on Refinery property include:

- Interior trails throughout the Primary Study Area need to be jointly designed by the implementing agency(ies), Chevron, and other affected organizations or private entities, to ensure that refinery safety concerns are addressed.
- Chevron should be encouraged to work with potential park operators to transfer lands on the shore side of Western Drive to a public entity for park and recreation purposes.
- The obsolete railroad line running from the Chevron Refinery toward Terminal 4 should be abandoned and considered for use as a Class I trail.

(LSA Associates, Inc. et al., 2005)

4.15.3 Parks and Recreation Significance Criteria and Methodology

Significance Criteria

California Environmental Quality Act (CEQA) Guidelines Appendix G states that a project would have a significant recreation-related impact if it would:

- 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; or
- Include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment.

CEQA Guidelines Appendix G topics that will not be discussed further in this EIR

Review and comparison of the Proposed Project to the environmental setting clearly shows that the Proposed Project would create no impacts related to the following environmental topics listed in CEQA Guidelines Appendix G.

- Potential of the Proposed Project to include or require the construction of additional park or recreation facilities, which might have an adverse effect on the environment.**

The Proposed Project does not include parks or recreational facilities nor require the expansion or construction of any recreational facility. Thus, there would be no impact related to construction or operation of the Proposed Project.

4.15.4 Parks and Recreation Impacts and Mitigation Measures

Impact 4.15-1: The temporary increase construction labor force during construction of the Proposed Project could increase the use of nearby neighborhood parks and increase demand for use of the proposed segments of the Bay Trail along Western Drive. This would be a less than significant impact.

An average of roughly 300 construction workers per day with a peak six-month period (in 2008) of approximately 750 workers is expected with the Proposed Project. These workers could, during lunch times, temporally increase the usage of local parks or the proposed segments of the Bay Trail along Western Drive. Because most construction labor would enter the Refinery at Gate 91 on the east site of the Refinery (See Section 4.16, *Traffic*) it is unlikely that construction worker would use any of the proposed Bay Trail segment to the west of the Refinery. Furthermore, time constraints getting to and from work area within the Refinery to local parks would be a disincentive for workers to leave the Refinery during work hours. Thus, this would be a less than significant impact.

As is discussed in Section 4.11, *Population and Housing*, no significant increase in local resident population and correspondingly, no significant impacts to local recreational facilities would occur.

Mitigation: None Required

References – Parks and Recreation

- Beyaert, Bruce, 2005. Chair, Trails for Richmond Action Committee (TRAC), written communication, July 21, 2005.
- City of Richmond, 1994a. *Volume Two of the Richmond General Plan, Technical Appendix*, August 1994.
- City of Richmond, 1994b. *Volume One of the Richmond General Plan, Goals, Policies, Guidelines, Standards, and Implementation Programs*, August 1994.
- City of Richmond, 2007, *Resolution 34-07*, March 20, 2007
- Contra Costa Transportation Authority, 2003. *Contra Costa Countywide Bicycle and Pedestrian Plan*, adopted December 17, 2003.
- LSA Associates, Inc. et al., 2005. *San Pablo Peninsula Open Space Study*, May 2005.
- East Bay Regional Park District (EBRPD), 2005. <http://www.ebparks.org/>, accessed October 20, 2005.
- Squatriglia, Chuck, “Dustup over missing link of Bay Trail, Chevron refuses access over its refinery land, citing security risk.” *San Francisco Chronicle*, Monday, April 2, 2007

4.16 Transportation and Traffic

The Transportation effects related to the implementation of the Proposed Project would occur primarily during construction of the Proposed Project components. The construction phase of the Proposed Project would generate up to about 1,767 daily trips, including 485 a.m. peak-hour trips and 400 p.m. peak-hour trips, at the Chevron Refinery.

- Project-generated increases in traffic volumes at the signalized study intersections of Castro Street / General Chemical Access, and Richmond Parkway / Gertrude Avenue would result in a significant impact to peak-hour operations.
- The impact at the above-cited intersections can be mitigated by implementation of Mitigation Measures 4.16-1 to 4.16-2, which include (1) the provision of traffic control personnel during peak arrival and departure times in the a.m. and p.m. peak hours, and (2) reconfiguration of lanes on specific intersection approaches during the affected peak hour(s), through the use of traffic cones (and flaggers as needed). Implementation of those measures would mitigate the project impacts to a less-than-significant level.

Operation of the Proposed Project following project construction would generate about 34 new daily one-way truck trips because of increased import and export of materials to and from the Refinery. Refinery permanent employment levels would increase by 10 employees. This amount of added traffic is insignificant when compared to the 2025 traffic volumes at the study area intersections.

4.16.1 Introduction

This section discusses the existing traffic conditions at the Refinery and its vicinity, and estimates the traffic that would be generated due to Project construction, and operation of the Project in the future¹. This section also describes the traffic impacts and presents measures to mitigate significant traffic impacts of the Project.

4.16.2 Setting

4.16.2.1 Roadway Network

Regional access to the site is provided via Interstate 580 (I-580) and Interstate 80 (I-80). Local site access is provided via Castro Street and Richmond Parkway.

¹ The analysis of potential transportation impacts is based on a critical review of information in the *Documentation of Existing Baseline Traffic Conditions* memorandum (June 8, 2005), and *Revised Traffic Impact Analysis for Chevron Renewal Project EIR* memorandum (February 22, 2007), which are included in Appendix C.

I-580 is a six-lane freeway in the vicinity of the project site and connects *I-80* east of the Project with U.S. 101 in Marin County via the four-lane Richmond – San Rafael Bridge. The median lanes on *I-580* are designated high-occupancy vehicle lanes during peak commute periods. The Chevron Refinery is located on the northern side of the *I-580* / Castro Street interchange. The average daily traffic volume on *I-580* is about 54,000 vehicles (Caltrans, 2006).

I-80 is a major east-west freeway link providing access between Richmond and Oakland / San Francisco to the south and west, and Sacramento to the east. Through the City of Richmond, six travel lanes are provided on *I-80*. Drivers traveling to and from the northeast between *I-80* and the project site use the Richmond Parkway, which extends from *I-80* near the northern limits of the City to *I-580*. The average daily traffic volume on *I-80* is about 190,000 vehicles (Caltrans, 2006).

Castro Street / Richmond Parkway is a major local road providing access to freeways in the cities of Richmond and San Pablo. It connects *I-580* in the south (at Castro/Marine Streets interchange) and *I-80* in the north (at Fitzgerald Drive / Richmond Parkway interchange in San Pablo). Refinery Access Gates 31 (Mills Street) and 91 (General Chemical Access), which would be used during the project construction, are located on Castro Street. The average daily traffic volumes on Castro Street and Richmond Parkway are about 27,200 vehicles and 32,800 vehicles, respectively (Wilbur Smith Associates, 2005).

4.16.2.2 Existing Traffic Conditions

To assess existing traffic conditions on the local street network serving the Refinery, existing intersection operating conditions were evaluated for the morning (7:00 to 9:00 a.m.) and evening (4:00 to 6:00 p.m.) peak periods at the following 11 study intersections (see Figure 1 in the 2007 memo in Appendix C), all of which are controlled by traffic signals, except as indicated below:

1. Chevron Way / Marine Street (side-street Stop sign control on Chevron Way)
2. Castro Street / Tewksbury Avenue (all-way Stop sign control)
3. Marine Street / *I-580* Eastbound Ramps
4. Castro Street / *I-580* Eastbound Ramps
5. Castro Street / Chevron Way
6. Castro Street / *I-580* Westbound Ramps (Gate 14)
7. Castro Street / Mills Street (Gate 31)
8. Castro Street / General Chemical Access (Gate 91)
9. Castro Street / Hensley Street
10. Richmond Parkway / Hensley Street
11. Richmond Parkway / Gertrude Avenue

To measure and describe the operating conditions of intersections, a rating system called Level of Service (LOS) is commonly used. LOS is a qualitative description of an intersection's performance based on the average delay per vehicle. The levels range from LOS A, which indicates free-flow vehicular traffic conditions with little or no delay experienced by motorists, to LOS F, which indicates congested conditions with long delays. Table 4.16-1 presents the LOS criteria for the signalized and the unsignalized intersections.

**TABLE 4.16-1
DEFINITIONS FOR INTERSECTION LEVEL OF SERVICE**

Unsignalized Intersections		Level of Service Grade	Signalized Intersections	
Description	Average Total Vehicle Delay (Seconds)		Average Control Vehicle Delay (Seconds)	Description
No delay for stop-controlled approaches.	≤10.0	A	≤10.0	Free Flow or Insignificant Delays: Operations with very low delay, when signal progression is extremely favorable and most vehicles arrive during the green light phase. Most vehicles do not stop at all.
Operations with minor delay.	>10.0 and ≤15.0	B	>10.0 and ≤20.0	Stable Operation or Minimal Delays: Generally occurs with good signal progression and/or short cycle lengths. More vehicles stop than with LOS A, causing higher levels of average delay. An occasional approach phase is fully utilized.
Operations with moderate delays.	>15.0 and ≤25.0	C	>20.0 and ≤35.0	Stable Operation or Acceptable Delays: Higher delays resulting from fair signal progression and/or longer cycle lengths. Drivers begin having to wait through more than one red light. Most drivers feel somewhat restricted.
Operations with increasingly unacceptable delays.	>25.0 and ≤35.0	D	>35.0 and ≤55.0	Approaching Unstable or Tolerable Delays: Influence of congestion becomes more noticeable. Longer delays result from unfavorable signal progression, long cycle lengths, or high volume to capacity ratios. Many vehicles stop. Drivers may have to wait through more than one red light. Queues may develop, but dissipate rapidly, without excessive delays.
Operations with high delays, and long queues.	>35.0 and ≤50.0	E	>55.0 and ≤80.0	Unstable Operation or Significant Delays: Considered to be the limit of acceptable delay. High delays indicate poor signal progression, long cycle lengths and high volume to capacity ratios. Individual cycle failures are frequent occurrences. Vehicles may wait through several signal cycles. Long queues form upstream from intersection.
Operations with extreme congestion, and with very high delays and long queues unacceptable to most drivers.	>50.0	F	>80.0	Forced Flow or Excessive Delays: Occurs with oversaturation when flows exceed the intersection capacity. Represents jammed conditions. Many cycle failures. Queues may block upstream intersections.

SOURCE: Transportation Research Board, Special Report 209, *Highway Capacity Manual*, updated 2000.

The study intersections for this analysis, both signalized and unsignalized, were evaluated using the 2000 *Highway Capacity Manual* (HCM) methodology (TRB, 2000). For signalized and four-way stop-controlled intersections, LOS is defined based on average delay (in seconds per vehicle) for the overall intersection. For side-street stop-controlled intersections, the average delay and LOS are reported for the movements subject to delay by conflicting vehicles (i.e., vehicles on the side street(s) and vehicles making left turns on the major street).

The City of Richmond General Plan classifies Richmond Parkway and Castro Street as Routes of Regional Significance.² Per Contra Costa County and the City of Richmond, signalized and unsignalized intersections on Routes of Regional Significance are considered to be functioning under acceptable conditions if the service level is LOS D or better.³

Existing peak-hour traffic volumes for the study intersections were collected in May 2005. Review of more-recent traffic volume data indicates that the 2005 volumes remain valid for the analysis presented herein (Thompson, 2007). During weekday peak traffic hours, all 11 study intersections currently operate at an acceptable LOS D or better, except the intersection of Castro Street and I-580 Westbound Ramps, which operates at an unacceptable LOS E during the p.m. peak hour (see Table 4.16-2).

**TABLE 4.16-2
INTERSECTION PEAK-HOUR TRAFFIC LEVEL OF SERVICE (LOS) OPERATIONS –
EXISTING CONDITIONS**

#	Intersection	Traffic Control ^a	AM Peak Hour		PM Peak Hour	
			Delay ^b	LOS	Delay ^b	LOS
1.	Chevron Way / Marine Street	SSSC	10.0	B	10.5	B
2.	Castro Street / Tewksbury Avenue	AWSC	8.8	A	9.1	A
3.	Marine St. / I-580 Eastbound Ramps	Signal	12.1	B	18.2	B
4.	Castro Street / I-580 Eastbound Ramps	Signal	12.8	B	30.5	C
5.	Castro Street / Chevron Way	Signal	0.1	A	0.1	A
6.	Castro Street / I-580 Westbound Ramps	Signal	31.5	C	60.7	E
7.	Castro Street / Mills Street	Signal	2.7	A	22.1	C
8.	Castro St. / General Chemical Access	Signal	6.6	A	31.4	C
9.	Castro Street / Hensley Street	Signal	3.2	A	5.8	A
10.	Richmond Pkwy. / Hensley Street	Signal	16.6	B	16.8	B
11.	Richmond Pkwy. / Gertrude Avenue	Signal	38.6	D	42.7	D

^a SSSC = side-street stop-controlled intersection; AWSC = all-way stop-controlled intersection; Signal = traffic signal-controlled intersection.

² As described in the City of Richmond General Plan, routes of regional significance are roadways that (1) connect to a regional highway/transit facility; (2) carry significant amount of traffic; (3) cross County boundaries; and/or (4) connect more than one region of the County.

³ The West Contra Costa County Transportation Advisory Committee's *West Contra Costa County Action Plan 2000 Update* (July 2000) establishes a Traffic Service Objective of LOS D or better for intersections on Routes of Regional Significance. The City of Richmond General Plan policies stipulate that LOS standards shall comply with WCCTAC's Action Plan.

- ^b Average overall intersection control delay (seconds per vehicle) reported for signalized and all-way stop-controlled intersections.
Average delay on the highest-delay movement/approach reported for side-street stop-controlled intersections.

SOURCE: Wilbur Smith Associates, February 2007.

4.16.2.3 Regulatory Setting

As stated above, Contra Costa County and City of Richmond stipulate that the standard for acceptable traffic operating conditions at signalized and unsignalized intersections on Routes of Regional Significance is LOS D or better.

4.16.3 Traffic Impact Significance Criteria and Methodology

Significance Criteria

Based on Appendix G of the *CEQA Guidelines*, a project may be deemed to have a significant effect on the environment with respect to traffic and transportation if it would result in:

- a) Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections)?
- b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?
- c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?
- d) Substantially increase hazards 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?
- f) Result in inadequate parking capacity?
- g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?

CEQA Guidelines Appendix G topics that will not be discussed further in this EIR

Review and comparison of the Proposed Project to the environmental setting clearly shows that the Proposed Project would create no impacts related to the following environmental topics listed in CEQA Guidelines Appendix G.

- c. **Would the Proposed Project 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 Project would not involve aircraft, would not be near an airport, nor would the Project structures intrude into aircraft flight paths or air traffic spaces. Therefore, the

Proposed Project would have no impact on air traffic patterns that results in substantial safety risks.

d. Would the Proposed Project substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

The Proposed Project would not involve redesign or reconfiguration of roadways. Measures that are needed to mitigate traffic volume effects would eliminate any increase in hazard due to added trucks and workers automobiles accessing the Refinery. There would be no incompatible uses nor would there be roadway design changes. Therefore the Proposed Project would have no impact on road hazards.

e. Would the Proposed Project result in inadequate emergency access?

The Proposed Project would not involve obstruction, redesign or reconfiguration of roadways. Nor would the Proposed Project affect emergency services providers. Therefore the Proposed Project would have no impact on emergency access.

f. Would the Proposed Project result in inadequate parking capacity or result in projected parking demand that would exceed the proposed parking supply on a regular and frequent basis?

The Proposed Project would include adequate parking on or adjacent to Refinery property. The Proposed Project would not diminish the local parking supply. There would be no parking effect offsite. Therefore the Proposed Project would have no impact on parking.

g. Would the Proposed Project conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)? Would it result in potential conflicts for pedestrians or bicyclists or would it increase transit demand above the levels provided by local transit operators or agencies?

The Proposed Project would not involve obstruction, redesign or reconfiguration of roadways, nor would it affect bus routes or bicycle racks. Given that there would be little or no effect on population, there would be no increase in transit demand. The Proposed Project would have no impact on adopted policies, plans, or programs supporting alternative transportation.

Approach to Traffic Impact Analysis

Traffic Sources

The following four primary sources of traffic generation would be associated with the Refinery over the Proposed Project construction period (expected to occur over 60 months):

- Proposed Project Construction including the four large components, replacement and new tank construction, new control building construction and new maintenance facility construction.
- Refinery Operations: associated with the normal day-to-day operations of the refinery, which will continue through the duration of Proposed Project construction. Existing refinery-operations traffic is part of the Setting condition for this analysis. Changes to operations-related traffic generation, following project construction, would be minor, as described below.
- Major Turnarounds: associated with periodic refinery maintenance, and a component of normal refinery operations.
- Other cumulative Refinery Projects (see Section 5.2).

For the purposes of this analysis, traffic associated with Proposed Project construction is the basis for determining the significance of direct Proposed Project impacts. In addition, cumulative impacts associated with other projects and major turnarounds are addressed herein, as are increases in traffic volumes associated with Refinery operations.

The traffic study evaluated the following scenarios:

- 2008 Baseline Conditions
- 2008 Baseline Plus Proposed Project Construction Conditions
- 2008 Baseline Plus Proposed Project Construction Plus Other Projects Construction Conditions
- 2008 Baseline Plus Proposed Project Construction Plus Other Projects Construction Plus Major Refinery Turnaround Conditions
- Future 2025 Conditions (assuming normal refinery operations, and changes to existing operations-related traffic generation following project construction).

The year 2008 was selected for the analysis of construction traffic impacts because the expected peak traffic period of the Proposed Project construction period would be during the first quarter of 2008. The impact of the project was estimated by evaluating how intersection levels of service would change with the addition of construction-related traffic to the baseline conditions.

For the cumulative (2025) scenario, the Proposed Project would be in its operational phase (i.e., construction of its components would have been completed). The 2004 *Contra Costa Transportation Authority* Travel Demand Forecasting Model (CCTA Model) was used to identify 2025 conditions. The CCTA Model forecast includes the most up-to-date information regarding City and County land use and transportation improvement information for both Contra Costa and Alameda Counties, and uses Association of Bay Area Governments (ABAG) *Projections 2000 and 2002* for land use and employment. Operation of the refinery following project construction would generate about 34 new daily one-way truck trips because of increased import and export of materials to and from the refinery. Refinery permanent employment levels would increase by only 10 employees.

Trip Generation

The trip generation of the Proposed Project (and Other Projects, and Major Refinery Turnarounds) was obtained from estimates provided by Chevron. These estimates provide information regarding the construction-related vehicle and truck trips. Vehicle and truck traffic estimates are provided, as well as the total Passenger Car Equivalents (PCE).⁴ Table 4.16-3 presents the estimated increase in peak daily traffic during the construction period. Note that the table includes estimates not only for Proposed Project construction traffic, but also estimates for normal project operations, major turnarounds, and Other Projects, as these activities will occur during the same periods as Proposed Project construction.

Table 4.16-4 presents the a.m. and p.m. peak-hour traffic generation estimates for the peak 2008 construction period of the Proposed Project, the Other Projects that occur during the peak construction activity, and the Major Refinery Turnarounds that occur during the peak construction activity. The highest daily volume of traffic that can be expected to occur over the course of planned Proposed Project construction (i.e., if a major turnaround were to occur) is estimated to be about 2,283 PCE.

Trip Distribution

The trip distribution of the construction-related vehicle trips was based on the existing directional split of the vehicles currently entering/leaving Gate 91 from/to North and South. A previous study (*Cleaner Fuels Project Circulation Analysis*) for the Chevron Refinery was used to identify the trip distribution of the construction-related trucks. The resulting trip distribution of the construction-related traffic is shown in Table 4.16-5.

Trip Assignment

The a.m. and p.m. peak-hour peak construction-generated trip generation estimates were applied to the distribution paths described above, and the construction period trips were assigned to Gates 91, 31 and 67, with the majority of the trips oriented to/from Gate 91. The assigned project trips were added to 2008 baseline a.m. and p.m. peak-hour volumes to derive the 2008 with-project traffic volumes and to determine project-specific impacts to study area intersections.

⁴ Passenger-car equivalent (PCE) represents the number of passenger cars displaced by each truck in the traffic stream. One truck is the equivalent of two passenger cars for this analysis.

TABLE 4.16-3
CHEVRON RICHMOND REFINERY RENEWAL PROJECT, OTHER PROJECTS, MAJOR TURNAROUNDS, AND REFINERY OPERATIONS
ESTIMATED DAILY TRIP GENERATION, BY QUARTER^a

Year Quarter	2007				2008				2009				2010				2011 x4 ^b	2012 x4 ^b	2013 x4 ^b
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th			
Worker Vehicles																			
<u>Proposed Project Construction</u>																			
Craft labor vehicle traffic ^c	35	35	376	1,437	1,556	1,506	1,167	736	673	673	673	673	147	72	72	72	72		
Construction support ^d	1	1	9	36	39	38	29	18	17	17	17	17	4	2	2	2	2		
Total Proposed Project Autos per day ^e	36	36	385	1,473	1,595	1,544	1,196	754	690	690	690	690	151	74	74	74	74		
<u>Other Projects</u>																			
Craft labor vehicle traffic ^c	145	318	268	97	116	143	143	132	88	88	88	88	88	88	88	88		28	
Miscellaneous turnaround support ^d	4	8	7	2	3	4	4	3	2	2	2	2	2	2	2	2		1	
Total Other Project Autos per day	149	326	275	99	119	147	147	135	90	90	90	90	90	90	90	90		29	
<u>Major Refinery Turnarounds ^f</u>																			
Craft labor vehicle traffic ^c	667			83	333	83	83	83	500	83		83	667	500		83	625	333	333
Miscellaneous turnaround support ^d	16			16	16	16	16	16	8	8		8	8	8		8	30	18	18
Total Turnaround Autos per day	683			99	349	99	99	99	508	91		91	675	508		91	655	351	351
Total Auto Vehicle one-way trips per day	867	362	660	1,672	2,063	1,789	1,441	988	1,288	872	780	726	916	672	164	255	729	380	351
Vehicle Summary By Refinery Gate																			
Gate 91 (construction and turnaround contractors)	815	340	620	1,572	1,815	1,574	1,311	899	1,005	680	608	566	861	632	154	240	685	357	330
Gate 31 (construction and turnaround support)	52	22	40	100	248	215	130	89	283	192	172	160	55	40	10	15	44	23	21
Trucks																			
<u>Proposed Project Construction</u>																			
Materials traffic (one-way truck trips)	2	2	242	59	86	67	83	30	32	30	30	30	8	4	4	4	4		
Total Proposed Project PCE per day ^{e, h}	4	4	484	118	172	134	166	60	64	60	60	60	16	8	8	8	8		
<u>Other Projects</u>																			
Materials traffic (one-way truck trips)	18	18	20	6	12	8	138	138	4	4	4	4	4	4	4	4		6	
Total Other Projects PCE per day ^h	36	36	40	12	24	16	276	276	8	8	8	8	8	8	8	8		12	
<u>Major Refinery Turnarounds ^f</u>																			
Materials traffic (one-way truck trips)	20			12	12	10	10	10	15	12		12	20	15		10	20	20	20
Total Turnaround PCE per day ^h	40			24	24	20	20	20	30	24		24	40	30		20	40	40	40
<u>Proposed Project Operation ^g</u>																			
Post-construction increase in sulfur product trucks																	20	20	20
Post-construction new liquid oxygen trucks																	14	14	14
Total Project Operations PCE per day																	68	68	68
Total Truck one-way PCE per day	80	40	524	154	220	170	462	356	102	92	68	92	64	46	16	36	116	120	108

(continued)

TABLE 4.16-3 (continued)
CHEVRON RICHMOND REFINERY RENEWAL PROJECT, OTHER PROJECTS, MAJOR TURNAROUNDS, AND REFINERY OPERATIONS
ESTIMATED DAILY TRAFFIC BY QUARTER ^a

Year Quarter	2007				2008				2009				2010				2011	2012	2013
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	4th	4th	1st
Truck (PCE) Summary By Refinery Gate																			
Gate 31 (construction and turnaround materials, and refinery operation deliveries)	80	40	524	154	220	170	332	226	102	92	68	92	64	46	16	36	116	120	108
Gate 67 (Castro Cove remediation)							130	130											
Total Proposed Project Construction PCE Volumes ^e	40	40	869	1,591	1,767	1,678	1,362	814	750	754	750	750	167	82	82	82	82	0	0
Total Volumes	947	402	1,184	1,826	2,283	1,959	1,903	1,344	1,390	964	848	818	980	718	180	291	845	500	459

- ^a All vehicle and truck trips are shown as one-way trips per day. A round trip equals two trips. See *Revised Traffic Impact Analysis for Chevron Renewal Project EIR* memorandum (February 22, 2007), in Appendix C, for a breakdown of estimated daily traffic associated with separate individual projects.
- ^b Volumes in these columns are typical for all quarters of the year.
- ^c Based on carpooling with 1.2 people per car. Each person makes two trips per day.
- ^d Miscellaneous construction support include lunch wagons, fueling, parts runs, etc.
- ^e Construction related trips (either vehicle or PCE) equals ONLY renewal project traffic. **This is the basis for traffic impact evaluations and is highlighted above.**
- ^f Major turnarounds are shown to provide an idea of total variability in refinery traffic and do not result from the Renewal Project. Totals reflect peak periods, and therefore are not at these levels for the entire quarter. Estimated durations of turnarounds vary from 18 to 38 days per turnaround. 2010-2012 period shows selected peak future quarters with projected turnaround activity and Renewal Project in operation. Turnaround schedules are subject to change (estimated traffic is based on Richmond Refinery Long Range Shut Down Schedule, as of January 29, 2007).
- ^g Numbers shown are changes from current operation.
- ^h Passenger Car Equivalent (PCE) factor of 2.0 used per HCM 2000.

SOURCE: Chevron, Wilbur Smith Associates, February 2007.

**TABLE 4.16-4
CHEVRON RICHMOND REFINERY
CONSTRUCTION TRAFFIC ESTIMATES (DURING PEAK CONSTRUCTION ACTIVITY)**

Project	Type	Daily	AM Peak Hour (vehicle/hr)		PM Peak Hour (vehicle/hr)	
			In	Out	In	Out
Proposed Project Construction	Vehicle	1,595	399	0	0	399
	Trucks	172	86	0	0	0
	Subtotal	1,767	485	0	0	399
Other Projects	Vehicle	119	30	0	0	30
	Trucks	24	12	0	0	0
	Subtotal	143	42	0	0	30
Major Refinery Turnaround	Vehicle	349	87	0	0	87
	Trucks	24	12	0	0	0
	Subtotal	373	99	0	0	87
Total Trips		2,283	626	0	0	516

- ^a Peak construction activity during the first quarter of 2008, based on Chevron Construction Traffic Estimates (see Table 4.16-3).
^b For peak hour trip generation, assume all inbound trips occur during the AM peak hour and all outbound trips occur during the PM peak hour, as shown:
- Half of the vehicle trips arrive at 6:00 AM for a 10-hour shift, departing at 4:00 PM.
 - Half of the vehicle trips arrive at 7:00 AM for a 10-hour shift, departing at 5:00 PM.
 - Assume all trucks are inbound in the AM and outbound in the PM.
 - Assume half trucks arrive at 7:00 AM and depart at 3:00 PM, half arrive at 6:00 AM and depart at 2:00 PM. (Therefore, no trucks during the PM peak hour analysis period.)

SOURCE: Wilbur Smith Associates, February 2007.

**TABLE 4.16-5
TRIP DISTRIBUTION – CONSTRUCTION TRAFFIC**

Construction Trips	Trip Distribution	
	North	South
Vehicle	80%	20%
Truck	20%	80%

SOURCE: Wilbur Smith Associates, February 2007.

4.16.4 Traffic Impacts and Mitigation Measures

4.16.4.1 2008 Baseline Conditions

Proposed Project impacts are analyzed by comparing conditions with and without project-generated traffic. The “without project” (baseline) scenario represents reasonably-foreseeable conditions without the addition of project traffic. Current refinery operations will continue through the duration of project construction, and existing traffic counts conducted at area intersections reflect the current operations. As described above, the highest project construction-generated traffic volumes are expected to occur in the first quarter of 2008. Therefore, the traffic impacts associated with the Proposed Project construction traffic were assessed under 2008 conditions.

Intersection volumes under 2008 conditions were interpolated using forecast growth rates developed using the Contra Costa County Transportation Authority travel demand model (CCTA model). CCTA model-derived traffic volumes were compared to traffic volumes developed from estimated trip generation, distribution and assignment associated with other planned and approved development projects within the City of Richmond expected to generate traffic in the Year 2008 (see Appendix C), and it was determined that the CCTA model growth forecasts encompass the planned and approved development projects. Table 4.16-6 shows the results of the intersection operations analysis for 2008 baseline conditions.

As shown, under 2008 baseline conditions, ten of the 11 study intersections are forecast to operate at acceptable LOS D or better during both peak hours. The one intersection projected to operate at an unacceptable service (LOS E or F) during one or both of the peak hours is Castro Street / I-580 Westbound Ramps (which would continue to operate at LOS E in p.m. peak hour).

4.16.4.2 2008 Baseline plus Project Conditions

Table 4.16-7 shows the results of the intersection operations analysis for the weekday a.m. and p.m. peak hours under 2008 Baseline Plus Project Construction conditions. As shown, under 2008 baseline plus project construction conditions, eight of the 11 study intersections are forecast to operate at acceptable LOS D or better during both peak hours. The three intersections projected to operate at an unacceptable service (LOS E or F) during one or both peak hour are Castro Street / I-580 Westbound Ramps (LOS E in p.m. peak hour), Castro Street / General Chemical Access (LOS F in p.m. peak hour), and Richmond Parkway / Gertrude Avenue (LOS F in both peak hours). The project impact at the intersection of Castro Street / I-580 Westbound Ramps would be less than significant (level-of-service conditions would remain unchanged at LOS E, with the average delay increasing about one second).

TABLE 4.16-6
INTERSECTION PEAK-HOUR TRAFFIC LEVEL OF SERVICE (LOS) OPERATIONS –
2008 BASELINE CONDITIONS

#	Intersection	Traffic Control ^a	AM Peak Hour		PM Peak Hour	
			Delay ^b	LOS	Delay ^b	LOS
1.	Chevron Way / Marine Street	SSSC	10.0	A	10.6	B
2.	Castro Street / Tewksbury Avenue	AWSC	9.3	A	10.0	A
3.	Marine St. / I-580 Eastbound Ramps	Signal	13.1	B	18.6	B
4.	Castro Street / I-580 Eastbound Ramps	Signal	13.9	B	36.9	D
5.	Castro Street / Chevron Way	Signal	0.1	A	0.1	A
6.	Castro Street / I-580 Westbound Ramps	Signal	45.4	D	61.9	E
7.	Castro Street / Mills Street (Gate 31)	Signal	5.6	A	24.4	C
8.	Castro St. / General Chemical Access (Gate 91)	Signal	6.9	A	32.3	C
9.	Castro Street / Hensley Street	Signal	3.7	A	6.1	A
10.	Richmond Pkwy. / Hensley Street	Signal	18.0	B	16.6	B
11.	Richmond Pkwy. / Gertrude Avenue	Signal	48.3	D	50.0	D

^a SSSC = side-street stop-controlled intersection; AWSC = all-way stop-controlled intersection; Signal = traffic signal-controlled intersection.

^b Average overall intersection control delay (seconds per vehicle) reported for signalized and all-way stop-controlled intersections. Average delay on the highest-delay movement/approach reported for side-street stop-controlled intersections.

SOURCE: Wilbur Smith Associates, February 2007.

TABLE 4.16-7
INTERSECTION PEAK-HOUR TRAFFIC LEVEL OF SERVICE (LOS) OPERATIONS –
2008 BASELINE PLUS PROJECT CONSTRUCTION CONDITIONS

#	Intersection	Traffic Control ^a	AM Peak Hour		PM Peak Hour	
			Delay ^b	LOS	Delay ^b	LOS
1.	Chevron Way / Marine Street	SSSC	10.0	A	10.6	B
2.	Castro Street / Tewksbury Avenue	AWSC	9.3	A	10.0	A
3.	Marine St. / I-580 Eastbound Ramps	Signal	15.9	B	18.6	B
4.	Castro Street / I-580 Eastbound Ramps	Signal	13.9	B	36.9	D
5.	Castro Street / Chevron Way	Signal	0.1	A	0.1	A
6.	Castro Street / I-580 Westbound Ramps	Signal	47.1	D	63.2	E
7.	Castro Street / Mills Street (Gate 31)	Signal	13.4	B	24.4	C
8.	Castro St. / General Chemical Access (Gate 91)	Signal	17.8	B	>100	F
9.	Castro Street / Hensley Street	Signal	4.5	A	7.3	A
10.	Richmond Pkwy. / Hensley Street	Signal	18.0	B	16.6	B
11.	Richmond Pkwy. / Gertrude Avenue	Signal	98.7	F	95.2	F

^a SSSC = side-street stop-controlled intersection; AWSC = all-way stop-controlled intersection; Signal = traffic signal-controlled intersection.

^b Average overall intersection control delay (seconds per vehicle) reported for signalized and all-way stop-controlled intersections. Average delay on the highest-delay movement/approach reported for side-street stop-controlled intersections.

Bold type indicates significant impact.

SOURCE: Wilbur Smith Associates, February 2007.

Impact 4.16-1: Proposed Project-generated increases in traffic volumes would result in a significant impact to p.m. peak-hour traffic operations at the signalized study intersection of Castro Street / General Chemical Access (Gate 91). This impact would be mitigated to a less-than-significant level by implementation of Mitigation 4.16-1.

Proposed Project construction-related traffic is projected to add a substantial amount of traffic to the critical movements of the Castro Street / General Chemical Access (Gate 91) intersection, which would result in a significant worsening of its operating conditions (from LOS C to LOS F).

Mitigation Measure 4.16-1: Implement the following measures at the intersection of Castro Street / General Chemical Access:

- Chevron shall reconfigure the eastbound (General Chemical Access) approach to the intersection to provide two exclusive left-turn lanes, and one exclusive right-turn lane (this would be a permanent change).
- Chevron shall work with the City of Richmond's Director of Public Works Department (or the Director's designated representative) to provide modified traffic control during peak arrival and departure times in the p.m. peak hour. The modified traffic control shall be accomplished by one or more of the following methods: (1) posting a technician at the intersection to manually operate signal controls (using the police key feature of standard traffic signal controllers), (2) programming an alternate signal timing plan that would be in operation during specified peak commute periods, and/or (3) posting traffic control officers at the intersection to manually control traffic movements. Chevron shall pay the full cost of this measure, including costs for sheriff's deputies or other law enforcement personnel to provide the traffic control under above-cited methods (1) or (3).

Implementation of Mitigation Measure 4.16-1 would improve intersection operating conditions to LOS D during the p.m. peak hour.

Significance after Mitigation: Less than Significant

Impact 4.16-2: Proposed Project-generated increases in traffic volumes would result in a significant impact to peak-hour traffic operations at the signalized study intersection of Richmond Parkway / Gertrude Avenue. This impact would be mitigated to a less-than-significant level by implementation of Mitigation 4.16-2.

Project construction-related traffic is projected to add a substantial amount of traffic to the critical movements of the Richmond Parkway / Gertrude Avenue, which would result in a significant worsening of its operating conditions (from LOS D to LOS F).

Mitigation Measure 4.16-2: Implement the following measures at the intersection of Richmond Parkway / Gertrude Avenue:

- Chevron shall work with the City of Richmond's Director of Public Works Department (or the Director's designated representative) to provide modified traffic control during peak arrival and departure times in the a.m. and p.m. peak hours. The modified traffic control shall be accomplished by one or more of the following methods: (1) posting a technician at the intersection to manually operate signal controls (using the police key feature of standard traffic signal controllers), (2) programming an alternate signal timing plan that would be in operation during specified peak commute periods, and/or (3) posting traffic control officers at the intersection to manually control traffic movements. Chevron shall pay the full cost of this measure, including costs for sheriff's deputies or other law enforcement personnel to provide the traffic control under above-cited methods (1) or (3).
- During the a.m. peak hour, through the use of traffic cones (and flaggers as needed), Chevron shall reconfigure the southbound (Richmond Parkway) approach to the intersection to provide one shared left-through lane, one through lane, and one shared right-through lane.

Implementation of Mitigation Measure 4.16-2 would improve intersection operating conditions to LOS C or better during both peak hours.

Significance after Mitigation: Less than Significant

Although not required to mitigate Impacts 4.16-1 and 4.16-2 to less-than-significant levels, the City will request Chevron to consider implementing of one or more of the following improvement measures as a means to further reduce project impacts by reducing construction-related traffic trips during a.m. and p.m. peak hours:

- Stagger the hours of operation of the craft labor so that the construction-related traffic would be distributed over the peak and non-peak hours of traffic operation.
- Promote the use of car-sharing by the craft labor.

Evaluation of Impacts Associated with Other Projects and Major Turnarounds expected to Overlap with Proposed Project Construction

Potential traffic impacts associated with other (near-term cumulative) projects, and major refinery turnarounds are also addressed, specifically during the first quarter of 2008 (estimated daily traffic generation for those elements was shown in Tables 4.16-3 and 4.16-4, pages 4.16-9 through 4.16-11).

Chevron has identified a number of other projects, such as electrical infrastructure, a new fire house, and Castro Cove remediation, to occur during Proposed Project construction. In addition, according to the Richmond Refinery Long Range Shut Down Schedule (January 29, 2007), a major turnaround is expected to occur during the first quarter of 2008. The impacts of the added

traffic associated with those other projects and the major turnaround was evaluated to determine if new or more severe impacts beyond those identified under Impacts 4.16-1 and 4.16-2 above would require mitigation beyond Mitigation Measures 4.16-1 and 4.16-2. As shown in Table 4.16-4, the potential traffic generation associated with these other projects in the first quarter of 2008 would be approximately 48 daily trucks and 468 daily vehicles.

The results of the evaluation show that, as would be the case for the Proposed Project construction, (1) level-of-service conditions at two of the 11 study intersections (Castro Street / General Chemical Access and Richmond Parkway / Gertrude Avenue) would degrade from an acceptable LOS under 2008 Baseline conditions to an unacceptable LOS, and (2) implementation of Mitigation Measures 4.16-1 and 4.16-2 would improve conditions to an acceptable LOS.

Mitigation Threshold Analysis

A threshold analysis was performed to identify the two levels of increased traffic that would (1) trigger each specific mitigation measure identified above for the two study intersections at which the Proposed Project-generated increases in traffic volumes would result in a significant impact to traffic operations during the peak hours, and (2) cause the failure of Mitigation Measures 4.16-1 and 4.16_2 (i.e., require additional measures to reduce traffic impacts to less-than-significant levels). These thresholds were calculated based on the increase in PCE vehicle volumes for the movement or approach direction requiring improvement. The threshold increase in PCE vehicle volumes was measured against the 2008 baseline PCE vehicle volumes. The threshold increase in PCE vehicle volumes was then compared to the estimated distribution of Proposed Project construction traffic for that location, in order to identify the total trip generation (in both PCE vehicle volumes and truck volumes) of the Proposed Project that would trigger the need for the specific mitigation measure. See Appendix C for more details about the mitigation threshold analysis.

Impact 4.16-3: Proposed Project-generated increases in heavy truck traffic on area roadways could result in substantial damage or wear of public roadways. This impact would be mitigated to a less than significant level by implementation of Mitigation 4.16-3.

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-580, are designed to handle a mix of vehicle types, including heavy trucks. The project's impacts are expected to be negligible on those roads. Arterials, such as Castro Street and Richmond Parkway, are likewise designed to handle a mix of vehicle types. However, because of the potential for excessive roadwear due to project construction trucks, measures are identified to mitigate this potentially significant impact.

Mitigation Measure 4.16-3: Chevron shall repair any roads damaged by Project construction to a structural condition equal to that which existed prior to construction activity. Prior to project construction, City of Richmond Public Services Department would document road conditions for all routes that would be used by project-related vehicles. The City would also document road conditions after project construction is completed. The pre- and post-construction conditions of the haul routes shall be reviewed, and Chevron or contractor(s), and staff of the Public Services Department, would enter into an agreement prior to construction that details the pre-construction conditions and the post-construction requirements of a rehabilitation program. Fees shall be determined by the City of Richmond Construction Road Traffic Fee, which went into effect October 1, 2006.

Significance after Mitigation: Less than Significant

References – Transportation

- California Department of Transportation (Caltrans), *2005 Traffic Volumes on California State Highways*, published 2006. Available at the Caltrans website (www.dot.ca.gov/hq/traffops/saferesr/trafdata/index.htm)
- Thompson, Lamont, Senior Planner, City of Richmond, personal communication with Environmental Science Associates, May 3, 2007.
- Transportation Research Board (TRB), *Highway Capacity Manual*, 2000.
- West Contra Costa County Transportation Advisory Committee (WCCTAC), *West Contra Costa County Action Plan 2000 Update*, July 2000.
- Wilbur Smith Associates, *Documentation of Existing Baseline Traffic Conditions*, June 8, 2005.
- Wilbur Smith Associates, *Revised Traffic Impact Analysis for Chevron Renewal Project EIR*, February 22, 2007.

4.17 Utilities and Service Systems

The Proposed Project would have less than significant effects on the utilities and services systems:

- The increase of 0.7 MGD in water use for the Proposed Project represents a 6% increase over the current water use at the Refinery. The overall water supply would be sufficient to serve the Proposed Project, and would not require the development of new potable water sources. Thus, the contribution of the Project to the water demand would be less than significant.
- The Proposed Project would not substantially increase the amount of non-hazardous solid waste that would be produced at the Refinery and either recycled or disposed in landfills. Current landfill capacity would be sufficient to serve the Proposed Project.

No mitigation would be required for potential impacts to utilities and services systems.

4.17.1 Introduction

This section presents a discussion of utility and service systems, and analyzes the potential impacts related to implementing the Proposed Project. The following types of utilities and infrastructure are addressed here: municipal water supply, wastewater, and solid waste. Potential impacts relevant to stormwater runoff and surface water quality are discussed in Section 4.8, *Hydrology and Water Quality*. Electricity, natural gas, and energy related supply and demand impacts are discussed in Section 4.6, *Energy*. Generation and disposal of hazardous waste is discussed in Section 4.13, *Public Safety*.

4.17.2 Setting

4.17.2.1 Existing Conditions

Municipal Water Supply

Potable water is provided to the City of Richmond by the East Bay Municipal Utility District (EBMUD). EBMUD obtains approximately 90% of its municipal water supply from the Mokelumne River, and 10% originates as runoff from the protected watershed lands in the East Bay area. The water supply system consists of a network of reservoirs, aqueducts, water treatment plants, pumping plants, and distribution facilities. Annual precipitation and stream flow in the Mokelumne River watershed are extremely variable from month to month and from year to year. Approximately 1.3 million people are served by EBMUD's water system in the District's 331-square-mile service area (EBMUD, 2005a).

In addition, EBMUD has been recycling water at its main wastewater treatment facility since the early 1970s. Recycled water is suitable for land uses that do not require potable water sources, such as golf courses, some agricultural areas, and industrial uses. Incentives used by EBMUD to

encourage customers to utilize recycled water include rate discounts on recycled water and low-interest loans used to retrofit buildings so that they can accommodate recycled water.

There are six water treatment plants in the EBMUD water supply and distribution system. Combined, the six plants have a treatment capacity of over 375 million gallons per day (MGD). The Orinda Water Treatment Plant, which supplies potable water to Richmond and the project site, has a treatment capacity of 200 MGD and is currently operating at approximately 70% capacity (EBMUD, 2005b).

EBMUD's system storage generally allows it to continue serving its customers during dry-year events. EBMUD imposes rationing based on the projected storage at the end of September each year, and by imposing rationing in the first dry year of potential drought, EBMUD attempts to minimize rationing in subsequent years if a drought persists while continuing to meet its current and subsequent-year fishery flow release requirements and obligations to downstream agencies. The District's Water Service Regulations, which all customers must comply with, provide for special restrictions on water use during a water shortage emergency.

Municipal Water Demand

The demand for water in EBMUD's service area is projected to increase to 232 MGD by the year 2030. This projection assumes that the existing EBMUD water conservation program would reduce annual demand by 35 MGD and the water recycling program would decrease water demand by 14 MGD. EBMUD's 2005 Urban Water Management Plan (UWMP) was adopted on November 22, 2005 by the EBMUD Board of Directors to meet year 2030 district-wide demand. The UWMP sets minimum performance goals for water supply in the service area including reliability, flexibility, and the minimization of water rationing. Key components of the UWMP are water conservation and water recycling.

Wastewater and Sewer Treatment

The Refinery is served by the Richmond Sewer District, which is one of three sewer districts that services areas within Richmond. The Richmond Sewer District is managed by Veolia Water, a private water services company specializing in the outsourced management of water services for municipal or industrial customers. The Richmond Sewer District has a wet weather design capacity of 40 MGD and a dry weather design capacity of 16 MGD. Operation of the treatment plant has shown that it has adequate capacity to meet secondary treatment for discharge flows up to 18 MGD.

The wastewater collection system in Richmond consists of a 250-mile network of pipes, 18 to 19 lift/pump stations and associated infrastructure that carry wastewater from homes and businesses to the Richmond Water Pollution Control Plant located at 601 Canal Boulevard, Richmond. The plant utilizes secondary treatment with activated sludge.

The average dry weather flow treated at the plant was approximately 7.1 MGD. Although the peak wet weather capacity of the plant is 40 MGD, at times, peak wet weather flows exceed 42 MGD, as the system is influenced by the infiltration of stormwater drainage. Wastewater is

treated at a secondary level with some additional level of treatment following the secondary process. The main treatment process consists of pre-chlorination, screening, grit removal, pulverization, primary sedimentation, activated sludge/biological secondary clarification, chlorination (disinfection) and de-chlorination.

The West County Wastewater District (WCWD) operates a sewage treatment plant for the City of San Pablo, parts of Richmond, El Sobrante, Pinole, and other unincorporated areas of western Contra Costa County. The WCWD plant's dry weather capacity is approximately 12.5 MGD; flow is currently at approximately 7.8 MGD (WCWD, 2007). During wet weather, flows increase dramatically, and the plant has a system of equalization basins to store wet weather flows for processing. The plant's wet weather capacity is approximately 21 MGD, and during the rainy season, it has processed flows as high as 70 MGD. The WCWD shares an outfall pipe with the City of Richmond's municipal treatment plant. The WCWD imposes controls on industrial users on effluent discharged to the sanitary sewer system. The WCWD provides a supply of up to 6 MGD of secondary-treated wastewater to East Bay Municipal Utility District for its North Richmond Water Reclamation Facility.

Non-Hazardous and Recyclable Solid Waste

Refuse collection and disposal in the City of Richmond is provided by Richmond Sanitary Service and is taken to the Integrated Resource Recovery Facility (IRRF), a combined waste transfer station and materials recovery facility located just off the Richmond Parkway at 101 Pittsburg Avenue in North Richmond. The IRRF, operated by West County Resource Recovery Inc., a division of Richmond Sanitary Service, is located at the site of the West Contra Costa Land Fill, which was closed in September of 2006. As a materials recovery facility, or recycling plant, the IRRF processes both the curbside recyclables from the West County Recycles program and the commercial recycling materials collected from West County businesses. Solid waste that is sent to this facility now goes to the Potrero Hill Land Fill in Solano County, also operated by Richmond Sanitary Service. As of 2007, the Potrero Hills Landfill's remaining permitted capacity is estimated to be approximately 8,200,000 cubic yards (38.1% of the original capacity) and the landfill is not expected to reach its capacity until 2017 (CIWMB, 2007).

The Potrero Hill Land Fill has an approximately 10-year life expectancy, but could close in less time unless it obtains approval to expand. The proposed expansion of the landfill onto an adjacent 260-acre area would increase the facility's overall capacity and waste processing capabilities, and add approximately 61.6 million cubic yards of fill capacity. Total fill capacity would then be approximately 83 million cubic yards, adding approximately 35 years to the current landfill's remaining site life of 10 years. (CIWMB, 2007) and (CEQANet Database, 2007).

When the Potrero Hill Land Fill does close, another facility would be used for disposal of the County's non-hazardous solid waste. The cities in the County and Contra Costa County are actively pursuing a county-wide program to address solid waste problems.

The Contra Costa Environmental Health Division is certified by the California Integrated Waste Management Board as the Local Enforcement Agency (LEA) for solid waste in Contra Costa

County. The goal of the LEA is to protect the public health and safety of the citizens of Contra Costa County and the environment through the enforcement of minimum standards for the collection, handling, storage, and disposal of residential, commercial and industrial solid waste for the protection of air, water, and land from pollution and nuisance. The LEA is responsible for ensuring that all solid waste disposal facilities and medical waste generators comply with applicable local, State, and Federal codes and regulations (Contra Costa Environmental Health, 2002).

The Regional Integrated Waste Management Plan state law (Assembly Bill 939) enacted in 1989 establishes a new integrated waste management planning process, including requirements for counties and cities to meet adopted waste diversion goals for source reduction, recycling, and composting programs. It required municipal and state agencies to divert the amount of waste going to landfills by 25 percent by the year 1995 and by 50 percent by the year 2000.

The West Contra Costa Integrated Waste Management Authority (WCCIWMA) is a joint powers agency created by the cities of El Cerrito, Hercules, Pinole, Richmond, and San Pablo. The Authority is responsible for ensuring that facilities within its jurisdiction meet the requirements of AB939 (WCCIWMA, 2002). The Authority has been able to reduce the waste streams from its member cities by approximately 29 to 37 percent between 1995 and 1998; however, based on current data, a diversion rate could not be accurately determined by the CIWMB for the year 2000. The estimated diversion rate for 2001 was 41 percent but the CIWMB has not reviewed this diversion rate and therefore, the rate is subject to change (CIWMB, 2003). In 2002, unincorporated portions of Contra Costa County diverted 49 percent, an amount that the California Integrated Waste Management Board approved as a good faith effort toward attaining a 50 percent diversion rate.

Assembly Bill 939 also requires that each county prepare and adopt a Countywide Integrated Waste Management Plan which must include a Source Reduction and Recycling Element (SREE) and a Household Hazardous Waste Element (HHWE) prepared by each city in the county. Contra Costa County has an adequate Plan, which will reduce the potential for solid waste generation to become a significant effect. In addition to the County elements and Plan, the City of Richmond's 1994 General Plan includes a SREE as element CF-H.8 and a HHWE as HW-13, -14, & -15.

4.17.2.2 Refinery Site Setting

The Refinery activities require the use of municipal water, and result in the generation of solid waste.

Municipal Water Use and Reuse

The Refinery uses fresh water supplied by the EBMUD, at a current rate of approximately 12.0 MGD via a 16-inch pipe feed to the Refinery.

EBMUD currently provides approximately 4 million gallons per day (MGD) of tertiary-treated recycled water from its North Richmond Water Reclamation Plant (NRWRP) for use in

Chevron's cooling towers. The NRWRP obtains processed effluent from the West Contra Costa Sanitary District.

EBMUD and Chevron are currently working with the West County Wastewater District (WCWD) to expand the use of recycled water at the refinery through development of the proposed Richmond Advanced Recycled Expansion (RARE) Water Project¹. The proposed RARE Water Project would provide up to 4 MGD of high-purity recycled water for use in Chevron's boiler feedwater applications. Secondary effluent from the WCWD would be further treated at a new advanced recycled water treatment plant located within the Refinery. EBMUD would operate the new water treatment plant in parallel with its existing NRWRP. The increase in water usage due to the Proposed Project could potentially be more than offset by the proposed RARE Water Project. The public review process for the RARE Water Project EIR has recently been concluded (May 8, 2007) with certification of the final EIR by EBMUD. The RARE Water Project is proposed to be online by end of 2009.

The RARE Water Project is a project sponsored by EBMUD, and is not linked to the proposed Renewal Project. However, to the extent that recycled water from the RARE Water Project can be used at the Refinery, potable water use by the Refinery would decrease.

The most common industrial reuse application is for cooling, but reclaimed water can also be used for boiler feedwater, as process water, and for washdown. Other uses of recycled water are dust control and soil compaction during construction, as well as landscape irrigation.

Non-Hazardous and Recyclable Waste

The Refinery currently generates approximately 37,000 cubic yards of non-hazardous solid waste per year, all of which is in the form of Class III trash. This waste is managed in large bins and is currently removed from the Refinery by Richmond Sanitary Service and taken to the IRRF at the site of the former West Contra Costa Land Fill. Non-hazardous solid waste is then disposed at the Potrero Hills Land Fill.

The generation and disposal of hazardous waste is discussed earlier in this EIR, in Section 4.13, *Public Health and Safety*.

The Refinery has a Waste Minimization Plan, and makes continuing efforts to reduce the amount of solid hazardous and non-hazardous waste generated. Pre-job planning to reduce the amount of soil requiring disposal, source reduction of solids, and testing and segregation of hazardous wastes with a focus on recycle are ongoing activities in the Refinery. In addition, the Refinery has emphasized a paper reduction program to eliminate unnecessary reports and copies of printed material. It also segregates paper and cardboard products for recycling.

¹ See also Section 5.2.3, *Specific Projects Considered in the Cumulative Analysis*, where the RARE Water Project is described in more detail and its cumulative effects are considered.

Wastewater

The Refinery has its own wastewater treatment system. The system's capacity is about 20 MGD, compared to an average May 2003 - September 2004 dry-weather wastewater discharge of 5.48 MGD. During periods of dry weather such as the summer months, almost all wastewater comes from the various processing plants. Sources of this process wastewater include cooling tower blowdown, condensed steam used for process heating, plant washup water, etc. Process wastewater is treated in the Refinery effluent treatment system prior to release into the Bay.

During the winter months, in addition to the average 5.48 MGD process wastewater, large amounts of rainfall also enter the effluent treatment system. The 2004 daily wastewater flow varied from a low of 0.0 MGD in June to a high of 24.75 MGD in January. This increase in wastewater flow was due principally to the influx of rainfall into the system. Implementation by Chevron of a system that separates storm water from wastewater has resulted in only the wastewater flow being treated by the wastewater system. As a result, the current system appears to have excess capacity for treating wastewater. The effluent treating system was originally sized to handle simultaneously the full flow of wastewater and storm water from a large storm.

4.17.2.3 Regulatory Setting

Senate Bill 610 and Senate Bill 221

The purpose and legislative intent of Senate Bills 610 (SB 610) and Senate Bill 221 (SB 221) was to preclude projects from being approved without specific evaluations being performed and documented by the local water provider to ensure that sufficient water is available to serve the project. SB 610 primarily affects the Water Code and SB 221 principally applies to the Subdivision Map Act. The laws took effect on January 1, 2002. SB 610 requires the preparation of a Water Supply Assessment (WSA) for large-scale development projects.² The WSA report evaluates the water supply available for new development based on anticipated demand. For the broad range of projects which are subject to this law, the statutory WSA must be requested by the lead agency from the local water provider at the time the lead agency determines that an EIR is required for the project under CEQA. The water agency must then provide the assessment within 90 days (but may request a time extension under certain circumstances). The WSA must include specific information including an identification of existing water supply entitlements and contracts. The governing board of the water agency must approve the assessment at a public hearing.

² All projects that meet any of the following criteria require a WSA: [1] a proposed residential development of more than 500 dwelling units; [2] a proposed shopping center or business establishment employing more than 1,000 persons or having more than 500,000 ft² of floor space; [3] a proposed commercial office building employing more than 1,000 persons or having more than 250,000 ft² of floor space; [4] a proposed hotel or motel, or both, having more than 500 rooms; [5] a proposed industrial, manufacturing, or processing plant, or industrial park planned to house more than 1,000 persons, occupying more than 40 acres of land, or having more than 650,000 square feet of floor area; [6] a mixed-use project that includes one or more of the projects specified in this subdivision; or [7] a project that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project

SB 221 requires that the local water provider supply “written verification” of “sufficient water supplies” to serve the project. Sufficiency under SB 221 differs from SB 610 in that sufficiency is determined by considering the availability of water over the past 20 years; the applicability of any urban water shortage contingency analysis prepared per Water Code Section 10632; the reduction in water supply allocated to a specific use by an adopted ordinance; and the amount of water that can be reasonably relied upon from other water supply projects, such as conjunctive use, reclaimed water, water conservation, and water transfer. In most cases, the WSA prepared under SB 610 will meet the requirement for proof of water supply under SB 221.

Senate Bill 365 (SB 365; Chapter 980, Statutes of 1993)

Existing provisions of the California Water Code declare that the use of potable water for certain non-potable uses “is a waste or an unreasonable use of water.” SB 365, which amends and expands the Water Code to strengthen the provision that the use of potable water for the irrigation of residential landscaping, floor-trap priming, cooling towers, or air-conditioning devices, is wasteful and unsound if reclaimed water suitable for these purposes is available. SB 365 also gives the power to any public agency, including a State agency, City or County, district, or any other political subdivision of the state, to require the use of reclaimed water for these purposes if certain conditions are met. The conditions that must be met are:

- Reclaimed water meeting the requirements of existing law (Section 13550 of the Water Code) is available to the user;
- The use of reclaimed water does not cause any loss of diminution of any existing water right;
- Public health concerns regarding exposure to mist or spray must be addressed, if appropriate;
- The water user must prepare an engineering report pursuant to Title 22 regulations governing the use of reclaimed water.

The requirements of the law are applicable to all new industrial facilities and subdivisions for which the Department of Health Services has approved the use of reclaimed water, and for which a building permit is issued on or after March 15, 1994, or, if a building permit is not required, new structures for which construction begins on or after this date.

Assembly Bill 325

In September 1990, Governor Pete Wilson signed Assembly Bill 325 directing the Department of Water Resources to adopt a Model Local Water Efficient Landscape Ordinance by January 1, 1992. A Model Water Efficient Landscape Ordinance was created by an advisory taskforce of interested stakeholders such as landscape and construction industry professionals, members of environmental protection groups, water agencies and state and local government. The Model Water Efficient Landscape Ordinance promotes the values and benefits of landscapes while recognizing the need to invest water and other resources as efficiently as possible; established a structure for designing, installing, and maintaining water efficient landscapes in new projects; and established provisions for water management practices and water waste prevention for established landscapes. Cities and counties are required to enforce the ordinance as it applies to new and rehabilitated public and private landscapes that require a permit and on developer installed

residential landscapes. The ordinance does not apply to landscapes under 2,500 square feet, homeowner-installed residential landscapes, cemeteries, registered historical sites and ecological restoration and mined reclamation areas without permanent irrigation systems.

Recently in a Water Supply Assessment (WSA) performed by EBMUD for the Proposed Project (See Appendix F), EBMUD indicated that the City of Richmond should condition any components of the Proposed Project to comply with the Model Local Water Efficient Landscape Ordinance (EBMUD, 2007). Over the years, the Chevron Refinery has worked with EBMUD on other projects to reclaim, recycle, and reuse water. The RARE project is a current example of such work (See Section 5.2.3.1, *Projects at the Richmond Refinery*). The EBMUD WSA suggests that Chevron and the EBMUD discuss water conservation projects with respect to the Proposed Project. Chevron has indicated that it welcomes opportunities to discuss water conservation programs and best management practices applicable to Refinery projects requiring landscaping with EBMUD the City of Richmond (Piersante, 2007).

Assembly Bill 939

The Regional Integrated Waste Management Plan state law (Assembly Bill 939) enacted in 1989 established an integrated waste management planning process, including requirements for counties and cities to meet adopted waste diversion goals for source reduction, recycling, and composting programs. It required municipal and state agencies to divert the amount of waste going to landfills by 25 percent by the year 1995 and by 50 percent by the year 2000. In 2002, unincorporated portions of Contra Costa County diverted 49 percent, an amount that the California Integrated Waste Management Board approved as a good faith effort toward attaining a 50 percent diversion rate.

Contra Costa County Code

Construction and Demolition Debris Recovery (418-14)

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 CoIWMP establishes waste management goals, objectives, and policies related to solid waste disposal; facilities siting; household hazardous waste collection and disposal; and implementing 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.

City of Richmond General Plan

Water Use, Conservation and Demand

Goal CF-H: Provide and maintain a level of public infrastructure facilities that adequately serves the present and future needs of the community.

Policy CF-H.1: Coordinate with East Bay Municipal Utility District (EBMUD) to ensure an adequate water system for existing and future residents and to maintain adequate water reserves.

Policy CF-H.3: Encourage effective water conservation practices by residents and businesses including household water conservation and use of drought resistant landscaping and reclaimed wastewater.

Wastewater

Goal CF-H: Provide and maintain a level of public infrastructure facilities that adequately serves the present and future needs of the community.

Policy CF-H.4: Continue to operate and maintain the Municipal Sewer District at high levels of efficiency, and upgrade the City's waste water system to provide sufficient capacity and water pollution control facilities to meet current and future project needs, including backup capacity to cover periods of maintenance and heavy storm water runoff.

Policy CF-H.5: Coordinate closely with planning, operation, and upgrading of the Richmond Municipal Sewer District facilities with the West Contra Costa and Stege Sanitary Districts and with East Bay Municipal Utility District.

Solid Waste

Goal CF-H: Provide and maintain a level of public infrastructure facilities that adequately serves the present and future needs of the community.

Policy CF-H.8: Work actively to (a) reduce the amount of solid waste generated, (b) promote reuse of materials, (c) recycle as much of the solid waste as possible, (d) make use of the energy and nutrient value of the solid waste, and (e) properly dispose of the remaining solid waste.

4.17.3 Utilities and Service Systems Significance Criteria

Significance Criteria

California Environmental Quality Act (CEQA) Guidelines Appendix G, states that a project would have a significant public utilities or service systems impact if it would:

- a) Exceed wastewater treatment requirements of the 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 are new or expanded entitlements needed.
- e) Not result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?
- f) Not be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs.
- g) Not comply with federal, state, and local statutes and regulations related to solid waste.

CEQA Guidelines Appendix G topics that will not be discussed further in this EIR

Review and comparison of the Proposed Project to the environmental setting clearly shows that the Proposed Project would create no impacts related to the following environmental topics listed in CEQA Guidelines Appendix G.

a. Would the Proposed Project exceed wastewater treatment requirements of the Regional Water Quality Control Board?

This criterion is directed to project effects on public utilities. Although the Refinery lies within Richmond Sewer District's service area, the Refinery collects, treats and discharges all wastewater and storm water using its own private facilities. The Refinery does not discharge to the public wastewater treatment facilities. The capacity of the Richmond Sewer District's wastewater treatment facility would be unaffected, as would its ability to meet the wastewater treatment requirements of the Regional Water Quality Control Board. There would be no impact.

For thorough discussions about the Refinery's private combined wastewater (including storm water runoff, process water, sanitary sewage, and groundwater remediation) collection, treatment and disposal system and the ability of that system to meet the treatment requirements of the Regional Water Quality Control Board, see Section 4.8, *Hydrology and Water Quality*.

b. Would the Proposed Project 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 Proposed Project would be constructed and its operations conducted entirely within those areas of the Refinery that are already served by the existing water and wastewater collection and treatment systems. The Proposed Project would not include new water and wastewater facilities, the construction of which could cause significant environmental effects. There would be no impact.

- c. **Would the Proposed Project 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 Proposed Project would be constructed and its operations conducted entirely within those areas of the Refinery that are already served by the existing storm water collection and treatment system. The Proposed Project would not involve the construction of new facilities, the construction of which could cause significant environmental effects. There would be no impact.

- e. **Would the Proposed Project result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?**

Although the Refinery lies within Richmond Sewer District's service area, the Refinery collects, treats and discharges all wastewater and storm water using its own facilities. The Refinery does not discharge to the Richmond Sewer District's public facilities. The Proposed Project would be constructed and its operations conducted entirely within those areas of the Refinery that are already served by the Refinery's own existing wastewater collection and treatment system. The existing Refinery treatment system is adequate and would require no modification to serve the Proposed Project. The capacity of the Richmond Sewer District's facility would be unaffected. There would be no impact.

- g. **Would the Proposed Project comply with federal, state, and local statutes and regulations related to solid waste?**

The applicable federal, state and local statutes and regulations related to solid waste are described in Section 4.17.2, above, as are the actions taken by the Refinery to comply with those statutes and regulations. The Refinery is currently complying with federal, state, and County requirements related to management of solid waste. In addition, the Refinery has an ongoing recycling program that would be employed during the construction and operation of the proposed facilities. There are no aspects of, or actions proposed, under the Proposed Project that would not comply with these existing solid waste statutes and regulations. As a result there is no reason to expect that the Refinery would not continue to comply. There would be no impact.

The remaining criteria are discussed in Section 4.17.4, *Utilities and Services Systems Impacts and Mitigation Measures*, under Impacts 4.17-1, 4.17-2, and Section 4.17.5, *Cumulative Impacts*, Impacts 4.17-3 and 4.17-4, below.

4.17.4 Utilities and Service Systems Impacts and Mitigation Measures

Impact 4.17-1: Solid waste generated from Proposed Project construction and operation would not adversely affect local landfills. The Proposed Project would not affect the

Refinery's ability to continue to comply with federal, state, and local statutes and regulations related to solid waste. The impact would be less than significant.

Solid waste is expected to be generated during construction of the Proposed Project facilities. Construction phase wastes would include materials such as asphalt, concrete, metals, and other site preparation materials activities, as well as typical construction debris such as packaging materials, etc. It is anticipated that no additional solid waste would be generated during Proposed Project operations beyond the amount currently generated at the Refinery.

All construction waste would be disposed of in accordance with established procedures and applicable regulatory requirements. Non-hazardous construction wastes would be sent to the Potrero Hill Land Fill in Solano County, which has sufficient capacity (see Section 4.17.2, above). In addition, the Refinery has an ongoing recycling program that would be employed during the construction of the proposed facilities. It is not expected that the construction or operation of the Proposed Project facilities would affect the Refinery's ability to maintain compliance with AB 939 requirements. Thus, the impacts from solid waste generation and disposed would be less than significant.

Mitigation Measure: None required.

Impact 4.17-2: Implementation of the Proposed Project would increase water use, however, there would be sufficient water supplies available to serve the Proposed Project from existing entitlements and resources. The impact would be less than significant.

The Project would increase the Refinery's consumption of water, requiring approximately an additional 0.7 MGD over current fresh water usage. This demand is the net from both increases and decreases in process water use. Specifically the increases are a combination of 1.7 MGD of new water use for the new Hydrogen Plant cooling tower, 0.013 MGD for the new CoGen cooling tower, and approximately 0.2 MGD for other project sources (Johnston, 2007); a total of approximately 1.9 MGD. With the operation of the new Hydrogen Plant, the load on the existing South Isomax cooling tower, which also serves the existing Hydrogen Plant, will decrease by approximately 1.2 MGD (Johnston, 2007) because the existing Hydrogen Plant would shut down.

Pursuant to Sections 10910-10915 of the California Water Code, a water supply assessment must be prepared for the Project because its water use would exceed the minimum threshold required for an assessment of water supply (i.e., demand equivalent to or greater than that required for 500 dwelling units).

The Water Supply Assessment (WSA) has been prepared by EBMUD. The WSA shows that the EBMUD projects demand for water in its service area to increase to 232 MGD by the year 2030. This projection assumes that water conservation would reduce annual demand by 35 MGD and the water recycling would decrease water demand by 14 MGD. EBMUD's 2005 Urban Water Management Plan (UWMP) sets minimum performance goals for water supply in the service area

including reliability, flexibility, and the minimization of water rationing. Key components of the UWMP are water conservation and water recycling.

EBMUD's demand projections indicate both densification and land use changes in all land use classifications, including industrial land uses, thus increasing overall EBMUD demand. EBMUD's 2005 UWMP projects water demands over time, accounting for estimated variations in demand usage less conservation and recycled supply sources as noted in Table 4.1 of the UWMP. For planning purposes, the demands are estimated in five-year increments, but it is recognized that actual incremental amounts may occur stepwise. An increase in usage by one customer in a particular customer class does not require a strict gallon-for-gallon increase in conservation by other customers in that class, as in actuality the amount of potable demand, conservation and recycled water use EBMUD-wide will all vary somewhat. Periodically EBMUD updates the demand projections to reconcile these variations, and the UWMP is updated as appropriate at each five-year cycle.

Because of this, the overall water supply available for the Proposed Project would be sufficient to serve the Project and would not require the development of new potable water sources. Thus, the contribution of the Project to the water demand would be less than significant.

With respect to controlling fresh water use at the Chevron Refinery, EBMUD and Chevron are currently working to expand the use of recycled water at the Refinery by jointly developing the proposed Richmond Advanced Recycled Expansion (RARE) Water Project. The RARE Water Project would provide up to 4 MGD of high-purity recycled water for use in Chevron's boiler feedwater applications. The anticipated 0.7 MGD increase in water use due to the proposed Chevron Project could be more than offset by the 4 MGD of recycled water supply provided by the RARE Water Project, which is proposed to be online by the end of 2009. However, the RARE Water Project is not linked to the proposed Chevron Renewal Project. The WSA shows that even with out the RARE Project sufficient water supplies are available for the Proposed Project.

Mitigation Measure: None required.

References – Utilities and Service Systems

California Integrated Waste Management Board (CIWMB), Active Landfills Profile for Potrero Hills Landfill (48-AA-0075),
<http://www.ciwmb.ca.gov/Profiles/Facility/Landfill/LFProfile1.asp?COID=7&FACID=48-AA-0075>, accessed April 17, 2007

CEQANet Database Query, <http://www.ceqanet.ca.gov/ProjDocList.asp?ProjectPK=538641>
accessed April 17, 2007.

East Bay Municipal Utility District, 2005a. Urban Water Management Plan 2005. November 2005.

East Bay Municipal Utility District, 2005b. Daily Water Supply Report. August 5.
http://www.ebmud.com/water_&_environment/water_supply/daily_reports/default.htm.

East Bay Municipal Utility District. Water Supply Assessment Letter to Lamont Thompson, City of Richmond. April 24, 2007.

Johnston, Robert, Personal Communication, April 12, 2007.

Piersante, Mark, Personal Communication, April 26, 2007.

West County Wastewater District (WCWD), <http://www.wc wd.org/index.htm>, accessed April 17, 2007.

CHAPTER 5

CEQA Statutory Sections

The impacts of the Proposed Project and the mitigation measures that would be adopted as conditions of approval of the Proposed Project are presented and discussed in detail in Chapter 4 of this document. Section 5.1 of this Chapter discusses significant and unavoidable impacts. Cumulative impacts, summarized in Section 5.2 of this Chapter, are analyzed by considering the effects of the Proposed Project combined with other concurrent projects at the Refinery, plus approved or planned projects in the vicinity of the Refinery, as well as future development that could occur under the Richmond General Plan, and under other applicable adopted local or regional plans. Section 5.3 considers the potential for growth-inducing impacts. Section 5.4 lists the environmental effects of the Proposed Project that have been found to be less-than-significant or not significant. Section 5.5 discusses any potential irreversible significant effects on the environment from the Proposed Project.

5.1 Significant Unavoidable Environmental Impacts

As described in Section 4.3, *Air Quality*, there would be one significant unavoidable air quality environmental impact as a direct result of the Proposed Project (See Impact 4.3-2). As discussed below, there would also be one significant cumulative air quality environmental impact to which the Proposed Project's contribution would be cumulatively considerable (See Impact 5-4).

5.2 Cumulative Impacts

5.2.1 Introduction

Public Resources Code § 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.*) Pursuant to CEQA Guidelines § 15130(a)(1), “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.” 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 Proposed 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.

The key characteristics of a cumulative impact analysis are:

- An impact due to the Proposed Project (significant or less-than-significant), plus
- Impacts of the same type or from other projects of the same type as that of the Proposed Project. In this case, the cumulative projects include other projects on the Refinery and outside the Refinery projects with similar impacts (e.g., traffic impacts).
- Analysis of the interaction of these impacts to determine whether they create a cumulatively considerable impact that affects the same geographic area as that of the Proposed Project.

Section 5.2 analyzes the cumulative impacts for each of the environmental topics addressed in Sections 4.1 through 4.17 of this Master EIR, and determines whether any are significant.

5.2.2 General and Regional Plans Considered in the Cumulative Analysis

To determine the effects of projects that may not be well defined or are unforeseen, the CEQA analysis considered the following planning documents:

- Richmond General Plan
- North Richmond Specific Plan
- Contra Costa County General Plan
- Contra Costa County Transportation Authority (CCTA) Transportation Plan.
- Bay Conservation Development Commission Plans
- Regional Planning Documents from ABAG / MTC / RWQCB
- Bay Area 2005 Ozone Strategy from the Bay Area Air Quality Management District

These adopted local and regional plans are prepared by cities, counties, and agencies in California to meet the requirements of state law. These plans are comprehensive, long-term plans for the physical development of the city, county, or region. For example, the Richmond General Plan, adopted in 1994, includes specific policies to preserve and enhance existing development and to

provide for orderly and appropriate new development until approximately the year 2010. City land use and development actions and approvals must be consistent with the City's General Plan.

5.2.3 Specific Projects Considered in the Cumulative Analysis

This cumulative analysis considers the specific environmental aspects of the adopted plans, listed above, that would interact with identified Proposed Project impacts within the same geographic area. To further supplement this plan-based analysis, a list of probable future projects for both the Refinery site and the project vicinity were identified, and the interaction of these other projects with the Proposed Project was considered.

At the time Chevron submitted its application for the Proposed Project to the City of Richmond (April 2005), it already had a number of Refinery projects in the approval process or under construction. These projects, discussed in the following sections, are not part of the Proposed Project. They are considered for the purpose of analyzing cumulative impacts in this Master EIR. The general locations of the following projects being undertaken or proposed to be undertaken by the Refinery are shown on Figure 5-1.

5.2.3.1 Projects at the Richmond Refinery

LPG Spheres Project

Chevron constructed in 2002 and began operating in 2003 two new 30,000-barrel liquefied petroleum gas spheres (LPG Spheres Project) at the Refinery. For the location of the two spheres, see Figure 5-1. Following the City's adoption of a Mitigated Negative Declaration (MND) (Lamphier-Gregory, 2001) for and approval of the LPG Spheres Project on September 22, 2001, a lawsuit was filed challenging the MND. In 2004, the Court of Appeal for the First District invalidated the MND.¹ In an unpublished decision, the Court found that the cumulative impacts analysis in the initial study did not list or apparently consider "impacts the spheres project might have in connection with *any other* current or anticipated project at the refinery," and that the City of Richmond should analyze cumulative impacts from construction and operation of the spheres in combination with "all past, current and reasonably foreseeable future projects that could produce a combined environmental impact [citation omitted]."²

The Court of Appeal ordered the Superior Court to issue a peremptory writ of mandate directing the City to set aside its approvals and "determine whether an EIR should be required after examining the cumulative impacts of the project in connection with past, present and probable future projects at the refinery."³ While allowing the completed LPG Spheres Project to remain in operation, the Superior Court's Writ of Mandate ordered the City to (1) "conduct an analysis of the cumulative impacts of the LPG spheres project in connection with other past, present and probable future projects at the Refinery;" (2) "determine whether to prepare an . . . [EIR] or a

¹ Slip Opinion, *Communities for a Better Environment v. City of Richmond*, Court of Appeal, First Appellate District, Division Three, Case No. A101913 (October 29, 2004).

² *Id.*, pp. 24-25 (emphasis in original).

³ *Id.*, p. 29.

revised [MND], as appropriate;” and (3) “take such actions as may be necessary and appropriate with regard to additional mitigation measure, if any, to be imposed on the project.”⁴ The consideration of cumulative impacts in this EIR, therefore, includes the LPG Spheres Project and considers whether additional mitigation measures are necessary.

The following information about the regulatory status of the LPG Spheres Project with the BAAQMD is pertinent to this analysis:

1. No Bay Area Air Quality Management District (BAAQMD) “Authority to Construct” or “Permit to Operate” permit was required for the LPG Spheres Project.
2. Fugitive (air) emissions from piping associated with the LPG Spheres were accounted for and offset as part of the BAAQMD permitting for the Butamer Plant Project.

The following facts relevant to the conditions at the Refinery at the date of the adoption of the LPG Spheres Project MND are considered in this cumulative analysis:⁵

1. The Alkylation Plant wash water project (now built and operating), a potential cumulative project at the time of preparation of the LPG Spheres Project MND, did not increase plant throughput or emissions.
2. The Butamer Plant’s emissions, another potential cumulative project at the time of preparation of the LPG Spheres Project MND (now built and operating), with 2.8 tons of volatile organic compounds (VOCs) per year, had no net effect because the Butamer Plant’s emissions were offset by shutting down the MTBE and TAME plants at the same time, reducing VOC emissions by 4.72 tons per year and resulting in a net VOC emissions reduction of 1.92 tons per year.
3. “Low NO_x Burners,” which would have been cumulative projects at the time of the LPG Spheres Project MND, were installed on over a dozen separate furnaces and heaters throughout the Refinery, as required by changes to BAAQMD regulations, resulting in emissions reductions and, therefore, no impacts.
4. The Fluid Catalytic Cracker (FCC) alterations (now complete and operating), another cumulative project at the time of preparation of the LPG Spheres Project MND, did not increase throughput or emissions.

⁴ Writ of Mandate, *Communities for a Better Environment v. City of Richmond*, Contra Costa County Superior Court, Case No. C-02-01968 (August 5, 2005).

⁵ These items are mentioned here because they were referenced in the Court Order.



— Refinery Boundary

SOURCE: Chevron, 2005

Chevron Energy and Hydrogen Renewal Project . 205166

Figure 5-1
Cumulative Refinery Project Locations

5. A floating roof tank to store sour water was another potential cumulative project at the time of preparation of the LPG Spheres Project MND. The tank was permitted by BAAQMD for 1.09 tons/year of emissions and was constructed. BAAQMD determined that the emissions were sufficiently low that only a minimum level of emissions control was required, and that, considered cumulatively, the 1.09 tons/year of VOC emissions from the floating roof tank project would be more than offset by the net reduction of 1.92 tons per year from the previous Butamer project and shutdown of the MTBE and TAME plants, as discussed above.

Although the Court's decision required the City to conduct an analysis of the cumulative impacts of the LPG Spheres Project, it did not specifically direct how this was to be performed. From one CEQA perspective, the LPG Spheres Project has become part of the baseline environmental conditions for the Proposed Project, as is also the case for the other Refinery projects (listed above) that were under consideration and constructed around the time that the LPG Spheres Project application was undergoing environmental review. To directly address the Court-ordered cumulative impacts analysis, however, the LPG Spheres Project first will be considered here, retrospectively, in the context of Refinery projects that existed or were proposed at that time (2001-2002). Evaluating the Initial Study for the LPG Spheres Project (Lamphier-Gregory, 2001), it is clear that the only areas of potential cumulatively considerable impacts for the LPG Spheres Project were Air Quality, Hazards, Noise, and Traffic. All other CEQA Guidelines Appendix G checklist criteria for the LPG Spheres Project were found to have no impact; therefore, the LPG Spheres Project would have no potential to contribute to cumulative impacts. There is no substantial evidence that these conclusions have changed since the Initial Study was completed.

LPG Spheres Project Cumulative Air Quality Impacts. Considering shutdown of the MTBE and TAME plants (reducing VOC emissions by 4.72 tons per year), factoring in the Butamer Plant (2.8 tons per year increase), external floating roof tank project (1.09 tons per year increase), and LPG Spheres Project emissions (0.5 tons per year increase) together, there was at that time a net reduction in cumulative VOC emissions amounting to 0.33 tons/year at the Refinery. Thus, although the LPG Spheres Project by itself resulted in an increase in Refinery VOC emissions, the operational cumulative effects of the contemporaneous projects was a net decrease in VOC emissions. As a result, there were no cumulatively considerable air quality impacts, and no additional mitigation is required for the LPG Spheres Project.

LPG Spheres Project Cumulative Hazards (Public Safety) Impacts. The LPG Spheres Project would contribute to the potential cumulative hazards/public safety impacts within the project area because the other then-proposed projects would have had no substantial potential risk to public safety. The risk from the LPG Spheres Project would result from the potential for a boiling liquid expanding vapor explosion (BLEVE) at one of the LPG Spheres. The likelihood of such a singular event was correctly considered to be low and, therefore, less-than-significant in the 2001 Initial Study. Furthermore, the risk from the other cumulative projects was negligible, and this conclusion was not affected by the Court's decision, there were no cumulatively considerable impacts for public safety due to hazards, and no additional mitigation is required for the LPG Spheres Project.

LPG Spheres Project Cumulative Noise Impacts. The 2001 Initial Study identified pile-driving as a potentially significant noise impact and required mitigation measures to restrict the hours of pile-driving to 7:00 am - 6:00 pm on weekdays only. The duration of this project-related pile-driving was to be about a one month period in late 2001. From a cumulative standpoint, the relatively short duration of pile-driving activities for the LPG Spheres Project had little potential to interact cumulatively with other then proposed projects at the Refinery, because it was likely that the pile driver would have been moved from one project site to another and only the Alkylation Plant, Butamer Plant, and FCC Plant projects were likely to require pile driving for foundation work. Furthermore, implementation of the mitigation measures applied to the LPG Spheres Project was sufficient to have mitigated to a less-than-significant level any contribution of the project to a cumulatively considerable noise impact. Therefore there would be no cumulatively considerable contribution to the noise from the LPG Spheres Project, and no additional mitigation for the LPG Spheres Project is required.

LPG Spheres Project Cumulative Traffic Impacts. The construction of the LPG Spheres was proposed to occur over a one-year period, with the intensive period of construction occurring over approximately one-half of this period. The peak labor force was estimated at 30 construction workers and up to 12 truck trips per week. With regard to traffic from operation of the project, no additional new employees were required; therefore, no new operational traffic was produced. The 2001 Initial Study relied on analyses found in the 1993 Chevron Reformulated Gasoline EIR (SCH No. 1994106487), which previously considered the significant effects on the environment of the Reformulated Gasoline project as well as the FCC alterations project, and contained mitigation measures that were adopted by the City to reduce traffic impacts that would occur when much larger work forces were involved. The 1993 Chevron Reformulated Gasoline EIR assumed that between 1,500 and 1,850 workers were needed for the proposed Reformulated Gasoline project and estimated 5,000 workers were needed for the other then-proposed cumulative projects in the local area, and it concluded that mitigation measures then in place for the FCC alteration project (a much larger project) were sufficient to reduce significant traffic-related impacts to a less-than-significant level. It is therefore reasonable to conclude that the cumulatively considerable impact of the addition of the relatively smaller temporary labor force from the LPG Spheres Project would, when considered with the other then-proposed projects, also be less than cumulatively considerable (because of the previously adopted and still-in-effect traffic mitigation measures). In summary, the LPG Spheres Project had no cumulatively considerable impact on traffic, and no additional mitigation for the LPG Spheres Project is required.

Finally, considering the cumulative impacts of the LPG Spheres Project in the context of and in the time frame of the Proposed Project, the overall results would be essentially the same as the comparison with other known Refinery projects at that time (2001-2002), as presented above. Consideration of the cumulative air quality impacts of the LPG Spheres Project, as discussed above, in addition to the current cumulative context does not alter the conclusions of the cumulative analysis presented in Sections 4.3, *Air Quality* and 5.2.5.3 of this EIR because the cumulative effect of projects at the time of the analysis of the LPG Sphere Project indicated that there would be a net decrease in air emissions. Because the LPG Spheres Project was a much

smaller project than the Proposed Project, the construction-related noise and traffic effects, as discussed above, were smaller than those of the Proposed Project (See Sections 4.10, *Noise* and 5.2.5.10 and Sections 4.16, *Transportation and Traffic* and 5.2.5.16 of this EIR). Although the LPG Spheres Project was constructed prior to the Proposed Project, even if it were to coincide with the peak of the Proposed Project, the cumulative construction noise and traffic impacts could be mitigated to less-than-significant levels by the mitigation measures included in the Proposed Project. Finally, the cumulative hazard or public safety impacts resulting from the LPG Spheres Project, the Proposed Project, and from the other cumulative projects would be negligible for the reasons discussed above, and because they are all independent of each other in terms of accident risk. Therefore, there would be no cumulatively considerable impacts to public safety due to hazards. No additional mitigation measures are required for the LPG Spheres Project.

TURBO

The proposed Three-Stage Upgrade to Richmond Base Oil (TURBO) consists of modifications to four Richmond Lube Oil Project (RLOP) process units at the Refinery: Light Neutral Cracker, Light Neutral Hydro-Finisher, Heavy Neutral Cracker, and Heavy Neutral Hydro-Finisher. The TURBO project includes modification to a RLOP process furnace (the Heavy Neutral Hydro-Finisher Vacuum Stripper Feed Furnace) and includes alteration to the RLOP Gas Recovery Unit and Heavy Neutral Cracker Vacuum Column Feed Furnace. An Authority to Construct / Permit to Operate application was submitted to the BAAQMD in September 2004; BAAQMD was lead agency for the environmental review process. Construction of the TURBO project is now complete and is anticipated to be operating by the end of first quarter of 2007. The location of this project is shown on Figure 5-1.

Butane Selective Hydrogenation Unit

The Butane Selective Hydrogenation Unit (C4 SHU) project at the Refinery would result in modification to the existing Refinery Alkylation Plant (BAAQMD Source No. S-4291) and involves the installation of one process vessel, two heat exchangers (non-combustion sources), and piping/piping components. The C4 SHU was assigned BAAQMD Source No. S-4357 and is a part of the Reformulated Fuels & FCC Modernization Project, which was analyzed in the 1993 Chevron Reformulated Gasoline EIR. For the location of this project, see Figure 5-1.

The C4 SHU Project was previously approved for construction by the City of Richmond as part of Chevron's 1994 Clean Fuels Project Conditional Use Permit and by the BAAQMD in 1994. However, lack of available funding and other factors caused some of the projects, including the C4 SHU, to be postponed. The C4 SHU Project has continued to be reviewed and evaluated since 1996. The implementation of this project is currently expected to occur in 2012.

This project would add a small, new process unit that requires installation of only VOC fugitive emissions control measures. No change to upstream or downstream Refinery process units would occur. The Project would qualify for the BAAQMD's Accelerated Permitting Program because the highest daily maximum emissions would be less than 10 pounds of VOCs.

FCC Gasoline Hydrotreater

Chevron is in the process of performing alterations to the hydrotreater stage of the Refinery Diesel Hydrotreater II to enable it to process FCC gasoline (light, heavy, and sidcut naphtha). Chevron submitted an Authority to Construct and Permit to Operate application to BAAQMD in September 2004 that was subsequently approved by the BAAQMD. The project was previously approved by the City of Richmond as part of Chevron's 1994 Clean Fuels Project Conditional Use Permit. The timing for implementation of this project is during the last quarter of 2006 through the third quarter of 2007. The location of this project is shown on Figure 5-1.

EBMUD Richmond Advanced Recycled Expansion (RARE) Water Project

The East Bay Municipal Utility District (EBMUD) is proposing implementation of the Richmond Advanced Recycled Expansion (RARE) Water Project. The purpose of the RARE Water Project would be to produce high-purity recycled water for boiler make-up water applications at the Refinery. The use of up to 4 million gallons per day (MGD) of recycled water would save an equivalent amount of fresh potable water, which is currently used for boiler make-up water, thereby reducing the threat of severe rationing to EBMUD's 1.3 million customers during droughts.

The project would treat the secondary effluent from the West County Wastewater District, which would otherwise be discharged to the Bay, to produce high-purity recycled water for use as boiler make-up water at the Refinery. The project would require construction of a 4 MGD advanced recycled water facility within the Chevron Refinery property (See Figure 5-1). The project treatment facility would be owned and operated by EBMUD in conjunction with its existing North Richmond Water Reclamation Plant (NRWRP). The Draft EIR for the RARE Water Project was released in February 2, 2007 for a 45-day public review period. The Draft EIR found that the RARE Project would have short-term impacts to water quality, land use, air quality, noise, traffic, hazardous materials, public services and utilities, and visual resources. It also found that in some areas, these impacts, while individually short term in nature, could be potentially significant due to their aggregate effect on the light industrial and residential uses in the community. However, the DEIR also determined that proposed mitigation measures would reduce these impacts to less-than-significant levels and that there would be no long-term significant adverse effect on the environment. The Final EIR was certified by EBMUD on May 8, 2007. Construction of the first phase of this project (designed to deliver up to 4 MGD of recycled water) is expected to occur between 2008 and 2009.

The RARE Water Project would be built and constructed at the Refinery at a location northeast of Chevron's bioreactor. The treatment plant site would include a 16,500-square foot treatment plant building with a 0.5 million gallon tank approximately 60 feet in diameter, a 2 million gallon tank approximately 130 feet in diameter, a 144,000-gallon inter-process storage tank, chemical storage and feed facilities, and associated electrical systems. While a majority of the RARE Water Project facilities would be located within the Refinery, a portion of the Project facilities, including several short pipelines would be installed in areas outside the Refinery.

Electrical Infrastructure Replacement Projects

Chevron has been developing projects to improve electrical system reliability, including replacement of old electrical infrastructure facilities and equipment. These projects are in various stages of development, from initial scoping to construction. Because these projects would be replacement projects only, no discretionary approval from the City of Richmond is required. However, some parts of these projects would require City of Richmond building permits and possibly grading permits:

- **Quarry Substation replacement / 2nd Quarry feeder.** This project involves replacement of an existing 25MegaVolt-Ampere (MVA) 12 kV / 2.4 kV substation that has reached the end of useful life. The new substation will be a 5 MVA, 2.4 kV Double-Ended Substation and include the addition of a second 12 kV overhead feeder. This substation provides power for an existing Refinery pump station.
- **Isomax Motor Control Centers.** This project involves implementation of reliability upgrades within the Isomax area to address electrical equipment that is at full load or at the end of its useful life. The project would also de-cluster/redistribute electrical loads to allow equipment maintenance in alignment with plant shutdown schedules.
- **Critical Power.** This project is planned to implement Refinery Process Engineering recommendations for the provision of alternate stand alone power sources for electrical loads identified as “Critical to Refinery Operations,” such as unit control rooms and emergency shutdown systems.
- **Electrical Management System.** This project involves installation of a modern Electrical Management System (“EMS”), including system monitoring and control features. EMS technology would be part of all new electrical installations within the Refinery, and may also be retrofitted into existing installations. This project would replace the Refinery’s existing SCADA System and improve analysis and response time in the event of electrical system trips or unit upsets.
- **D&R Motor Control Centers.** This project involves implementation of reliability upgrades within the Distillation & Reforming (“D&R”) area to address electrical equipment that is at full load or at the end of its useful life. The project would also de-cluster/redistribute electrical loads to allow maintenance in alignment with plant shutdown schedules.
- **No. 6 Substation.** This project is planned to replace and relocate a 50-year old substation (64MVA No. 1 Sub) that is at the end of its useful life. Relocation will improve system reliability by reducing the distance between the substation and the respective electrical loads.
- **South Yard Substation.** This project is planned to replace and relocate a 70-year old substation (25 MVA Power Plant Sub) that is at the end of its useful life. Relocation will

improve system reliability by reducing the distance between the substation and respective electrical loads.

- **Cracking Power Center.** This project entails replacement of the 50-year old FCC Unit In-Plant Substations and Motor Control Centers that have reached end-of-life.
- **FCC Cooling Tower Substation (TX-116/117).** This project is planned to replace a 50-year old 1500kVA substation that is at the end of its useful life.
- **3 Sub High Voltage.** This project is planned to install additional circuit breakers, switches and relays for improved 115 kV system protection and reliability at #3 Substation.
- **2/4 Sub High Voltage.** This project is planned to install additional circuit breakers, switches and relays for improved 115 kV system protection and reliability at #2 and #4 Substations.
- **17 Pump Station.** This project entails replacement of the two 60-year old 1500kVA 2.4KV and 480V substations that are at the end of useful life.

New Firehouse

The Refinery anticipates replacing its current Refinery firehouse building, which was constructed prior to 1950. The project includes the construction of a 25,000 square-foot seismically-safe firehouse to adequately protect critical Refinery communications and emergency response equipment. For the location of this project, see Figure 5-1. Building permits from the City of Richmond would be required as well as a Design Review application and hearing before the City of Richmond Design Review Board. The timing for start of construction of this project is the third quarter of 2007 with completion estimated to be the fourth quarter of 2008.

Castro Cove

The Castro Cove Project would involve dredging materials from Castro Cove (See Figure 5-1). The dredge spoils would be deposited on Refinery's No. 1 Oxidation Pond to start the process of filling and closing this pond. A grading permit from the City of Richmond would be required; however, no BAAQMD permit is required. The timing for implementation of this project is the second quarter of 2007, and the project is expected to be completed by the second quarter of 2008. On November 13, 2006, the RWQCB adopted a Negative Declaration (SCH No. 2006092119) for this project covering the Site Cleanup Requirements (SCRs) for Castro Cove. As a result of the SCRs, a remedial action will be conducted that includes removal of contaminated sediments in that portion of the Cove where studies have shown that contaminants present a potential risk to benthic invertebrates, which are small, sediment-dwelling organisms. Pursuant to the SCRs and permits to conduct the work from the Bay Conservation and Development Commission and the United States Army Corps of Engineers, the impacted sediments will be dredged from the Cove and placed in the Number 1 Oxidation Pond, an upland location within the Refinery. When removal of the impacted sediments from the Cove is complete, the biological viability of Castro Cove would be restored. In addition, after the

sediments are placed in the Number 1 Oxidation Pond, this facility would be capped and closed, providing long-term protection of the environment.

Long Wharf Lease Renewal

Chevron is seeking a renewal of its State Lands Commission (SLC) lease on its Long Wharf tanker pier in San Francisco Bay. No physical changes or construction are involved in this project. The State Lands Commission published a Draft EIR (SCH No. 98112080) on February 27, 2006, and has recently (March 7, 2007) published the Final EIR for the proposed lease renewal. For the location of this project, see Figure 5-1. See Section 4.15, *Recreation*, for additional information on recent City of Richmond actions regarding this project.

Hazardous Waste Facility Permit Renewal

Chevron operates a 1.3-acre Hazardous Waste Treatment and Storage area Facility (HWTSF) within the eastern portion of the Refinery. The construction of the HWTSF was completed in October 1983. The HWTSF is utilized for storage and treatment of many of the hazardous wastes generated in various production areas of the Facility. The HWTSF is arranged into five major hazardous waste management units to avoid the potential for physical contact of different waste types. The five hazardous waste management units are: drummed waste storage; neutralization; bulk liquid storage and treatment; solid waste storage and treatment, and liquid waste treatment. The HWTSF has a small laboratory for performing onsite evaluations of wastes, a personnel office and a shower/change trailer. Two sheds for storing safety related items and spill containment, control, and cleanup materials are located along the east boundary of the HWTSF.

Hazardous wastes are brought to the HWTSF for segregation, treatment and storage before shipment from the Facility for further treatment or disposal. The treatment at the HWTSF reduces the volume and hazardous characteristics of the waste. The wastes are primarily acids, bases and reactive chemicals. The estimated quantity generated by the HWTSF is 17,065 tons per year from 35 different operations. These wastes can be stored at the HWTSF for up to one year.

Chevron filed a Part A Application with the Department of Toxic Substances Control (DTSC) under the Resource Conservation and Recovery Act (RCRA) for treatment and storage of hazardous waste on November 7, 1980, and was issued an Interim Status Document on May 16, 1983. Chevron submitted the RCRA Part B Application in 1984. DTSC issued a RCRA-equivalent Hazardous Waste Facility Permit to Chevron on September 10, 1992, which expired on September 10, 2002. In 2001, Chevron submitted a Permit renewal application, which has been amended several times in 2004 and 2005. On September 6, 2006 DTSC issued a new permit (06-BRK-13) for the HWTSF which will be valid for 10 years until 2016. An Initial Study / Negative Declaration (SCH No. 2006042054) was issued for this permit renewal, and no mitigation measures were required for the continued operation of the HWTSF. The Initial Study / Negative Declaration was adopted by DTSC on August 25, 2006.

5.2.3.2 Other, Non-Chevron Refinery and Pipeline Projects

Also considered in this Master EIR are known or planned related non-Chevron refinery projects close to or within the vicinity of the Proposed Project area. These projects are the following:

Valero Improvement Project

A series of modifications and additions to the Valero Benicia Refinery are proposed. The project would provide the ability to process lower grades of raw materials and provide flexibility to substitute raw materials. 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 was scheduled to be implemented over a seven year period.

PG&E Richmond Fuel Oil Pipeline Divesture Project

PG&E has proposed to sell its heated Richmond-to-Pittsburg Fuel Oil Pipeline. The activities considered include the sale of the pipeline by PG&E, and the reconstruction of a 4,000-foot section of the pipeline that was removed in 1998 to allow construction of a railway station in the City of Martinez. This project was approved by the California Public Utilities Commission in spring 2005 and implementation of the project has not yet been scheduled.

ConocoPhillips Clean Fuels Expansion Project (CFEP)

ConocoPhillips is seeking 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 Refinery and sold into the heavy gas oil and fuel markets. The project involves a number of changes to the existing Refinery in Rodeo and would involve the installation of a new hydrogen plant operated by a third party at the Refinery. No hydrogen pipeline is proposed as a part of this project. An EIR has been prepared by Contra Costa County Community Development Department. The Draft EIR (SCH No. 2005092028) was published in November 2006 and the Final EIR was certified by Contra Costa County on May 8, 2007.

Praxair Contra Costa Pipeline Project

The new Hydrogen Plant described in Section 3.4.3.1 will be constructed and operated by Praxair, a third-party industrial gas company. Praxair has separately proposed to construct a hydrogen pipeline to connect the Refinery to other hydrogen users and producers in the Bay Area besides Chevron (the “Contra Costa Pipeline Project”), and submitted an application to Contra Costa County in February 2007 for a conditional use permit to do so. The proposed hydrogen pipeline would serve the new Hydrogen Plant at the Refinery, as well as other users.

As part of the Contra Costa Pipeline Project, Praxair is also seeking approval to construct a new natural gas pipeline that would follow the same route as a segment of the new hydrogen pipeline and would be located in the same construction corridor. The natural gas pipeline would be constructed by Praxair, but owned and operated by Chevron. It would preserve the exiting back-up supply of natural gas for the Refinery.

The route of the hydrogen pipeline would span a number of jurisdictions, and only a relatively small portion of the pipeline would be constructed in Richmond. Thus, the City anticipates that the Contra Costa County Community Development Department will be the CEQA lead agency for environmental review of this project, and the City of Richmond would serve as a responsible agency for the portion that requires a conditional use permit from the City. Praxair submitted an application for a conditional use permit to the City of Richmond on March 5, 2007.

The Notice of Preparation published by the City of Richmond on July 15, 2005 for the Proposed Chevron Renewal Project identified a proposed hydrogen pipeline project as part of the Proposed Project. However, the Contra Costa Pipeline Project, including the construction of the natural gas pipeline segment, is more appropriately considered in this Cumulative Impacts Section of the EIR because it is part of a larger Contra Costa County project and because neither the hydrogen pipeline nor the natural gas pipeline is a crucial aspect of the Proposed Project. As discussed below, the Proposed Project can and would be built whether or not either of the pipelines is constructed.

Because the environmental review for the Contra Costa Pipeline Project has just begun and a number of different routing alternatives are proposed, it is too early to determine the exact nature of the potentially significant impacts of the project and feasible mitigation measures. General experience with this type of linear project, however, suggests that impacts from construction-related activities to air and water quality, noise, biologic and cultural resources, hazards (public health and public safety), recreation, traffic and utilities could occur. Typically, these construction impacts can be fully mitigated to a less-than-significant level through the use of avoidance of potential impact areas and best construction management practices.⁶ Potential operational impacts due to accidental fire and explosion hazards during operation of the Contra Costa Pipeline Project may occur, although application of proper building standards would be expected to minimize these impacts to a less-than-significant level. The Contra Costa Pipeline Project would have no visual impacts, as it would be built below ground and, with the exception of potential hazards, no operational impacts would be expected. Similarly no impacts to population and housing, public services or land use would be expected

The hydrogen and natural gas portions of the Contra Costa Pipeline Project are described separately, below.

Praxair Contra Costa Hydrogen Pipeline Project

In early February 2007, Praxair filed an application with Contra Costa County for a conditional use permit for a proposed hydrogen pipeline that would connect the proposed new Hydrogen Plant for the Chevron Renewal Project to other jurisdictions to serve Bay Area hydrogen

⁶ For example the Contra Costa Pipeline Project would cross several water courses, but could employ construction methods such as horizontal directional drilling to avoid significant impacts to these habitats. Similarly, known cultural resources along the alignment could be avoided and measures to address the accidental discovery of such resources could be employed. Further, any impact for the Contra Costa Pipeline Project on biologic or cultural resources would be confined to the alignment of the pipeline and local features along that alignment. Thus, the impacts on these resources are not likely to combine with the impacts of the Proposed Renewal Project to create a cumulatively considerable impact.

consumers and producers. This approximately 21.5-mile hydrogen pipeline would be located entirely in jurisdictions within Contra Costa County. Approximately 13.5 miles of the project would be newly constructed. The remaining 8.0 miles would be an existing natural gas pipeline owned by Chevron that would be converted to hydrogen service. For the 13.5 miles of new hydrogen pipeline construction, up to 0.8 miles would be located in the City of Richmond; approximately 1.6 miles would be located in the City of Pinole; and approximately 2.3 miles would be located in the City of Martinez. The remainder of the new hydrogen pipeline construction (approximately 8.8 miles) would be located in unincorporated areas of Contra Costa County.

For the existing Chevron natural gas pipeline that would be converted to hydrogen service, a 3.0 mile segment is located in the City of Richmond; a 0.7 mile segment is located in the City of Pinole; a 1.9 mile segment is located in the City of Hercules; and a 2.4 mile segment is located in the unincorporated areas of Contra Costa County. No modifications are required for Praxair's use of the existing Chevron natural gas pipeline except to connect the existing pipe to the proposed newly constructed segments of the hydrogen pipeline and to construct a valve station at Chevron's existing Hilltop valve station. Praxair would operate and maintain the existing pipeline segment, but it would continue to be owned by Chevron.

The Contra Costa Pipeline Project would be constructed with approximately five continuous operations or "spreads" working concurrently. A spread consists of equipment adequately staffed to handle various types of construction activities for a given pipeline segment. The construction contractor would employ approximately 10-20 individuals per spread for conventional construction, 5 workers for jack and bores, and 10 workers for horizontal directional drilling. The Contra Costa Pipeline Project would employ a total peak work force of up to 100 workers. Praxair anticipates that construction would begin in Spring 2008 and be completed in Fall 2008.

Conditional use permits would be required from Contra Costa County and the Cities of Martinez and Richmond. Other permits would be required from the City of Pinole and BAAQMD. In addition, easements and encroachment permits, a NPDES permit, a Section 12 Nationwide permit, Section 7 and 106 consultations, and streambed alteration agreements would be required. At the present time, the exact route of the pipeline is not known, as there are a number of alternative routings suggested in the application. As mentioned above, environmental review of the entire 21.5-mile pipeline project by Contra Costa County would be required before the Contra Costa Pipeline Project could be approved.

The Contra Costa Pipeline Project is not a crucial or functional element of the Chevron Renewal Project. The Chevron Renewal Project does not depend on the Contra Costa Pipeline Project in order to proceed, and would be implemented with or without a pipeline being constructed by Praxair. The scope of the remainder of the Chevron Renewal Project is not dependent upon, and would not change if the pipeline is, or is not, constructed. Rather, the Contra Costa Pipeline Project's purpose would be to serve Bay Area hydrogen consumers and producers in addition to Chevron.

Praxair Natural Gas Pipeline Project

As proposed by Praxair, the Contra Costa Pipeline Project would convert an existing section of a Chevron-owned natural gas pipeline—a section which currently provides the Refinery with a backup supply of natural gas—to hydrogen service. To meet the Contra Costa Pipeline Project's objectives, Praxair considered constructing a new three-mile pipeline between the Hilltop Station and North Richmond. However, this route proved impractical due to the existence of several wetland areas (including the Rheem Creek drainage in north Richmond) and sensitive species habitat (pickleweed habitat for the salt marsh harvest mouse) in the area between the Refinery and Parchester Village. Converting the existing natural gas line to hydrogen service allows the project to bypass these environmentally sensitive areas and saves the expense of constructing three miles of new pipeline. However, it also requires that Praxair replace the pipeline for backup natural gas supply to the Chevron Refinery since the existing line will be converted to hydrogen service.

Thus, as part of the Contra Costa Pipeline Project, Praxair is also seeking approval to construct a new 16-inch diameter carbon steel natural gas pipeline that will be approximately 2.0-miles long (0.9 miles would be located in the City of Richmond and 1.1 miles would be located in unincorporated areas). The purpose of the new natural gas pipeline would be to replace the Refinery's current back-up supply of natural gas if the Contra Costa Pipeline Project is approved.

Praxair has proposed that most of the new natural gas pipeline would interconnect to PG&E's existing STANDPAC 3 gas transmission pipeline, would follow the same route as a segment of the new hydrogen pipeline, and would be located in the same construction corridor, with a small portion (estimated at 600 feet) extended to Chevron's AB station in Richmond for interconnection with the Refinery's existing natural gas supply system. However, Praxair has proposed several alternate routes, and at this time it is unclear which route ultimately would be selected.

The construction of the new natural gas pipeline segment is not a crucial aspect of the Proposed Renewal Project because it will only be necessary if Praxair converts the existing natural gas to line to hydrogen service as part of its hydrogen pipeline project. As explained above, Praxair's Contra Costa Pipeline Project is itself independent from the Chevron's Proposed Project. The Proposed Project can and would go forward regardless of whether its natural gas supply comes from the existing line or from the new segment that Praxair proposes to construct.

The natural gas pipeline segment will undergo thorough environmental review as part of the review of the Contra Costa Pipeline Project as a whole, as discussed above. Its construction would coincide with that of the hydrogen pipeline, which Praxair anticipates it will begin in Spring 2008 and be completed in Fall 2008. Praxair would construct the new natural gas pipeline, but Chevron would own and operate it.

5.2.3.3 Other Projects in the City of Richmond

Other development projects within the City of Richmond are listed in Table 5-1, below.

**TABLE 5-1
CHEVRON ENERGY AND HYDROGEN RENEWAL PROJECT
CITY OF RICHMOND CUMULATIVE PROJECT LIST**

Project Name	Project Address	Description	Filed/Status
Point Richmond Shores	Dornan Drive	330 residential condos	Approved 2006
Westshore Marina	Marina Way South	300 residential condos	4/2006 Approved
Seacliff Marina	Point Richmond	300 residential condos	12/23/04 EIR under review
Parkway Transit Village	Goodrick Avenue	Mixed-Use	3/24/05 Under review
Marina Way Live /Work	900 Marina Way South	64 industrial live/work	3/31/05 Under review
Anchorage at Marina Bay	Regatta Blvd	211 residential townhouses	Approved Under Construction
Anchor Cove	1340 Marina Way S.	138 residential townhouses	1/23/04 Approved under Construction
Ford Building	1414 Harbor Way S.	Mixed use – residential/commercial	6/8/04
The Crossing	Marina Bay Pkwy	Commercial buildings (3)	2/10/04 under construction
Forest Green	Clark Road	122 homes	1/15/04 Under review
Parkway Commerce Center	Giant Hwy/Richmond Pkwy	11 lots-industrial use	Approved Fall 2005

SOURCE: City of Richmond, 2007

In addition to the Richmond-related projects listed in Table 5-1 another project located just west of the Refinery in Richmond is also considered in this cumulative analysis.

Point Molate Reuse Project

Point Molate Naval Fuel Depot (NFD) is located on the San Pablo Peninsula, approximately 1.5 miles north of the Richmond-San Rafael Bridge in the City of Richmond, California. The NFD covers approximately 412 acres in the Potrero Hills along the northeastern shore of San Francisco Bay. The San Pablo Peninsula is the land mass between San Pablo Bay and San Francisco Bay. The facility occupies approximately 1.6 miles of shoreline and its property extends into adjacent hillsides up to the top of the San Pablo ridge. The facility is bordered to the north, south, and east by the Chevron Richmond Refinery and to the west by San Francisco Bay. In 1995, Point Molate was listed for closure and disposition under the Defense Base Closure and Realignment Act (BRAC) of 1990, and the facility was closed on September 30, 1998.

In November 2004, the Guidiville Band of Pomo Indians (Tribe), and Upstream Point Molate LLC, working with Harrah's and the Tribe on a hotel-casino resort, entered into an agreement with the City of Richmond (City) to develop the site.

The development project will reflect the goals and objectives of the Point Molate Base Reuse Plan by including a range of hospitality, retail, entertainment and recreation uses, while providing job and revenue generation for the City. The Proposed Project will include a balance of development and open space on the property. The project will feature first class destination resort

and gaming facilities, together with approximately 150,000 square feet of indoor related showroom entertainment and conference space, 1,100 hotel rooms and approximately 300,000 square feet of retail space, together with public-serving uses, park and open space and pedestrian, bicycle and vehicular access and circulation. Retail uses will be organized into a pedestrian village inland from and parallel to the shoreline, leaving a generous park and Bay Trail alignment on the Bay's edge. In concert with the Bay Trail, the plan provides for a ferry terminal at the Point Molate pier, with clustered public facilities and amenities to provide the necessary shoreside facilities and enhance the waterfront experience. Development along the shoreline will be clustered in designated areas, leaving the majority of the shoreline in a natural state. The City Planning Commission and the Bureau of Indian Affairs (BIA) held a scoping meeting on March 31, 2005, to discuss the development. A joint EIR/EIS is currently being prepared.

5.2.4 General Approach and Method of Cumulative Analysis

To illustrate the approach and methodology used in this Draft EIR for the analysis of cumulative impacts, Table 5-2 shows for each environmental category, that has a potential cumulative impact, the applicable adopted plan(s) as well as the list of projects that make up the cumulative context considered in the analysis of cumulative impacts. The analysis of cumulative impacts for each environmental topic covered in Sections 4.1 through 4.17 of this Draft EIR is set forth in Section 5.2.5, below.

**TABLE 5-2
DEVELOPMENT PLANS AND PROJECTS CONSIDERED IN THE ANALYSIS OF
RENEWAL PROJECT CUMULATIVE IMPACTS**

Category	Primary Geographic Area Considered	Cumulative Development Considered in Analysis	Known Projects also Considered in Analysis
Visual Impacts	City Viewsheds	Future development according to Richmond General Plan and Richmond Municipal Code	Other Chevron Refinery (5.2.3.1) and Local Richmond Projects (5.2.3.3)
Air Quality	Local	Future development according to Richmond General Plan	All listed projects (5.2.3)
	Regional	Regional development per the Contra Costa County General Plan and the BAAQMD Bay Area 2005 Ozone Strategy	Projects considered in the Ozone Strategy includes other refinery projects (5.2.3.2)
Biological Resources	Local	Future development according to Richmond General Plan	Not supplemented by lists
	Regional	Regional Growth in accordance with Contra Costa General Plan, RWQCB, BCDC, CALFED planning	Not supplemented by lists
Cultural Resources	Local	Growth according to Richmond General Plan	Other Chevron Refinery (5.2.3.1), the Praxair Pipeline (5.2.3.2), and Local Richmond Projects
Energy	Local	Growth according to Richmond General Plan and Contra Costa County General Plan	All listed projects (5.2.3)
	Northern California	California Energy Commission	Not supplemented by lists

TABLE 5-2 (continued)
DEVELOPMENT PLANS AND PROJECTS CONSIDERED IN THE ANALYSIS OF
RENEWAL PROJECT CUMULATIVE IMPACTS

Category	Primary Geographic Area Considered	Cumulative Development Considered in Analysis	Known Projects also Considered in Analysis
Public Health	Local	Future development according to Richmond General Plan (Toxic Air Contaminants and risk are considered as specific project incremental impacts)	All listed projects (5.2.3)
	Regional	Development in accordance with the BAAQMD Bay Area 2005 Ozone Strategy	Projects considered in the Ozone Strategy (5.2.3.2)
Public Safety	Local	Future development according to Richmond General Plan and the Richmond Industrial Safety Ordinance	All listed projects (5.2.3)
Hydrology and Water Quality	Local	Future development according to Richmond General Plan	All listed projects (5.2.3)
	Regional	Regional development in accordance with San Francisco Bay Basin Plan, Contra Costa County General Plan, Regional WQCB, BCDC, CALFED planning	Not supplemented by lists
Land Use	Local	Growth in Accordance with Richmond General Plan, City of Richmond Zoning Ordinance, Association of Bay Area Governments - Bay Trail Plan, Bay Conservation and Development Commission San Francisco Bay Plan, Contra Costa Countywide Bicycle and Pedestrian Plan, East Bay Regional Park District Master Plan, San Pablo Peninsula Open Space Study	Other Chevron Refinery (5.2.3.1), the Praxair Pipeline (5.2.3.2), and Local Richmond Projects
	Regional	Development under the Contra Costa County General Plan, Contra Costa County Zoning Ordinance, Association of Bay Area Governments - Bay Trail Plan	All listed projects (5.2.3)
Noise	Local	Growth in Accordance with Richmond General Plan	Other Chevron Refinery (5.2.3.1), the Praxair Pipeline (5.2.3.2), and Local Richmond Projects that could affect local noise sensitive receptors (5.2.3.3)
Public Services	Local	Growth in Accordance with Richmond General Plan	All listed projects (5.2.3)
Population and Housing	Local	Growth in Accordance with Richmond General Plan	Local Richmond Projects (5.2.3.3)
Recreation	Local	Growth in Accordance with Richmond General Plan, Contra Costa County Transportation Authority Bicycle and Pedestrian Plan	All listed projects (5.2.3)
Traffic and Transportation	Local	Development under the Contra Costa General Plan	Not supplemented by lists
	Regional	Traffic conditions under Transportation Agency CMP	Projects considered in CMP (5.2.3.1 through 5.2.3.3)
Utilities and Services Systems	Local	Development under the Richmond General Plan	Not supplemented by lists
	Regional	Development under the Contra Costa General Plan	Not supplemented by lists
	State	Northern California development	Not supplemented by lists

5.2.5 Areas of Potential Cumulative Impacts

5.2.5.1 Aesthetics, Visual Quality, Light and Glare

The construction of the other non-Refinery cumulative projects, together with all of the reasonably foreseeable projects at the Refinery, would reinforce the industrial appearance of the overall complex and the northwest portion of the City of Richmond, as well. The development of the other, non-refinery cumulative projects, such as planned residential and commercial projects in the City of Richmond (See Table 5-1), including future development according to Richmond General Plan, also would result in changes to City viewsheds in the vicinity of the Refinery and throughout the northwestern portions of the City.

Impact 5-1: The reasonably foreseeable projects at the Richmond Refinery would expand the industrial appearance of the overall complex. However, none of the changes associated with individual projects would be expected to substantially alter the visual appearance of the Refinery or affect visual resources. As such, the cumulative projects would produce a less than significant cumulative visual quality impact.

As discussed in Section 5.2.3, *Specific Projects Considered in the Cumulative Analysis*, other projects planned at Richmond Refinery are upgrades to existing processing units, electrical infrastructure improvements, a new firehouse, and recycled water programs. The existing two LPG spheres are also discussed along with other past, cumulative projects (See Section 5.2.3.1). With the possible exception of some pipeline portions of the EBMUD RARE Water Project (see Section 5.2.3.1), these projects would be located within the existing Refinery complex, and would not expand industrial operations outside the processing, tanks storage, and wastewater processing areas. New processing facilities would be painted the same color scheme of the existing Refinery, and would not represent any overall significant changes in the industrial appearance of the complex. The RARE Water Project facilities, including the building housing the processing equipment and the storage tanks, will be visible from some viewpoints shown in Figure 4.1-1, however they too will blend in with the general appearance of the Refinery complex.

Some staging and shutdown equipment laydown areas used for construction of these foreseeable projects also would be visible, and would incrementally add to the overall extent of disturbed, graded areas surrounding the main processing and tank storage facilities, but this overall impact would be less than significant.

Mitigation: None required.

Impact 5-2: Other non-refinery cumulative projects, together with the Proposed Project and other Chevron Refinery projects, would combine to alter the general appearance of the northwestern portion of the City of Richmond, but would not degrade the visual character of the setting. Therefore, none of the changes would be considered to substantially impact

visual resources. As such, the cumulative projects would produce a less-than-significant visual impact.

The construction of the other non-Refinery cumulative projects, together with all of the reasonably foreseeable projects at the Refinery, would be consistent with the industrial appearance of the overall complex and the northwest portion of the City of Richmond as well. The development of the other, non-refinery cumulative projects, such as planned residential and commercial projects in the City of Richmond (See Table 5-1), including future development according to Richmond General Plan, also would result in changes to City viewsheds in the vicinity of the Refinery and throughout the northwestern portions of the City. These new facilities would very slightly change the already industrialized appearance of the Refinery property and northwest Richmond. While noticeable, these visual changes would be dispersed throughout the immediate region, but would not be collectively perceptible as a substantial visual change when compared to existing conditions. During construction, staging and laydown areas would be visible, and would incrementally add to the overall extent of disturbed, graded areas in the vicinity, but this cumulative impact would be less than significant. The Contra Costa County Pipeline project would not contribute to visual impacts because it would be entirely underground.

Mitigation: None required.

5.2.5.2 Agriculture

The Proposed Project would have no impact on agricultural resources. For that reason, it could not contribute to any adverse cumulative impacts related to agriculture resources.

5.2.5.3 Air Quality

The air quality cumulative analysis focuses on local and regional air quality and local odor impacts. For cumulative analysis related to local air quality impacts, refer to Section 5.2.5.12, *Public Health*. Operational cumulative air quality impacts related to NO_x and SO₂ are not analyzed because the Proposed Project would result in net reductions of these pollutants.

Impact 5-3: Short term criteria pollutant emissions associated with the construction of the Proposed Project could result in elevated pollutant concentrations when combined with emissions from other construction projects. However, construction emissions associated with the Proposed Project would not be cumulatively considerable and cumulative impacts would be less than significant.

Elevated criteria pollutant emissions could result if construction of the Proposed Project were to occur simultaneously with one or more of the cumulative projects described above. The cumulative projects include other Chevron projects at the Refinery as well as other refinery and development projects as identified in Section 5.2.3, above.

As described in Section 4.3, *Air Quality*, construction of the Proposed Project would result in emissions of criteria pollutants; however, construction emission estimates are included in the Bay Area Air Quality Management District emissions inventory that is the basis for regional air quality plans designed to bring the Bay Area into attainment status of air quality standards. Therefore, the estimated construction emissions presented in Table 4.3-8 that would be associated with the Proposed Project, and other emissions that could result from simultaneously constructed cumulative projects, would combine to create emission concentrations consistent with emission inventory estimates and would not be expected to impede attainment or maintenance of criteria pollutants in the Bay Area. In addition, the City would adopt the construction mitigation measures approved by the BAAQMD, which are designed to reduce dust and exhaust emissions to ensure that construction impacts associated with the Proposed Project would be less than significant (See Section 4.3). As it is the City's general practice to require these mitigation measures for all construction projects, the impacts from local non-Refinery and Refinery projects would be mitigated. Implementation of such mitigation measures would ensure that Proposed Project construction emissions would not be cumulatively considerable.

Mitigation Measures: Mitigation Measures 4.3-1a, 4.3-1b, and 4.3-1c (See Section 4.3, *Air Quality*).

Significance after Mitigation: Less than significant.

Impact 5-4: Operational emissions of Proposed Project-related VOC pollutants would be cumulatively significant, resulting in a significant and unavoidable cumulative impact.

According to the BAAQMD CEQA Guidelines, any proposed project that would individually have a significant air quality impact would also be considered to have a significant cumulative air quality impact. The total Proposed Project VOC fugitive emissions are estimated to increase by amounts greater than the BAAQMD significance threshold for project operations, primarily due to emissions from the proposed new and replacement tank component (See Tables 4.3-9 and -10 in Section 4.3, *Air Quality*). This Proposed Project impact would be significant and unavoidable. Therefore, the VOC emissions that would result from operations of the Proposed Project would be cumulatively considerable, resulting in a cumulative significant impact. No feasible mitigation is available. Chevron does not have any available additional contemporaneous VOC emission reduction offsets that could be used to mitigate this significant impact, and no feasible technology to reduce this impact has been identified. Therefore, there are no feasible mitigation measures that could reduce this impact to a less than significant level.

Significance after Mitigation: Significant and Unavoidable.

Impact 5-5: Operational emissions of criteria pollutants other than VOC from the Proposed Project could result in elevated pollutant concentrations when combined with emissions from other projects. However, operational emissions of criteria pollutants other than VOC

associated with the Proposed Project would not be cumulatively considerable and cumulative impacts would be less than significant.

According to the BAAQMD CEQA Guidelines, for any project that does not individually have significant operational air quality impacts, the determination of significant cumulative impacts is based on an evaluation of the consistency of the project with the local general plan and of the general plan with the regional air quality plan. As described in Section 4.3, *Air Quality*, the Proposed Project operations would result in net decreases of NO_x and SO₂ and less than significant increases of CO and PM emissions. Applicable regional clean air plans include the 1999 Ozone Attainment Plan, the 2005 Ozone Strategy, and the 1994 Maintenance Plan for CO. There is no regional air quality plan for PM₁₀. Proposed Project-related stationary sources would be permitted in a manner consistent with BAAQMD New Source Review requirements that implement these regional air quality plans. As described in Section 4.3, *Air Quality*, the Proposed Project would comply with all applicable rules and regulations contained in the City of Richmond and Contra Costa general plans. Because the Proposed Project would not require an amendment of the local general plans and it would not influence population and regional vehicle use projections that are included in regional air quality plans, it would be consistent with regional air quality plans. Therefore, Proposed Project emissions of criteria pollutants other than VOC would not be cumulatively considerable.

Mitigation: None required.

Impact 5-6: Operational activities associated with the implementation of the Proposed Project and other local cumulative projects could lead to cumulative increases in odorous emissions. This would be a less than cumulatively considerable significant impact.

Odorous emissions associated with Proposed Project are expected to be similar to or less than emissions under current conditions. Overall, Chevron anticipates no significant increase in odorous emissions from the Proposed Project and H₂S emissions would be below BAAQMD standards (i.e., 60 ppb for three consecutive minutes and/or 30 ppb for 60 consecutive minutes). H₂S concentrations after the Proposed Project would continue to be below applicable thresholds. Other cumulative projects at the Refinery would also be required to result in Refinery wide H₂S concentrations below the applicable thresholds. Thus, the Proposed Project would not be expected to cause a cumulatively considerable increase in the Refinery's potential to frequently expose substantial numbers of people to objectionable odors and the cumulative odor impact associated with the Proposed Project would be less than significant.

Greenhouse Gas Emissions

The Proposed Project would emit greenhouse gases during construction and operation. At the present time, there are no rules or regulations in place from the California Air Resource Board, State Clearinghouse, or other resource agency applicable to the Proposed Project that define a

“significant” source of Greenhouse Gas (GHG) emissions, and there are no applicable facility-specific GHG emission limits or caps. The BAAQMD has noted in its comments that the District has not yet established project or cumulative level thresholds for greenhouse gas emissions. Therefore, a significance determination related to cumulative impacts associated with GHG emissions can not be made at this time. An analysis of the quantities of the Proposed Project’s GHG emissions has been developed and is shown in Table 4.3-11 and discussed in Section 4.3.6.

5.2.5.4 Biological Resources

Impact 5-7: Potential impacts to special status fisheries could occur with additional discharges into receiving waters from other non-refinery industrial projects, together with cumulative refinery projects. Considering the negligible incremental contribution from the Proposed Project, together with continued compliance with the discharge requirements in the Refinery’s NPDES permit, this impact would be less than significant.

The additional wastewater associated with other refinery and non-refinery projects, especially industrial development, together with refinery discharges could increase the mass of pollutants in receiving waters. Those increased levels of pollutants may directly affect sensitive life stages or bioaccumulate and affect higher life forms, such as special status fishes that live near or would feed on organisms living in the vicinity. Future projects at the Refinery in conjunction with the EBMUD RARE Water Project would increase the amount of recycled water used at the Refinery, potentially changing the amount of pollutant loading in the effluent discharge. The source water for the RARE Water Project would be treated wastewater that is otherwise discharged to the Bay; thus, mass loading in the discharge from cumulative projects at the Refinery would be equivalent to that under current conditions.

Although potential increases in pollutants from the cumulative discharges could occur, as discussed in Impact 4.4-1, the impairment of San Francisco and San Pablo Bays is primarily due to nonpoint and historic sources. In particular, this has been demonstrated for the two pollutants with some potential for increase due to the Proposed Project - selenium and mercury. Continued compliance with the discharge requirements of the Refinery’s NPDES permit would keep the Refinery’s contribution to these impacts to a level that is less than cumulatively considerable. The Refinery’s contribution is controlled by discharge limits in the NPDES permit and eventually will be considered by the RWQCB under the regional TMDL program. Under either the NPDES or TMDL program, the RWQCB has the responsibility and authority to modify discharge limits for dischargers such as the Refinery in order to protect water quality. The Proposed Project’s impact would be mitigated to a less-than-significant level by complying with the discharge requirements established by the RWQCB, as would the other Refinery operations discharging under the Refinery’s NPDES permit. The existing regulatory programs consider cumulative impacts to water bodies, and the contribution of refineries to pollution of San Francisco and San Pablo Bays has been found to be insignificant. (See more detailed discussion in Impact 5-10, below.) Therefore, the Proposed Project would not contribute to a cumulatively considerable impact.

Mitigation: None required.

5.2.5.5 Cultural Resources

Impact 5-8: Future foreseeable development at and in the vicinity of the Chevron Richmond Refinery could result in cumulative impacts with respect to cultural resources. The impact would be less than significant.

Because the Proposed Project would not affect known significant cultural resources, it would not be likely to contribute to significant cumulative impacts. While the incremental loss of cultural resources over time has and continues to occur from both natural and human-caused activities, the combined effects of the implementation of both the City of Richmond and state level regulations that require identification and evaluation of cultural resources as part of environmental review effectively reduces the cumulative impacts that would occur to cultural resources. Because this uniform policy is designed in each case to reduce impacts on cultural resources to below a level of significance on a site-specific basis, cumulative impacts would be less than significant. Therefore, no cumulative impacts related to cultural resources would occur.

Mitigation: None required.

5.2.5.6 Energy

Impact 5-9: The Proposed Project would increase consumption of natural gas by one-third, but it would not add incrementally to cumulative net external energy consumption by the Refinery. Therefore the Renewal Project's cumulative impact on energy would be less than significant.

The Proposed Project and other cumulative projects at the Refinery would increase overall energy production at the Refinery by recovering more energy from the crude oil and gas oil feed stocks imported to the Refinery. As a result, more energy would be available to the public in the form of refined energy products, i.e., gasoline, diesel, etc. Furthermore, the Proposed Project would increase the production of CARB gasoline at the Refinery, making more gasoline (a 6 percent increase of Refinery output) available to the public within California. This would result in a slight reduction of total energy need to import the same quantities to the California market.

General demand for energy would continue to increase in the region (CEC, 2005) and the Proposed Project would make a contribution to those increases in energy use (increase in natural gas consumption by one-third). However, because the Proposed Project would make more energy resources available through not only more product available to the California market but through the routine supply of a few MegaWatts of electricity to the PG&E grid, the Proposed Project would not contribute to a significant cumulative impact on the availability of energy resources.

Note that this increase in electrical supply would be accomplished through implementation of the new CoGen and new Hydrogen Plant and energy efficiency improvements project-specific components. This is one of the specific objectives of the Proposed Project.

Mitigation: None required.

5.2.5.7 Geology, Soils, Seismicity and Mineral Resource Impacts

Impacts related to geology and soils tend to be very localized and generally could not result in regionally cumulative impacts. To the extent that the proposed new facilities would be more resistant to seismic damage, the ability of the Refinery to continue operation after an earthquake would be improved.

Because the Proposed Project would not result in a significant impact related to Geology, Soils, Seismicity, and Mineral Resources, it would not be likely to result in significant cumulative impacts. With the combined effects of the implementation of county and state level regulations (i.e. building codes) as well as and current design standards, required design measures would effectively reduce the cumulative impacts that would occur to less than significant levels. Therefore, no cumulative impacts related to Geology, Soils, Seismicity, and Mineral Resources would occur as a result of future development.

5.2.5.8 Hydrology and Water Quality

Impact 5-10: The cumulative wastewater flows from the Proposed Project process units and storm water flows from point and non-point sources within the vicinity of the Proposed Project could potentially increase the mass load of pollutant discharges to the Bay. Given the uncertainties in the amounts of the increases in the Proposed Project toxic metal and chemical loading, and in the ability of the receiving waters to carry those increases, if any, the Proposed Project could potentially contribute to a cumulative effect in the receiving water bodies. Considering the negligible incremental contribution from the Proposed Project, together with continued compliance with the discharge requirements of the Refinery's NPDES permit, this impact would be less than significant

The waste streams at the Refinery are treated by the wastewater treatment plant prior to discharge, and are required to comply with NPDES discharge limitations. The effluent discharges into the San Pablo Bay resulting from the Proposed Project in combination with other projects at the Refinery, such as EBMUD's proposed RARE Water project, would be regulated by Chevron's NPDES permit (RWQCB, 2006a).

Cumulatively, these discharges are assimilated into the receiving surface water resources. Discharges from point sources to the waters of the United States are regulated by the RWQCB through the establishment of limitations in the NPDES permit that are required to be followed by

dischargers to manage effluent and emission concentrations of contaminants. The applicable discharge and emission limits and requirements are derived from various applicable plans, policies, and regulations including the Federal Clean Water Act, Federal Code of Regulations: Title 40, San Francisco Bay Region Water Quality Control Plan (Basin Plan), California Toxics Rule (CTR), National Toxics Rule, State Implementation Policy (also referred to as the State Implementation Plan), US EPA Quality Criteria for Water, and Ambient Water Quality Monitoring. The water quality criteria set in these plans, policies, and regulations provide both numeric water quality objectives and narrative objective for toxicity and bioaccumulation in order to protect beneficial uses. The narrative objective for toxicity states: “All waters shall be maintained free of toxic substances in concentrations that are lethal to or produce other detrimental responses in aquatic organisms.” The NPDES permit also provides the means for implementing more stringent effluent limitations as necessary to protect beneficial uses.

The State Implementation Plan prescribes the plans for implementing the water quality standards in the CTR. The CTR establishes numeric criteria for aquatic life and human health for toxic pollutants and provides a compliance schedule which authorizes the State to issue new or revised NPDES permit limits based on the federal criteria. Combined with the Basin Plan and the other plans, policies and regulations listed above, the NPDES permit is the principal tool used in protection of aquatic sensitive species and other “beneficial uses” of State water resources such as San Pablo Bay. The Basin Plan states that water quality objectives are established to be “sufficiently stringent to protect the most sensitive use” (RWQCB, 2006b).

Currently, the NPDES permit allows the Refinery to receive discharge credit for pollutants that are detected in the recycled water used by the Refinery from the North Richmond Water Reclamation Plant (NRWRP). The RARE Water Project would increase the amount of recycled water used at the Refinery and would potentially cause a change in the amount of pollutant loading to the Refinery’s effluent discharge. This final effluent discharge would be regulated by Chevron’s NPDES permit (RWQCB, 2006a).

The Proposed Project’s discharge could contribute to an increase in the cumulative chemical loading to the receiving waters of the San Pablo Bay. The Refinery’s contribution is controlled by the discharge limits in the NPDES permit and eventually will be considered by the RWQCB under the regional TMDL programs, because discharges by Chevron contribute pollutants to the overall hydrologic system of the Bay. Either under the NPDES or TMDL program, the RWQCB would have the authority to modify the discharge limits in order to protect water quality from any sudden changes or significant deviations.

The combined changes in the constituents and mass loading of the final effluent discharge from the Proposed Project, RARE Water Project, and other Chevron Refinery projects, into the San Francisco and San Pablo Bays would be minimal. The final effluent discharge would be regulated by Chevron’s NPDES permit. The combined totals would represent less than significant increases in discharges to the receiving waters. The Proposed Project’s contribution to this cumulative effect would be less than cumulatively considerable. The impact of the combined discharges from

the Proposed Project, together with the other projects considered under the cumulative analysis, would be substantially controlled by discharge requirements established by the RWQCB.

The State 303(d) list indicates that the pollutants impairing San Pablo Bay are primarily contributed by non-point sources, atmospheric deposition and historic mining practices, not current industrial discharges. For this reason, as the State Water Resources Control Board has found, “the refineries’ discharges of impairing pollutants are insignificant” and even eliminating all refinery discharges would have “no demonstrable water quality effect.” (SWRCB, 2001)

Because the Bay Area refineries’ total discharges are judged to have “no demonstrable water quality effect”, and the Proposed Project total wastewater discharge increase would be relatively small (4 to 5% by wastewater volume and less, if at all, by pollutant load) when compared to the total Chevron discharge, and even less when compared to the total discharge of all refineries, the proposed Project would not make a cumulatively considerable contribution to the cumulative impact on water quality. In addition, both the NPDES permit limitations and the TMDL programs are designed to consider cumulative impacts by establishing criteria which consider the beneficial uses of the receiving waters. Therefore, although the Proposed Project may potentially contribute pollutants to the overall hydrologic system, this contribution would be considered to be less than significant.

Mitigation: None required.

5.2.5.9 Land Use

Impact 5-11: The cumulative impacts of the Proposed Project in relationship to existing land uses on site and in the Proposed Project vicinity would be less than significant.

The Proposed Project would intensify the existing use of land on a site that is developed for Refinery-related operations consistent with land use designations in the General Plan and Zoning Code. It would not divide the community or conflict with any other plans adopted for the purpose of avoiding or mitigating environmental effects. The Proposed Project would be within the scope of development of the Richmond General Plan and would make no cumulatively considerable contribution to future cumulative development within the City.

Mitigation: None required.

5.2.5.10 Noise

Impact 5-12: Operation and construction of the Proposed Project, together with proposed and planned future development at the Refinery and in the City of Richmond, could result

in a cumulative increase in noise levels. This would be a less-than-significant cumulative impact.

Operational Noise

Increased operational noise from cumulative development in Richmond would primarily occur from increases in motor vehicle traffic. The estimated operational increase in the number of truck roundtrips per day due to the Proposed Project is 20 trips for sulfur transport and 14 trips for oxygen transport, for a total of 34 new truck trips, plus a maximum of 20 new automobile roundtrips per day from the 10 new employees. An increase in noise levels of 3 dBA would be perceptible and potentially significant. Due to the logarithmic nature of sound, a 3 dBA increase only would result from a doubling of traffic volume (100 percent increase). Since the cumulative increase in traffic along all roadway segments affected by the Proposed Project would be about 0.4 percent (See Section 4.16, *Transportation and Traffic*), the increase in noise levels on city streets would be less than 3 dBA and this impact would not be cumulatively considerable.

The Proposed Project would not involve adding new noise-producing equipment that could increase operational noise levels and, therefore, would not contribute to a cumulative noise impact due to operation of equipment.

Construction Noise

Potential cumulative noise impacts from construction of the Proposed Project and other cumulative projects could occur primarily from construction activities similar to that (i.e., pile driving, grading, operation of construction of heavy equipment, etc.) of the Proposed Project (See Section 4.10, *Noise*). The impacts of this construction noise would not be perceptible at sensitive receptors because of the distances involved (2,500 or more from most of the components of the Proposed Project and 700-1,400 feet for three of the proposed replacement tanks: T-954, T-1451, and T-1504).

Due to the attenuation of noise because of distance, only those projects described in Section 5.2.3.1, which are located on the Refinery property, would have any potential to interact cumulatively with the Proposed Project's construction-related noise impacts. The most significant construction-related noise impacts would be from pile driving activities. As is discussed in Section 4.10, *Noise*, a distance of approximately 2,500 feet would be sufficient to mitigate noise from pile driving. With the exception of the new Chevron Fire House project, for which no pile driving activities are required, all cumulative projects on the Refinery site are located well beyond 2,500 feet from nearby sensitive receptors. The only other project that has the potential to interact with the Proposed Project is the Chevron Long Wharf Lease Renewal Project, which is in the same general area of the Refinery as the tank replacement component of the Proposed Project. Because the Long Wharf project involves no physical changes, however, it would not contribute to a cumulative construction noise impact.

As is discussed in Impact 4.10-1, Mitigation Measures 4.10-1a and 4.10-1b would be applied to the Proposed Project to reduce project-related noise impacts to less-than-significant levels. For all

of these reasons, the Proposed Project would not contribute to a cumulatively considerable construction noise impact.

Mitigation: Implement Mitigation Measures 4.10-1a and 4.10-1b.

Significance after Mitigation: Less than Significant.

5.2.5.11 Population and Housing

Impact 5-13: The combination of the Proposed Project and other local projects could result in indirect population growth within the City of Richmond. This would be a less than significant cumulative impact.

The Proposed Project would require the intermittent presence of an expected average of roughly 300 workers per day, with a six-month peak in 2008 of approximately 750 workers. The temporary addition of this construction work force to the Refinery would not be considered a significant impact of the Proposed Project in combination with other projects because it is anticipated that the bulk of the construction workforce for all the projects would be drawn from the construction labor pool available in Richmond and the rest of the Bay Area. All current Bay Area residents would be expected to commute rather than move. Therefore, that portion of the new construction jobs that would be filled by current Bay Area residents would have no impact on population or housing in Richmond. In addition, a fraction of the construction workforce for the Proposed Project and other cumulative construction projects would be drawn from outside the Bay Area on a temporary basis. However, as discussed in Impact 4.11-1, the housing vacancy rate in the Bay Area would be sufficient to meet the potential demand from the Proposed Project. Operationally, only 10 new permanent employees would be added as a result of the Proposed Project. Thus, the Proposed Project's contribution to cumulative population growth and associated housing impacts would not be cumulatively considerable.

Mitigation: None required.

5.2.5.12 Public Health

Impact 5-14: Public exposure to toxic air contaminant emissions from the Proposed Project and other projects or cumulative development could result in an increase in health risks at the same locations affected by the Proposed Project. Under BAAQMD criteria, the Proposed Project's increases in health risks are considered to be less than significant; therefore, the Proposed Project would not contribute to a significant cumulative impact.

Cumulative effects to Public Health could occur if TAC emissions from the Proposed Project were to combine with TAC emissions from one or more specific cumulative projects in the region to cause a combined impact. This includes cumulative projects at the Refinery and cumulative

projects outside of the Refinery. The cumulative projects are identified in Section 5.2.3, above. Such effects could occur for construction activities as well as operational activities. Projects with the greatest potential for cumulative impacts to public health would be those projects with sources of TAC emissions that are located on the Refinery property (See Section 5.2.3.1). Dispersion modeling shows that ambient air concentrations of emissions from point sources one mile away would typically be a small fraction (typically 1 to 5%) of the concentrations close to that source. Thus, individual sources would have to be physically close to each other and aligned in the downwind direction for the emissions from one source to add significantly to the emissions of another.

Construction

With respect to the cumulative effects of emissions from construction, the considerations in the analysis are the same as above. In addition: 1) the duration of construction for a project is limited, 2) emissions can vary widely during the project construction period, and 3) the timing of various construction projects may not coincide. All of these factors tend to limit the interaction of the construction emissions and reduce the potential that construction impacts will be cumulative for the various projects in the area. Because potential current and proposed construction projects on the Refinery site would typically not occur at the same time or in the same location, potential cumulatively considerable public health impacts at nearby sensitive receptors would not be expected to occur.

Operations

Cumulative impacts under operations would be the result of emissions of toxic metals and toxic VOCs from the Renewal Project combined with toxic emissions from other cumulative projects on or near the Refinery. The health risk from TAC emissions from Proposed Project components were evaluated in Section 4.12, *Public Health* and the impacts from TAC emissions were found to be less-than-significant. Section 5.2.3.1 describes cumulative projects located on the Refinery. These cumulative projects are generally related to the handling of hydrocarbons and could be sources of TACs that are components of the VOC emissions. Section 5.2.3.1 states that there will be little or no net increase in VOC emissions for several the cumulative projects, and there would be slight decrease in VOC emissions for other cumulative projects as more efficient units replace older units. Consequently there will be no net increase in TAC emissions from the non-project cumulative sources on the Refinery property. Thus, impacts to public health from cumulative projects located at the Refinery, including the Renewal Project, would be less than cumulatively significant.

As discussed above, dispersion modeling shows that ambient air concentrations of emissions from point sources one mile away would typically be a small fraction (typically 1 to 5%) of the concentrations close to that source. Thus, other cumulative sources would have to be physically close to each other and aligned in the downwind direction for the emissions from one source to add significantly to the emissions of another. Other cumulative projects located outside the Refinery, described in Section 5.2.3.2 and 5.2.3.3, would be located much further away from the Proposed Project component sites. TAC levels in the ambient air that are released by each of these cumulative sources would decrease by dispersion as they are transported downwind and the

combined impacts would be extremely small and, therefore, less than cumulatively considerable. Thus, the impacts to public health from cumulative projects would be less than cumulatively significant.

Mitigation: None Required.

5.2.5.13 Public Safety

Construction Impacts

Impact 5-15: The potential for accidents to occur during the construction of the Proposed Project would be mitigated to a less-than-significant level by construction safety measures included as a part of the Proposed Project and occupational worker safety regulations; therefore, project construction would not contribute to a cumulatively considerable risk of accidents during construction.

Since construction of the Proposed Project would not involve the handling of acutely hazardous materials, any potentially significant cumulative impacts would involve the risk of accidents during the construction phase of the Proposed Project and other cumulative projects described above. Excavation and disposal of existing soil would involve small amounts of materials. Clean, engineered fill would be imported for grading and geotechnical purposes at the various Proposed Project component sites and other nearby cumulative project sites. Therefore, any construction accidents likely would be minor accidents confined to actual construction sites and events. The Proposed Project includes construction safety measures that would reduce the risk of accidents to acceptable levels. In addition, other cumulative project would be expected to comply with similar safety measures. It is unlikely that these separate projects would interact; thus, the Proposed Project would not contribute to a cumulatively considerable construction-related public safety impact.

Mitigation: None Required.

Operational Impacts

Impact 5-16: The probability of an accidental release occurring from cumulative projects at the same time that an accident would occur at the Proposed Project would be extremely low. Therefore, cumulative impacts would be less than significant.

The impacts to public safety from plausible accidents that involve fires, explosions, and releases of hazardous substances are generally confined to the area limited by the fence line or near the fence line, mainly because the events are not great enough to cause far-reaching consequences. Since the impacts to public safety of plausible accidents from a project are generally localized, industrial projects at other sites in the region would be too far away from the Refinery site to result in a combined cumulative effect. The likelihood of an accidental release from the Proposed Project, in particular the new Hydrogen Plant, is discussed in Impact 4.13-2 and is considered to

be highly unlikely and would not affect off-site receptors. Cumulative impacts to public safety would therefore involve mainly other cumulative projects that are located at or near the Refinery site. The only cumulative projects at the Refinery site that would contain sufficient quantities of acutely hazardous substances is the LPG Spheres Project, in which up to 30,000 barrels of LPG could be stored in tanks,⁷ the Contra Costa Pipeline Project new hydrogen and natural gas pipelines, and potentially the FCC Gasoline Hydrotreater projects

With respect to the LPG Spheres Project, an Initial Study that was conducted for the LPG Spheres Project (Lamphier-Gregory, 2001) evaluated the potential of an accidental release of LPG with a subsequent major fire or explosion. The Initial Study concluded that an event such as a fire impinging on an LPG sphere would have to occur in order to cause the sphere to fail with subsequent ignition. It was determined in the Initial Study that the likelihood of such an event would be extremely low and would not occur during the life of the project. In order to have a cumulatively significant impact to public safety a major accidental fire at the LPG Spheres Project would have to occur in combination with a major accident related to the Proposed Project.

The probability of an accident involving more than one of the cumulative projects is the product of the probability of each accident. For example, if the probability of an accident for a given system is one in ten, and the probability of a second system that is independent of the first system is one in four, the probability of a cumulative accident involving both systems would be one in ten times one in four, or one in forty. Since the probability of a major accident at each project is extremely low, the probability of a cumulative accident involving simultaneous failures would be even lower. Thus, the cumulative impact to public safety would be less than significant.

Regarding the likelihood of multiple large accidents occurring simultaneously from other processes at the Refinery, the Center for Chemical Process Safety (CCPS) provides information on the frequency of major accidents at various processes in the refinery industry. The frequencies of accidents for various processes at a refinery, such as alkylation units, catalytic cracking units, crude units, and hydrocracking units are all very low, less than one in a thousand for each type of unit; therefore, the likelihood of simultaneous but independent accidents from separate units is extremely low (i.e., it is the product of the two low frequency numbers). The likelihood of a pipeline accident occurring also is extremely low, or about 0.002 per mile of pipeline per year of operation (Praxair, 2007). Thus, the probability of a simultaneous event occurring is extremely low and is not reasonably expected to occur during the life of the plant.

In addition, the chance that a cumulative or chain reaction event would occur, in which one accident may cause another accident to occur at the plant, is similarly highly unlikely. Refinery equipment installations and process units are designed in accordance with industry standards and best engineering practices (e.g., NFPA, ASME, and API) to ensure that appropriate distances exist between pieces of equipment and that other safety systems also exist to isolate equipment in an emergency. These safety systems include the utilization of intermediate storage tanks and emergency shutdown systems in order to prevent an upset or accident in one area from causing damage to other units. Furthermore, these risks are considered in the Process Hazard Analyses

⁷ Note that this project is complete and has been operational since 2003. See Section 5.2.3.1 for additional information about the LPG Spheres Project.

that are used to evaluate and improve design. Therefore, the probability that an incident in one process unit would cause failure of another unit is considered unlikely.

As stated in Section 4.13, *Public Safety*, the facility is required to prepare an RMP to include the new project components. As part of the RMP a comprehensive Process Hazard Analysis (PHA) is carried out by the hazard team, which includes plant personnel and Contra Costa Health Services Hazardous Materials Specialists. As part of the analysis, the potential for an incident in one process unit impacting another unit and causing further hazards is analyzed, and changes are implemented to minimize the potential for such chain reactions. Consequently the chance of such an event is highly unlikely, and the impacts would be less than significant.

In the unlikely event that one incident does cause another, the magnitude of the impact would depend on operating conditions and process design; in almost all cases, the adverse effects would stay within the Refinery and would not reach offsite receptors. Moreover, if explosions or fires do occur in multiple process units, the impacts and on-site damage would be greatest within the Refinery but would not extend the range of impacts to offsite receptors.

Mitigation: None Required.

Impact 5-17: Transportation, use and disposal of hazardous materials by other cumulative projects, when combined with hazardous materials transportation, use and disposal by the Proposed Project, would be a less than significant cumulative impact.

Hazardous materials from the Proposed Project would be used and either consumed, recycled, or disposed of as hazardous waste during operation. Hazardous materials and hazardous wastes are highly regulated, as is discussed in Section 4.13, *Public Safety*. As discussed in Impact 4.13-1, the Proposed Project would have a less than significant impact due to transportation, use and disposal of hazardous materials because of the comprehensive regulatory scheme that applies. Other cumulative projects with similar hazardous materials and wastes would be subject to the same regulations, which provide strict standards for handling and disposal of these materials and wastes. Thus, this would be a less than significant cumulative impact.

Mitigation: None Required.

5.2.5.14 Public Services

Impact 5-18: The Proposed Project, in conjunction with other proposed Refinery Projects, could add incrementally to cumulative demand for public services. This would be a less-than-significant impact.

The Proposed Project, along with City of Richmond and regional growth and development, would incrementally add to demand for public services. However, the Refinery is staffed with both police and fire protection staff as a first response team. The City of Richmond public services

personnel are used only to augment existing Refinery fire and police personnel. This need generally is of a temporary and sporadic nature and would not present a significant cumulative impact. In fact, the percentage of the Richmond Police Department calls for help to the Refinery on an active or stand-by basis has decreased from 15% in 1993 to 1.13% in 2005 (McBride, 2007). The difficulty in provision of public services is the ability to generate the financial resources to pay for them. In contrast to some projects, the Proposed Project would provide some fiscal benefits to assist the City in providing of some of these backup public services (See Mitigation Measure 4.14-2). Additionally, Mitigation Measure 4.14-2 would also facilitate reducing the impacts of other known Refinery projects (See Section 5.2.3.1). Therefore, the Proposed Project, with mitigation proposed in Section 4.14, is would have a less than cumulatively considerable impact on the need for governmental services for police or fire protection.

Mitigation: None required.

4.15 Parks and Recreation

Impact 5-19: Implementation of the Proposed Project, in addition to other cumulative projects in the area, would not result in significant cumulative impacts to recreation. This would be a less than significant impact.

As discussed in Impact 4.15-1, in Section 4.15, *Parks and Recreation*, and Section 4.11, *Population and Housing*, above, the Proposed Project, along with other cumulative projects in the local area, would not result in significant growth-inducing impacts or any corresponding impacts to recreation through increased demand for recreational resources during project construction and operation. The primary recreational resource in the Refinery area is the Bay Trail. The existing and proposed segments of the Bay Trail are shown on Figure 4.15-1. As discussed in Section 4.9, *Land Use* and Section 4.15, *Recreation*, none of the physical changes that would occur with the implementation of the Proposed Project would affect the proposed Bay Trail alignment. With the exception of the Chevron Long Wharf Lease Renewal Project, the other cumulative projects located on the Refinery site also would not affect the Bay Trail. Comments received on the Draft EIR for the Chevron Long Wharf Lease Renewal cite a July 31, 2001 study, Feasibility Study of Bay Trail Routes to the Point San Pablo Peninsula. The commenters contend that Chevron's safety issues could be addressed; however, Chevron contends that this report was prepared in the pre-9/11 security environment and that post-9/11 security concerns now cannot be addressed by the methods suggested in the feasibility study. Recently, the Richmond City Council passed Resolution 34-07 (March 20, 2007) requesting the California State Lands Commission, as part of its approval of the Chevron Long Wharf lease renewal, to require Chevron to provide public easements for the proposed Bay Trail segment as suggested in the July 31, 2001 Feasibility Study. The State Lands Commission declined to adopt the requested mitigation because the Long Wharf facilities would not be an impediment to the proposed Bay Trail, the Chevron Long Wharf Lease Renewal Project would not involve changes that would result in a land use plan or policy

impact, and the Commission does not have jurisdiction outside the leased premises (See Section 4.15, *Parks and Recreation*).

Implementation of other projects as described in Sections 5.2.3.2 and 5.2.3.3 above could increase demands on local recreational resources.⁸ However, the Proposed Project would not have a cumulatively considerable contribution to these potential impacts. Thus, the Proposed Project has no cumulatively considerable impacts on recreational resources.

Mitigation: None Required

5.2.5.16 Transportation and Traffic

The cumulative 2025 scenario,⁹ which is defined by the horizon year of the CCTA countywide travel demand model, was assessed to determine long-term traffic impacts associated with buildout conditions in the area. The locations and sizes of the major development projects envisioned in the county and cities' General Plans have been programmed into the CCTA Model, which reflects regional growth based on projections that are consistent with forecasts by ABAG.

Impact 5-20: Under 2025 conditions, operation of the Refinery would generate additional truck trips because of increased import and export of materials to and from the Refinery. Refinery permanent employment levels would increase by 10 employees due to the Proposed Project. The level of traffic increase would be insignificant when compared to the projected 2025 traffic volumes at the study area intersections. The impact would be less than significant.

Traffic operating conditions on project-used roadways in 2025 would be adversely affected by growth in population and employment in the area. Table 5-3 presents intersection operations for the weekday a.m. and p.m. peak hours under 2025 conditions. As shown, under 2025 conditions, 7 of the 11 study intersections are forecast to operate at acceptable LOS D or better during both peak hours. The four intersections projected to operate at an unacceptable level of service (LOS E or F) during one or both peak hour are Castro Street / I-580 Eastbound Ramps (LOS F in p.m. peak hour), Castro Street / I-580 Westbound Ramps (LOS F in both peak hours), Castro Street / Mills Street (LOS E in p.m. peak hour), and Richmond Parkway / Gertrude Avenue (LOS F in both peak hours).

⁸ The Contra Costa Pipeline Project would be physically located well away from the proposed Bay Trail alignment on the west side of the Refinery near the Long Wharf. The proposed Contra Costa Pipeline Project alignment, while not yet finalized, would have the potential to temporarily impact portions of the Bay Trail or other existing Parks and Recreational facilities between Richmond and Martinez. As environmental review of this project is just starting, the significance of these potential project-related impacts is not reasonably foreseeable and the potential for mitigation measures cannot be determined. Regardless, because the Proposed Project would have *no* impact on the Bay Trail (See Section 4.15, above), it cannot have a cumulatively considerable impact on the Bay Trail, even when combined with other projects such as the Contra Costa Pipeline Project.

⁹ Cumulative construction traffic impacts are addressed in Section 4.16, *Transportation and Traffic* as part of the analysis of project construction including the Renewal Project and other proposed project both on and off the Refinery as part of the intersection analysis. See Section 4.16, *Transportation and Traffic*.

**TABLE 5-3
INTERSECTION PEAK-HOUR TRAFFIC LEVEL OF SERVICE (LOS) OPERATIONS –
2025 CUMULATIVE CONDITIONS (WITH AND WITHOUT THE PROPOSED PROJECT)**

#	Intersection	Traffic Control ^a	AM Peak Hour		PM Peak Hour	
			Delay ^b	LOS	Delay ^b	LOS
1.	Chevron Way / Marine Street	SSSC	10.0	B	10.5	B
2.	Castro Street / Tewksbury Avenue	AWSC	14.9	B	10.3	A
3.	Marine St. / I-580 Eastbound Ramps	Signal	12.3	B	32.7	C
4.	Castro Street / I-580 Eastbound Ramps	Signal	17.0	B	87.5	F
5.	Castro Street / Chevron Way	Signal	0.2	A	0.1	A
6.	Castro Street / I-580 Westbound Ramps	Signal	>100	F	>100	F
7.	Castro Street / Mills Street	Signal	3.6	A	77.4	E
8.	Castro St. / General Chemical Access	Signal	8.9	A	52.8	D
9.	Castro Street / Hensley Street	Signal	5.0	A	8.3	A
10.	Richmond Pkwy. / Hensley Street	Signal	18.1	B	17.1	B
11.	Richmond Pkwy. / Gertrude Avenue	Signal	>100	F	98.7	F

^a SSSC = side-street stop-controlled intersection; AWSC = all-way stop-controlled intersection; Signal = traffic signal-controlled intersection.

^b Average overall intersection control delay (seconds per vehicle) reported for signalized and all-way stop-controlled intersections.
Average delay on the highest-delay movement/approach reported for side-street stop-controlled intersections.

SOURCE: Wilbur Smith Associates, February 2007.

For the cumulative (2025) scenario, the Proposed Project would be in its operational phase (i.e., construction of its components would have already been completed). Operation of the Refinery following project construction would generate about 34 new daily one-way truck trips because of increased import and export of materials to and from the Refinery. Refinery permanent employment levels would increase by 10 employees, resulting in a maximum of 20 new daily commuter trips. The additional truck would be spread over the operating hours of the day and are expected to occur primarily during off-peak traffic hours. The Proposed Project's contribution to the above-cited unacceptable levels of service were determined on the basis of reasonably-conservative assumptions that four new truck trips and 20 new daily commuter trips would occur during the peak traffic hours, and that all four trips would travel through the four intersections projected to operate at an unacceptable service level. The Proposed Project contribution would be no more than 0.4 percent, and that level of additional vehicles on area roadways during peak traffic hours would neither increase the average delay at the intersections nor be noticed by the average driver; therefore, its effect on traffic operating conditions would not be cumulatively considerable.

5.2.5.17 Utilities and Service Systems

Cumulative adverse impacts to utility and service systems such as wastewater treatment and disposal and solid waste handling and disposal systems would occur as these local and regional systems are affected by local and overall growth and development within the Bay Area region.

The Proposed Project would increase solid waste disposal and water use, but would not increase demand for wastewater treatment or storm drainage.

Impact 5-21: Demand for solid waste handling and disposal would increase due to increased growth and development within the Bay Area region. The Proposed Project, together with proposed and planned future development at the Refinery, would not make cumulatively considerable contributions to increases in demand solid waste handling and disposal. This impact would be less than significant.

The Proposed Project and other Refinery projects would produce waste due to demolition of obsolete facilities (such as tanks) that will be replaced. Note that the steel from the demolished tanks and obsolete facilities would be recycled. The construction and operation of the Proposed Project, or of other cumulative refinery projects, would have less than significant adverse impacts on solid waste disposal facilities or services, because there is adequate landfill capacity for the solid waste that would be produced in the construction and operational phases of the Proposed Project.

Mitigation: None required.

Impact 5-22: The Proposed Project would increase the Refinery's water use by 0.7 MGD. The Proposed Project, together with proposed and planned future development at the Refinery, would not make a cumulatively considerable contribution to increases in demand for fresh water from EBMUD. This would be a less-than-significant impact.

The increase of 0.7 MGD represents a 6% increase above the approximate 12.0 MGD current water usage at the Refinery¹⁰. This increase in water use falls within the demand projections and overall plans for water service, conservation and recycling contemplated by the EBMUD UWMP. In normal water years, EBMUD would be able to supply the projected increase in water demand of 0.7 MGD.

Approximately 4.0 MGD of the Refinery's water demand is currently supplied with recycled water from EBMUD's North Richmond Water Reclamation Plant. Although not a part of the Renewal Project, the RARE Water Project,^{11, 12} is projected to reduce the Refinery's daily fresh water usage by up to 4.0 MGD. The RARE Water Project is an important part of the water recycling component of the EBMUD UWMP. If approved, once the RARE Water Reclamation Project is in operation, Refinery use of EBMUD fresh water would decrease by 4.0 MGD, which

¹⁰ The current Refinery water usage value of 12.0 MGD includes existing Refinery and other Refinery cumulative projects.

¹¹ See Section 5.2.3, *Specific Projects Considered in the Cumulative Analysis*, where the RARE Water Project is described in more detail and its cumulative effects are considered. This analysis considers the fact that construction of the RARE Water Project is expected to occur between 2008 and 2009, so it is anticipated to become operational in the same general timeframe as the first major component of the Proposed Project – the Hydrogen Plant.

¹² The EBMUD certified the EIR for the RARE Project on May 8, 2007.

would more than offset the 0.7 MGD increase in EBMUD fresh water consumption by the Proposed Project.

Under either normal or drought conditions the marginal increase in water supply is expected to be available to the Refinery and the cumulative impact to water supply from this and other projects would be expected to be less than significant (EBMUD, 2007).

Mitigation Measure: None required.

5.3 Growth-Inducing Impacts

The Proposed Project would result in the presence over a six-month period of an approximate average of 300 workers per day, with a six-month peak in 2008 of approximately 750 workers. The temporary addition of a construction work force would not be considered a significant impact. Chevron estimates that 10 new permanent employees would be needed to operate the Proposed Project. The temporary addition of the construction work force to the Refinery would not be considered a significant growth-inducing impact of the Proposed Project, because it is anticipated that the bulk of the construction workforce would be drawn from the construction labor pool available in Richmond and the rest of the Bay Area. All current Bay Area residents would be expected to commute rather than move. Therefore, that portion of the new construction jobs that would be filled by current Bay Area residents would have no growth-inducing impact in Richmond. In addition, a fraction of the construction workforce for the Proposed Project and other cumulative projects would be drawn from outside the Bay Area on a temporary basis. However, as is discussed in Impact 4.11-1, the housing vacancy rate in the Bay Area would be sufficient to meet this potential demand for housing. California and Contra Costa County's continuing and rapid population growth has statewide direct and indirect cumulative impacts on population and housing. The effect of the Proposed Project on population growth would be indistinguishable from the general mix of factors that lead people to move to California, and would not be a critical component in such decisions. It has no impact on the rate of growth due to births. Although public services (e.g., fire protection, police protection) are at or near their limit in some localities, the Proposed Project creates no new significant demand for those services. While one of the goals of the Proposed Project is to increase by 6 percent the Refinery's total gasoline production that meets California specifications and can be distributed to local markets, this amount would not result in such substantially reduced gasoline prices that it would attract outside residents to move to the area. Thus, the Proposed Project, would not, directly or indirectly, induce population growth.

5.4 Effects Found Not to Be Significant

The environmental effects of the Proposed Project are identified and discussed in detail in Chapter 4. Except for emissions of VOC to the air, which would be significant and unavoidable, all identified significant environmental effects of the Proposed Project can be mitigated to less-

than-significant levels with the implementation of the mitigation measures identified in this EIR. The EIR further concludes that the Proposed Project would not have significant effects in the following environmental areas and that no further analysis of these topics was required:

- Agricultural Resources
- Geology, Soils and Seismicity
- Land Use
- Mineral Resources

5.5 Significant Irreversible Environmental Effects of the Proposed Projects

Pursuant to Section 15126.2(c) of the CEQA Guidelines, an EIR must examine the significant irreversible significant environmental effects from the:

“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.”

At the core of the Proposed Project is the continued use of nonrenewable crude oil supplies by the existing Refinery. Clearly at some point in the foreseeable future, the world supply of crude oil will become exhausted. With or without the Proposed Project, the Refinery would continue to operate. As is discussed in Section 4.6, *Energy* and Impact 5-9, the Proposed Project would increase the use of natural gas by one-third. With the Proposed Project, this operation would be more efficient (in energy usage) than the baseline condition and potentially use the same materials more somewhat more efficiently. Additionally, construction of the Proposed Project would tend to use up some non-renewable resources, such as fuel for construction vehicles, even though some Proposed Project components (for example, tank replacements) would involve recycling some of the materials from Refinery facilities that would be decommissioned and eventually removed from the site.

With respect to potential irreversible environmental damage from potential accidents, this issue is discussed in Section 4.13, *Public Safety* and Impact 5-16 above.

References

- American Petroleum Institute (API), *Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants*, Sixth Edition, February 2004.
- CEC, *2005 Integrated Energy Policy Report*, November 2005, available at <http://www.energy.ca.gov/2005publications/CEC-100-2005-007/CEC-100-2005-007-CMF.PDF>.

City of Richmond website, Accessed 5/09/07, [http://www.ci.richmond.ca.us/documents/Planning and Building Services/Applications/Application Lists/Major Project Review/Information.pdf](http://www.ci.richmond.ca.us/documents/Planning%20and%20Building%20Services/Applications/Application%20Lists/Major%20Project%20Review/Information.pdf)

East Bay Municipal Utility District. Water Supply Assessment Letter to Lamont Thompson, City of Richmond. April 24, 2007.

Lamphier-Gregory, Initial Study, *Chevron LPG Spheres Project Richmond CA* EID 01-06, August 2001.

McBride, Eugene, Captain, Richmond Police Department, Personal Communication, April 26, 2007.

Praxair, Private Communication with Bob Chamberlin of Chevron, email sent April 18, 2007.

Regional Water Quality Control Board (RWQCB), 2006a. *National Pollutant Discharge Eliminations System Permit No. CA0005134, Order no. R2-2006-0035*.

Regional Water Quality Control Board (RWQCB), 2006b. *Water Quality Control Plan (Basin Plan)*, June 21, 1995, approved December 22, 2006.

State Water Resources Control Board, *Order No. WQ 2001-067*, p.23., 2001

Wilbur Smith Associates, *Revised Traffic Impact Analysis for Chevron Renewal Project EIR*, February 22, 2007.

CHAPTER 6

Alternatives Analysis

6.1 Introduction

The California Environmental Quality Act (CEQA) Guidelines require an Environmental Impact Report (EIR) to describe and evaluate the comparative merits of a reasonable range of alternatives to a project, or to the location of a project that would feasibly attain most of the basic project objectives and avoid or substantially lessen any significant project impacts. The Guidelines set forth the following criteria for alternatives:¹

Identifying Project Alternatives. The range of alternatives should be limited to those that would attain most of the basic objectives of the project, would be feasible, and would avoid or substantially lessen any of the significant effects of the project. Factors that may be considered when addressing the feasibility of an alternative include site suitability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries, economic viability, and whether the project proponent can reasonably acquire, control or otherwise have access to an alternative site. An EIR need not consider an alternative whose impact cannot be reasonably ascertained and whose implementation is remote and speculative.

An alternative to the project must permit feasible attainment of the Proposed Project's basic objectives, even if that alternative would be more costly than the project or would impede to some degree the attainment of the project goals. Clearly, almost any of the various engineering processes or systems that the project sponsor investigated in the development of the project itself is a potential alternative under these criteria, because it is a feasible process aligned with project goals.

In addition to alternatives that would avoid or substantially lessen any of the significant effects of the project, would be feasible, and would attain most of the basic objectives of the project; CEQA also requires the evaluation of a "no project" alternative. The "no project" alternative consists of the existing conditions at the time the Notice of Preparation was published, and also includes changes and on-going activities needed to keep the Refinery in operation, such as regular major and minor maintenance activities and other reasonably foreseeable future Refinery projects that would be undertaken on an on-going schedule if the Proposed Project were not considered. The "no project" alternative is considered in Section 6.4.1.

¹ CEQA Guidelines Section 15126.6.

The CEQA Guidelines provide that alternative locations for the Proposed Project may be considered if feasible. Section 6.5.2 presents a discussion of an alternative site for the Proposed Project.

Range of Alternatives. An EIR need not consider every conceivable alternative, but must consider a reasonable range of alternatives that will foster informed decision-making and public participation. The “rule of reason” governs the selection and consideration of EIR alternatives, requiring that an EIR set forth only those alternatives necessary to permit a reasoned choice. The lead agency is responsible for selecting a range of project alternatives for examination, and must publicly disclose its reasons for selecting those alternatives.

Often, “reduced project” alternatives are developed to reduce significant adverse project impacts that are proportional to the size of the project. Given the nature of the Proposed Project at the Refinery, which consists of distinct components, this analysis is focused on significant project impacts related to specific components of the project rather than to the scale of the combined projects. Thus, the alternatives analysis identifies and evaluates scenarios under which combinations of project components and schedules are formulated to eliminate specific impacts that would otherwise occur with the Proposed Project.

Evaluation of Alternatives. An EIR is required to include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the project. If an alternative would cause one or more significant effects not caused by the project as proposed, the significant effects of the alternative must be discussed, but in less detail than the significant effects of the project.

6.2 Project Objectives

Through implementation of the Proposed Project, Chevron proposes to replace and upgrade some of its existing manufacturing facilities at the Refinery to improve the ability to provide gasoline for local and export markets using the wide range of sources of crude oil presently being processed at the Refinery. The Proposed Project would not increase the Refinery consumption of crude oil, although upgrades would expand the Refinery’s options for using a wider range of crude oils. Included in the project components are upgrades that would increase energy efficiency, reduce air emissions, and increase equipment reliability. Specifically, Chevron’s objectives for the Proposed Project are:

- Replace existing facilities with modern facilities providing improved reliability, energy efficiency, and additional environmental controls.
- To decrease the amount of energy imported by the Refinery.
- Ensure the Refinery’s ability to process future crude and gas oil supplies.
- Increase the portion/percentage of the Refinery's total gasoline production that can meet California specifications and be distributed to local markets by 300,000 gallons/day or 6 percent more than current Refinery production levels.
- Invest in Refinery upgrades that produce a competitive return on capital.

6.3 Alternatives Considered But Dismissed From Consideration in this EIR or Alternatives Screening Process

In addition to the Proposed Project and alternatives considered in this EIR, Chevron evaluated other potential project options but dismissed them from further consideration for the following reasons: they would not avoid or substantially lessen (or, in some cases would increase) any of the significant effects of the Proposed Project, were not feasible, and/or would not attain most of the basic objectives of the project.

Hydrogen Plant Replacement

Integrate a Cogeneration Facility into the Proposed Hydrogen Plant Replacement Design

Integrating a cogeneration facility into the Proposed Hydrogen Plant Replacement design would increase the footprint area of the Proposed Project by approximately 20%. Additionally, it would not meet the project objective of improving operating reliability because integration of a single cogeneration facility into both Hydrogen Plants could lead to a single point failure mode that would result in both Hydrogen Plants needing to shut down.

Reformer

Implement New Catalyst Technologies

Chevron researched the possibilities of implementing new catalyst technologies, specifically related to the semi-regeneration of Reformer catalysts. Were such new catalyst technologies available, there could potentially be alternatives to the proposed new Reformer component. However, Chevron found no improvements within this field were anticipated within the foreseeable future.

Replace Reformer Reactor with a Hot-Wall Design Reformer Reactor

The alternative to the proposed Continuous Catalytic Regeneration (CCR) technology would be to build a newer version of the old Naphtha Reformer reactor, which would consist of a hot external wall reactor. The structure that would contain the new reactors would be built adjacent to the existing reactors and would be of a size similar to that of the existing reformer. This alternative would be less operationally efficient as it would not be a continuous process and consequently, tend to use more energy than the Proposed Project. It would also produce less economically attractive liquid and gas product yields, and would ultimately produce less California specification gasoline (CARB), thus not meeting most of the project objectives with respect to gasoline production.

Hydrogen Purity

Increase Importation of FCC Feed from the Gulf Coast

As an alternative to the proposed improvements to the Refinery's hydrogen purity system Hydrofined Heavy Gas Oil could be obtained from other areas. Hydrofined Heavy Gas Oil is of

very limited supply, and would require transportation by ship, which would entail additional transportation energy and cost to import from the Gulf Coast to the West Coast. While importing Hydrofined Heavy Gas Oil might be a feasible alternative, unknown additional environmental effects could occur through the additional marine transportation of the Gulf Coast Gas Oils.

New Refinery Project Alternative

CEQA directs that the alternatives analysis include consideration of an alternative site for the Proposed Project. Factors to take into account when addressing the feasibility of alternatives are the suitability of the alternative site and whether the project proponent can reasonably acquire, control, or otherwise have access to the alternative site.

As stated in the CEQA Guidelines Section 15126.6(f)(2)(a), “[t]he key question and first step in the analysis is whether any of the significant effects of the project would be avoided or substantially lessened by putting the project in another location. Only locations that would avoid or substantially lessen any of the significant effects of the project need to be considered for inclusion in the EIR.”

Description of New Refinery Project Alternative

As an alternative to the Proposed Project, a complete new oil refinery could be constructed at another location in a compatibly zoned industrial area; however, a specific remote site has not been identified. If an alternative site were identified, marine or pipeline access would be needed for the new Refinery site. This alternative would likely involve the abandonment and/or demolition of most if not all of the old Refinery infrastructure. Depending on the purpose of the alternative Refinery site (e.g., to refine gasoline only or refine several products), the site size, buffer zone and impacts associated with noise, air, transportation and water quality would vary.

Impacts and Relationship to Project Objectives

While a New Refinery Alternative has been rejected as infeasible because no alternative site has been identified and because of the likely costs of relocating a refinery, the potential effects on the environment of developing a new refinery are discussed at a general level here. Relocating the Refinery could result in an entirely new and potentially more significant set of short-term construction and long-term operational environmental impacts at a new project site. Because this new site would likely need to be located in a relatively remote area with navigable water access for crude oil import, in order to minimize or avoid significant impacts to human populations, the potential for significant local and regional environmental impacts, in particular to noise, air, transportation and water quality, would be much greater than those of the Proposed Project modifications at the existing Refinery site.

Although implementation of a New Refinery Project Alternative might meet all of the Proposed Project objectives, it would cause many new and larger environmental impacts, and would cost substantially more than the Proposed Project because Chevron would have to purchase new land and additional infrastructure, and the likely timeframe to construct a new refinery would most likely exceed that of many of the Proposed Project components. Additionally, it could be

considered a major financial risk.² Finally, it is unlikely that Chevron would consider construction of a new refinery due to the general adequacy of the existing Refinery, as well as the ability to develop the Proposed Project at the current location. Thus, consideration of a new refinery site will not be considered further in this document.

6.4 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 Proposed Project. This EIR evaluates the potential impacts of implementing the Proposed Project (i.e., Hydrogen Plant Replacement; Power Plant Replacement; Catalytic Reformer Replacement; Hydrogen Purity Improvements; and Other Projects (See Figure 3-2)). As discussed in Chapters 4 and 5, with implementation of the mitigation measures proposed in this EIR, there are no remaining significant and unavoidable environmental impacts from the Proposed Project, except for the impact from increased VOC emissions. The alternatives discussed below also address reduction of the Proposed Project's impacts that are capable of being mitigated to a less-than-significant level; therefore, the following section considers an alternative that would reduce VOC emissions to a less-than-significant level.

6.5 Alternatives to the Project

6.5.1 No Project Alternative

Description of the No Project Alternative

Consideration of the No Project Alternative is specifically required by Section 15126.6(e)(1)-(3) of the CEQA *Guidelines*. The purpose of evaluating this alternative is to compare the impacts of the Proposed Project with the impacts that could occur without implementation of the Proposed Project. While the No Project Alternative would not include the components described in Chapter 3, it would include changes and ongoing activities needed to keep the Refinery in operation, such as regular major and minor maintenance activities and other reasonably foreseeable future Refinery projects that would be undertaken on an ongoing schedule if the Proposed Project were not implemented. The following analysis considers the effects of the No Project Alternative.

Impacts and Relationship to Project Objectives

Compared to the Proposed Project, the No Project Alternative would avoid all potential construction-related impacts to air quality, noise, traffic, aesthetics, geology and soils, hazards and hazardous materials, public services and utilities, recreation, water quality, and cultural resources, because no new facilities would be constructed and the use of construction equipment, site grading, earth work, paving or facilities construction would be avoided. Operationally, the No Project Alternative would avoid any impacts associated with air quality, land use, aesthetics,

² It appears to be infeasible to permit Construction of a new Refinery as no new refineries have been built in the United States since 1976 (Kam, 2005)

biology, water quality, and public services and utilities because no changes in current facilities operations or location would occur.

If the Proposed Project is not implemented, the Refinery would continue to operate using existing facilities which are not as energy efficient as the Proposed Project, and will require extensive maintenance with long shutdown periods compared to modern plants. Since improvements to energy efficiency and system reliability proposed for the Proposed Project would not be implemented, the No Project Alternative could ultimately result in adverse effects to energy, through continued use of less efficient processes and equipment and to public safety, due to continued reliance on aging equipment. Although implementation of the No Project Alternative is technically feasible, it would fail to meet all of the Proposed Project objectives.

6.6 Alternatives to the Proposed Project Components

6.6.1 Introduction

In an effort to provide a full analysis of the alternatives to the Proposed Project Components, the following sections had been organized as follows. For each Proposed Project component, this EIR analyzes a No Project Scenario, a Design Alternative Scenario, a Reduced Project Scenario and an On-site New Location Scenario as applicable.

No Project Scenario

The purpose of evaluating this alternative is to compare the impacts of each major component of the Proposed Project with the impacts that could occur without implementation that component of the Proposed Project. This analysis will focus on the No Project impacts associated with each individual Proposed Project component and further analyze its effects on the other components of the Proposed Project (i.e., will other components be needed if one component is not implemented).

Reduced Project Scenario

Often, “reduced project” alternatives are developed to reduce significant adverse project impacts that are proportional to the size of the project, such as a smaller tank or smaller capacity production process. In this case, the potentially significant project impacts relate to each component of the Proposed Project, rather than to the project as a whole. Therefore, this alternatives analysis identifies and evaluates scenarios under which specific combinations of project components and schedules are formulated to reduce or avoid impacts that would otherwise occur with the Proposed Project.

New Site Location Scenario

While, as discussed above, it would not be feasible to relocate the Refinery nor would the project objectives of the Proposed Project be achieved, where applicable this EIR analyzed the potential for alternative locations within the existing Refinery components of the Proposed Project.

Design Alternative Scenario

Design alternatives consist of other projects entirely or other approaches to achieving the project objectives.

6.6.1.1 Hydrogen Plant Replacement

No Project Alternative

Under the No Project Alternative, Chevron would not build the Hydrogen Plant Replacement component of the Proposed Project and would continue to use the existing Hydrogen Plant. The Other Projects (i.e. most new tanks, replacements tanks, new control room, and new maintenance facility) would still be implemented. This alternative would avoid all impacts from construction of the new Hydrogen Plant; however, there would be no reduction of Refinery fuel SO₂ emissions from Refinery Fuel Gas to offset increased SO₂ emissions from the Hydrogen Purity project.

Although continuing to use the existing Hydrogen Plant is technically feasible, this Alternative would not meet most of the project objectives. The Hydrogen Plant Replacement is the key element of the Proposed Project that, when combined with the new Power Plant and Reformer Replacement, allows Chevron to replace older, less efficient equipment with facilities that provide improved reliability, energy efficiency, and better environmental controls. For example, the Hydrogen Plant Replacement alone would reduce Refinery NO_x emissions by 10.4 tons per year, SO₂ emissions by 52.2 tons per year, PM₁₀ emissions by 12.7 tons per year and VOC emissions by 2.1 tons per year while improving gasoline quality and supply reliability. From an environmental impact perspective, the no Hydrogen Plant Replacement alternative would not provide the beneficial emission reductions that would result from the Proposed Project. Also, the new Hydrogen Plant would increase hydrogen production capacity by 30% and would produce a higher purity hydrogen gas than the existing facility. This production of higher-purity hydrogen directly affects the performance of other Refinery processes and would help Chevron to meet another project objective of increasing the portion/percentage of the Refinery's total gasoline production that can meet California specifications.

At a minimum, without the new Hydrogen Plant, the objective of Chevron to ensure the Refinery's ability to process future crude and gas oil supplies would not be met.

Reduced Project Alternative

Replace One Hydrogen Plant, Leave Existing Plant in Operation

While replacing one hydrogen plant and leaving one existing plant in operation would reduce the footprint of the Proposed Project by approximately 30%, and proportionally reduce construction impacts, the benefits achieved by installing the new Hydrogen Plant technology, such as improved reliability, increased energy efficiency, and shutting down old equipment which incurs large maintenance and replacement costs, would not be attained under this reduced scenario. Additionally, constraints regarding the design and engineering necessary to connect the existing facilities to the new plant would be multiplied, as it would be necessary to locate the new plant within a different area of the Refinery from the existing hydrogen plant.

Replace Both Hydrogen Plants with Smaller Capacity Hydrogen Plants

While replacing both hydrogen plants with smaller capacity hydrogen plants would reduce the footprint of the Proposed Project by approximately 10%, and reduce construction impacts proportionally, it is not considered economically sound. This scenario would leave the Refinery short of needed hydrogen, resulting in less gas oil conversion to saleable gasoline products, thus reducing earnings and not meeting the project objective for increasing the portion of California specification gasoline production by the Refinery. It would also require the existing Hydrogen Plant to remain in operation at some level, and it would continue to emit air pollutants at a higher rate than the proposed new Hydrogen Plant.

Neither of the above two reduced Hydrogen Plant alternatives, although slightly smaller than the Proposed Project, would create any significant reductions in potential environmental impacts over the Proposed Project. Operation of the proposed new Hydrogen Plant would result in significant net Refinery-wide reductions in air pollutant emissions (for NO_x, SO₂, CO, and VOC, see Section 4.3, *Air Quality*). As is discussed in Impact 4.3-3, in some cases these net reductions are necessary to allow offsetting of emissions from other project components that would be completed and started up following operation of the new Hydrogen Plant. While some reduction in Hydrogen Plant capacity is feasible, without substantial engineering design and analysis the optimum size, feasibility, resulting in reduction of environmental effects from a smaller Hydrogen Plant, and the effects on capacities of other Proposed Project components based on a smaller capacity Hydrogen Plant cannot be predicted.

New Site Location

It would be potentially feasible to locate the new Hydrogen Plant at another location within the Refinery in other process areas. However, the proposed site is the most suitable from the standpoint of proximity to other Refinery process units needing connection to the new Hydrogen Plant. Locating the new Hydrogen Plant elsewhere within the Refinery would have essentially the same environmental effects as the Proposed Project.

6.6.1.2 Power Plant Replacement

No Project Alternative

Purchase Additional Power from Pacific Gas and Electric (PG&E)

Under the No Project Alternative, Chevron would not implement the Power Plant Replacement component of the Proposed Project and would continue to use the existing Power Plant. Chevron would still implement all other Proposed Project components; therefore, additional power would need to be purchased from PG&E to continue operations at the Refinery. The Refinery would continue to use the inefficient 1937-vintage Power Plant, including five boilers that produce steam. While this alternative would eliminate potential Proposed Project environmental impacts associated with construction based air emissions as well as other construction-related impacts associated with implementation of this component, it would not improve the Refinery energy efficiency or ensure the Refinery's ability to process future crude and gas oil supplies. The Refinery would continue to import electricity from PG&E instead of being a net exporter. The

Refinery's electricity supply reliability and ability to supply products would be decreased somewhat. Purchasing additional power would not improve energy efficiency at the Refinery because generating and transporting power at the Refinery is more efficient as well as cheaper than transporting power from off-site sources. This alternative would not meet any of the project objectives.

Reduced Project Alternative

Reduce Cogeneration (CoGen) Capacity

One of the objectives of the Proposed Project is to replace existing facilities, including the five existing obsolete boilers, with modern facilities. Another objective of the Proposed Project is to decrease the amount of energy imported by the Refinery. To meet this objective, any reduced project alternative would need to generate more energy than the existing power plant is producing using the five existing boilers. The proposed new CoGen unit is already correctly sized to satisfy this objective and, as discussed in Section 4.6, *Energy*, with full operation of the CoGen and the new Hydrogen Plant the Refinery would be able to just meet the electrical needs of the Refinery. While not an objective of the Proposed Project, the proposed new CoGen unit would at times be able to export a few MegaWatts of electricity to the PG&E grid. Consideration of a reduced size CoGen unit does not appear feasible because any smaller size would still require routine importing of electricity.

Alternate Energy Sources

The primary purpose of the proposed CoGen unit is to generate reliable, on-site electrical energy and secondarily provide a replacement source of process steam for Refinery operations after the five existing boilers are removed from service. Modern CoGen units generate electricity and steam with a high degree of efficiency. For this component of the Proposed Project, several different fuels would be utilized, including Refinery Fuel Gas (RFG), medium BTU gas, PG&E natural gas, and Refinery produced LPG. One alternative would be to generate either electrical energy or steam on site utilizing alternative energy sources such as wind or solar power. While it is technically feasible to generate electrical energy equivalent to the 50MW that would be provided by the proposed CoGen, alternate energy sources like wind or solar are necessarily intermittent in their supply of energy, and could not be relied on for continuous Refinery operations. Furthermore, the generation of process steam by such alternate energy technologies, while again technically feasible, suffers more severe reliability concerns than normal PG&E electrical generation. From a practical aspect, it is not known if the Refinery site has sufficient space available or even the potential for generation of the large amounts of project-required electricity and process steam. Thus, an alternative that uses alternate energy sources does not appear feasible.

New Site Location

Generate Power Off-Site and Import to the Refinery

Building a power plant and substation off-site and then transporting the generated power to the Refinery would substantially increase the footprint of the Proposed Project as well as require a

substantial amount of capital investment to implement. Chevron would have to acquire additional lands for the power plant, substation and associated community buffer zone and/or right-of-way for transmission lines; and construct the substation and associated facilities to generate and transmit the power.

Alternate CoGen Site within the Refinery

It would be potentially feasible to locate the CoGen unit at another location within the Refinery in other process areas, and initially an alternate site in the “Y” area of the Refinery was considered but later rejected by Chevron. However, the proposed site is the most suitable from the standpoint of proximity to the Refinery’s two existing CoGens units and most efficient for connecting the new CoGen unit to existing Refinery infrastructure. Locating the new CoGen unit elsewhere within the Refinery would have essentially the same environmental issues as the Proposed Project and would not mitigate any of the Proposed Project’s impacts.

6.6.1.3 Catalytic Reformer Replacement

No Project Alternative

Under the No Project Alternative, Chevron would not implement the Catalytic Reformer Replacement component of the Proposed Project, and would continue to use the existing two Naphtha Reformers. If Chevron does not implement the Catalytic Reformer Replacement component of the Proposed Project, most other components of the Proposed Project would not be affected and would still be constructed with the exception of Tank T-3228, which is required to support the Catalytic Reformer Replacement component. This alternative would avoid the construction impacts of replacing the Catalytic Reformer, reduce of VOC emissions from the proposed Catalytic Reformer by 5.9 TPY, and reduce the 8 TPY of VOC emissions expected from proposed Tank T-3228 because the tank would not be needed. The net reduction would a total of 11.8 TPY of VOC,³ which would reduce this significant impact to a less-than-significant level.

If implemented, the Proposed Catalytic Reformer Replacement would reduce NO_x emissions by 46.2 tons per year. Without implementation of the Catalytic Reformer Replacement component, this air quality emission reduction would not occur. From an environmental impact perspective, the No Project Alternative would reduce VOC emission compared to the Proposed Project, but would not provide the beneficial reduction in other types of air emissions that would result from the Proposed Project. Also, the existing Reformer reactors are nearing their end of life and will have to be replaced. The existing Naphtha Reformer Plant technology (a) is not as energy-efficient as the new CCR technology, and (b) produces less economically-attractive liquid and gas product yields. Without implementation of this component the Refinery would not be able to meet several of the project objectives (increasing Refinery efficiency and the ability to produce more CARB gasoline).

³ There would also be a net reduction of SO₂, CO and PM emissions under this alternative. See Table 4.3-10.

Reduced Project Alternative

Import CARB Gasoline from Off-Site

This alternative is similar to the No Project Alternative in that no new Reformer would be installed and certain environmental impacts (construction impacts, VOC emissions) would be lessened or avoided. However, under this alternative, Chevron would reduce or shut-down use of the existing Reformers and would import CARB gasoline from other sources. Importing most CARB gasoline by ship from off-site locations to meet demands of local markets has a number of effects, including (1) transportation-related environmental impacts from increased marine shipping – air / water pollution etc.; (2) limited off-site facilities that produce CARB gasoline; and, (3) increased air quality impacts associated with additional wharf handling while unloading ships. This alternative would cause a major loss of Reformer hydrogen production because the Reformer hydrogen output would be reduced or no longer existing. This alternative would also require the Refinery to run the new Hydrogen Plant at maximum rates, require the importation of hydrogen on the proposed Praxair hydrogen pipeline, and would hinder the Refinery's ability to produce additional gasoline for California markets one of the key project objectives. This alternative would essentially turn this process of the Refinery into a gasoline transfer terminal. This alternative would not meet any of the project objectives.

New Site Location

With the Proposed Project the existing Naphtha Reformer Plant would continue to operate during the construction of the new CCR Reformer. Since the Catalytic Reformer Replacement is process-specific, it should only be installed within the immediate vicinity of the existing Naphtha Reformers to facilitate training of the same experienced process plant operators. Therefore a new site location alternative is not feasible for this component of the Proposed Project.

6.6.1.4 Hydrogen Purity Improvements

No Project Alternative

Without implementation of the Hydrogen Purity Improvements, all other Proposed Project components still could be implemented. However, Chevron would have to continue to import sweet crude, and under this scenario continued importation of sweet crude may not be feasible because future availability of sweet crude is in question. Approximately 75% of the world's oil reserves are sour crude, and only 25% are sweet crude, while most of the current oil production (40%) and most of the world's refineries are geared toward processing sweet crude. Moreover, the Organization of the Petroleum Exporting Countries (OPEC) announced in August 2005 that worldwide production of sweet crude may have peaked and is on the decline (OPEC, 2005). The Refinery would have to continue importing low sulfur content FCC feedstock or vacuum gas oil (VGO). The supply of desulfurized VGO available in the Bay Area is also expected to decrease. With the exception of decreasing energy import to the Refinery, this alternative would not meet most project objectives.

Reduced Project Alternative

The proposed Hydrogen Purity Improvements component would locate new equipment within the existing FCC Feed Hydrotreater and SRU operating units. It is infeasible to consider a reduced project alternative because the size of the Proposed Project is intended to function within the operating range of the existing FCC Feed Hydrotreater.

New Site Location

Because this project component involves the placement of a number of process units within existing Refinery structures, an alternate site or sites within the Refinery would not be feasible.

6.6.1.5 Other Projects

Storage Tank Replacements

No Project Alternative

Instead of replacing Tanks T-231, T-298, T-398, T-954, T-979, T-984, T-1451, T-1504, T-1689, and T-3075, under the No Project Alternative the tanks would be repaired and restored to a usable condition. However, these tanks are reaching the end of their useful life; therefore, it is infeasible and impractical to repair them because the repair and restoration process requires them to be completely reconstructed in order to be structurally sound and reliable.

Reduced Project Alternatives

Under one Reduced Project Alternative, Refinery processes would be changed so that the tanks in need of repair are no longer used. This is not a practical alternative, however, because the tanks that are in need of replacement are essential to the Refinery's production of gasoline and other products. Therefore, this alternative could limit the ability of the Refinery to produce products. Converting the use of other tanks that currently exist at the Refinery to fulfill the needs of the tanks that need to be replaced is not a practical alternative either, because there are no tanks available for conversion as they are all in service.

New Site Location

To install replacement tanks at other locations within the existing 'tank fields' at the Refinery or at other unspecified locations within the Refinery, would be a potentially feasible alternative if space were available for these tanks.⁴ This alternative is essentially the same as the Proposed Project and would meet project objectives. However, building replacement tanks at other locations than that of the existing tanks would entail the same suite of short-term construction-related impacts (i.e., noise, air quality, traffic, and aesthetics) as the Proposed Project. In addition, new infrastructure (i.e., piping, wiring, etc.) from the Refinery processes to the new tanks would potentially be needed. Because of the installation of the new infrastructure, this alternative would have potentially greater environmental impacts associated with the short-term construction

⁴ Chevron has indicated that the Refinery does not have other space adequate for the proposed tanks available. Thus this alternative is unfeasible.

impacts as well as depending on the location chosen, potential long term visual impacts associated with replacement tanks.

New Tank Installations

No Project Alternative

Instead of adding eight new tanks (T-3108, T-3228, T-4004, T-4006 through T-4010), the No Project Alternative would involve Chevron continuing to use existing tanks to store future volume of materials. This is not feasible, because the Refinery does not have capacity to meet its project storage needs in the future.

Reduced Project Alternative

One Reduced Project Alternative would consist of converting the use of other tanks that currently exist at the Refinery to fulfill the needs of the new tanks. This is not a practical alternative, because there are no tanks available for conversion as they are all in service.

New Site Location

This alternative would involve installing new tanks within the existing tank fields at the Refinery or at other unspecified location within the Refinery, if such space were available. Installation at a new site location would require new infrastructure (i.e., piping, wiring, etc.) and have essentially the same impacts as the Proposed Project. As with the replacement tanks above, this alternative is essentially the same as the Proposed Project in every respect.⁵

Central Control Room Replacement

No Project Alternative

Under the No Project Alternative, Chevron would continue to use facilities located at a variety of locations within the Refinery to operate the Refinery. While the No Project Alternative would result in fewer environmental impacts, it would not meet the project objectives of replacing existing facilities with modern facilities providing improved reliability.

Reduced Project Alternative

The Reduced Project Alternative would involve designing and building a reduced-size building that still provides sufficient space for central control room operations. Another form of Reduced Project Alternative would consist of combining some of the Refinery operational groups while maintaining existing independent facilities for others. There would be little reduction in environmental impacts from this alternative, because the difference in amount of new construction would be minimal in order to meet project objective of modernizing and improving energy efficiency at the Refinery.

⁵ *Ibid.*

New Site Location

A new onsite location is feasible from a construction point of view, although siting would be more difficult because Chevron believes that the proposed location is the most seismically fit and would appear to provide the most protection to the structure in the event of a seismic event. Additionally a new location would be essentially the same as the Proposed Project and would have the same impacts as the Proposed Project.

New Maintenance Facility**No Project Alternative**

Under the No Project Alternative, Chevron would continue to use existing maintenance facilities. Maintenance facilities would remain scattered around the Refinery, which is inefficient for current and future operations. While this would reduce the Proposed Project construction-related impacts, failing to build the proposed New Maintenance Facility would not meet projects related to improving reliability and energy efficiency at the Refinery.

Reduced Project Alternative

The Proposed Project is already a smaller facility than the existing maintenance facility, and an even smaller facility would not be feasible because it would not be large enough to house the required maintenance activities currently needed to maintain the Refinery. Hence, a reduced size maintenance facility would likely require some continued use of some portion of the existing facilities.

New Site Location

The proposed New Maintenance Facility component could be located in an alternate location on the Refinery site, but such an alternate site would not reduce any of the environmental impacts of the Proposed Project as it would be essentially the same as the Proposed Project. Practically, such an alternate site would have to be in the same general area of the Refinery as both the existing and proposed maintenance facility, because other more western locations on the Refinery are filled with either tanks, process units or existing buildings.

6.6.2 Environmentally Superior Alternative

Identification of an environmentally superior alternative is required under CEQA pursuant to CEQA Guidelines § 15126.6(e)(2). If the environmentally superior alternative is the No Project Alternative, the EIR shall also identify an environmentally superior alternative from among the other alternatives. (CEQA Guidelines § 15126.6(e)(2).)

As presented in Chapter 4 of this EIR, all significant environmental effects of the Proposed Project can be reduced to less-than-significant levels with the implementation of proposed mitigation measures except Impact 4.3-2, which would remain significant and unavoidable for VOC emissions. No feasible mitigation measures have been identified in this EIR to reduce this impact to a less-than-significant level. In this analysis, the No Project Alternative for the entire Proposed Project (see Section 6.5.1) would be environmentally superior because it would avoid

all of the environmental effects of the Proposed Project, although none of the project objectives would be met.

The Environmentally Superior Alternative

Other than the No Project Alternative (for the entire Proposed Project) a No Project Alternative for the Catalytic Reformer Replacement and Tank T-3228 component is the Environmentally Superior Alternative. Under this alternative Chevron would not build the Catalytic Reformer Replacement and its associated Tank T-3228. This alternative would result in VOC emissions that would have a less-than-significant impact, compared to VOC emissions resulting from the Proposed Project which would cause a significant and unavoidable air quality impact. It would also avoid the construction-related impacts associated with these components. However, as is discussed in Section 6.6.1.3, above, this alternative, while feasible, would not meet project objectives of increasing Refinery efficiency and increasing the ability to produce more CARB gasoline. A secondary effect of this alternative would be that the net reduction of 46.2 TPY of NO_x would not be achieved.

References – Alternatives Analysis

- Kam, Ken, 2005. Filling up on Energy Bargains
http://www.forbes.com/home/investmentnewsletters/2005/10/14/chevron-conoco-valero-tesoro-cz_kk_1013soapbox_inl.html accessed November 6, 2005.
- Organization of the Petroleum Exporting Countries (OPEC), 2005. OPEC Monthly Oil Market Report, August 2005. [http://www.opec.org/home/Monthly percent20Oil percent20Market percent20Reports/2005/MR082005.htm](http://www.opec.org/home/Monthly%20Oil%20Market%20Reports/2005/MR082005.htm) Accessed November 6, 2005.

CHAPTER 7

Report Preparation

7.1 Report Authors

7.1.1 Lead Agency

City of Richmond

Richard Mitchell, Director of Planning and Building Services

Janet Harbin, Principal Planner

Lamont Thompson, Senior Planner / Project Planner

7.1.2 Consultants

Environmental Science Associates

Doug Cover	Project Director
Chuck Bennett	Project Manager; Project Description; Alternatives; Cumulative Impacts
Tim Morgan	Deputy Project Manager; Project Description; Alternatives; Cumulative Impacts; Public Services
Dean Martorana	Cultural Resources
Brad Brewster	Aesthetics, Visual Quality, Light and Glare
Elizabeth Kanner	Aesthetics, Visual Quality, Light and Glare; Land Use
Deborah Kirtman	Land Use, Plans, and Policies
Heidi Von Blum	Agricultural Resources, Employment, Population and Housing, Parks and Recreation
Eric Schniewind	Geology, Soils, Seismicity and Mineral Resources, Hydrology and Water Quality
Peter Hudson, REG	Hydrology and Water Quality
Michael Ratte	Air Quality
Matt Fagundes	Air Quality, Utilities and Service Systems
Robert Vranka, Ph.D.	Public Health; Public Safety, Energy, Utilities and Service Systems
Jyothi Iyer	Noise
Mark Fogiel	Biological Resources
Jack Hutchison	Traffic and Transportation
Ron Teitel	Graphics
Gus JaFolla	Word Processing and Report Production

IES

Dave Powell – Senior Engineer, Project Description, Public Safety, Public Health

ARD

Joe Sullivan – Wildlife Toxicology Support

Aspen Environmental Group

Brewster Birdsall, P.E., QEP Peer Reviewer to the City of Richmond

Alan Greenberg, Ph.D. Peer Reviewer to the City of Richmond

7.2 Agencies and Organizations Contacted

The Planning Department submitted a copy of this Draft EIR to the following agencies and organizations:

Adams Broadwell Joseph & Cardozo	Contra Costa Transportation Authority
Bay Area Air Quality Management District	East Bay Municipal Utility District
CalEPA Department of Toxic Substances Control Region 2	Marina Bay Neighborhood Council
California Air Resources Board	Native American Heritage Commission
California Department of Conservation	NOAA National Marine Fisheries Service Protected Resources Division
California Department of Fish and Game	Oceanic Society San Francisco Bay Chapter
California Energy Commission	Pillsbury Winthrop Shaw Pittman LLP
California Highway Patrol	San Francisco Bay Conservation and Development Commission
California Native Plant Society	San Francisco Bay Regional Water Quality Control Board
California Office of Historic Preservation	Sierra Club San Francisco Bay Chapter
Caltrans District 4	State Department of Boating and Waterways
Caltrans Division of Transportation Planning	State Lands Commission
Communities for A Better Environment	State Water Resources Control Board
Contra Costa County Community Development Department	U.S. Army Corps of Engineers
Contra Costa County Environmental Health Department	U.S. Environmental Protection Agency Region 9
Contra Costa County Flood Control District	U.S. Fish & Wildlife Service
Contra Costa County Health Services Hazardous Materials Program	United States Coast Guard Marine Safety Office
Contra Costa County Local Agency Formation Commission	West Contra Costa Unified School District

CHAPTER 8

Glossary / Acronyms / Measurement Units

8.1 Glossary

A number of technical terms are used in the refining industry and at the Chevron Richmond Refinery (Refinery) to describe the materials, products, operations and equipment that are in use there. This glossary includes selected definitions and in some cases expanded descriptions of these terms that allow the reader of this document to follow the discussions. In addition, these expanded descriptions also present how these processes specifically take place at the Refinery.

Name	Description
Acid Gas Stripper	Equipment in which a gas is blown by a fan through a liquid chemical mist. The liquid chemical has an affinity for the acid components in the gas and absorbs the acid components in the liquid.
Alkanes	Commonly-known <i>Hydrocarbons</i> such as methane (CH₄), ethane (C₂H₆), propane (C₃H₈), and butane (C₄H₁₀), are all members of the <i>alkane</i> series—a family of <i>hydrocarbons</i> having the general molecular formula C_nH_{2n+2}. In this formula, “n” stands for the number of carbon atoms. The formula states that the number of hydrogen atoms in any <i>alkane</i> is two times the number of carbon atoms, plus two. For example, propane has three carbon atoms. Therefore, propane contains (2 x 3) + 2 = 8 hydrogen atoms. Hence, its molecular formula is C₃H₈. In organic chemistry terms, an <i>alkane</i> is a saturated <i>hydrocarbon</i> without carbon rings, that is, primarily an acyclic, or aliphatic (straight-chain) <i>hydrocarbon</i> in which the molecule has the maximum possible number of hydrogen atoms and so has no double bonds. <i>Alkanes</i> are also often known as <i>paraffins</i>, especially the high molecular weight <i>alkanes</i> for which n is greater than about 20, Alkanes, or paraffins, are one of the four classes or types of hydrocarbon molecules found in refined petroleum products and crude oil mixtures. These four —<i>paraffins</i>, <i>olefins</i>, <i>naphthenes</i>, and <i>aromatics</i>— have different chemical properties.
Alkylate	A high <i>octane</i> component that is blended with reformat and other gasoline component streams to make finished gasoline.
Alkylation	A process which chemically combines LPG's (light olefin hydrocarbons produced at the FCC Plant and isobutene), using low temperature and sulfuric acid as a catalyst, to make a gasoline blending component known as alkylate.
Amine	Amines are chemicals with nitrogen and hydrogen molecules that are similar to ammonia with hydrocarbons substituted for one, two or three of the hydrogen atoms. Amines are colorless gases or liquids, usually flammable, with strong odors.
Amine Contactor	Equipment in which an amine or amine solution is used as the liquid chemical in a stripper. The liquid amine has an affinity for the acid components in the gas, especially hydrogen sulfide and absorbs them in the liquid.
Ammonia	The molecular formula for ammonia is NH ₃ .
Aromatic	Aromatics are cyclical hydrocarbon molecules. The base of aromatics molecules is usually benzene.

Name	Description
Asphalt	Asphalt is a large hydrocarbon found in crude oil that is separated from the lighter molecules with a lower molecular weight.
Atmospheric Pressure	14.6 pounds of force per square inch at sea level. One atmosphere pressure is used as the standard pressure for gases and gas mixtures.
Aviation Gasoline	Aviation gasoline is a special blend of hydrocarbons in crude oil or formed from components in crude oil to provide a stable fuel which performs well for airplane engines, both propeller and jet engines.
Barrel	In the petroleum industry, a barrel is a volume of 42 gallons. See also BBL.
Beamer Reactor	Converts normal butane into isobutene.
Benzene	A special hydrocarbon with a formula of C_6H_6 , with a stable, resonating carbon to carbon bond.
Biomass	Biomass refers to solid organic material that is amenable to reaction with biologic agents such as bacteria or enzymes, or is produced by them.
Boiler	Equipment in which water is heated to create steam, a pressurized water vapor that is used to transport energy to other equipment in which the vapor is condensed, releasing some of the energy used to create the steam.
Boiling Point	The boiling point of a pure chemical is that temperature, for a specified pressure, at which the chemical undergoes a physical transformation from the liquid phase to the gaseous phase. For a mixture of chemicals, the boiling point becomes a range of temperatures where all the components in the mixture undergo the liquid to vapor transition.
British thermal unit	One British thermal unit (Btu) is the quantity of heat required to raise the temperature of one pound of water from 60° to 61°F at a constant pressure of one atmosphere, or the quantity of heat equal to 1/180 of the heat required to raise the temperature of one pound of water from 32° to 212°F at a constant pressure of one atmosphere.
Butane	Butane is a saturated (only single chemical bonds) hydrocarbon with a formula of C_4H_{10} . See also <i>Alkanes</i> , above.
C3 or C_3	Hydrocarbons with 3 carbon atoms. Refers to mixed <i>propane</i> streams or fractions.
C4 or C_4	Hydrocarbons with 4 carbons. Refers to mixed <i>butane</i> streams or fractions.
C5 or C_5	Hydrocarbons with 5 carbons. Refers to mixed <i>pentane</i> streams or fractions.
C6 or C_6	Hydrocarbon compounds with six (6) carbon atoms. Refers to mixed <i>hexane</i> streams or fractions.
California Specifications	Specifications on gasoline formulations for motor gasoline mixtures to be used in vehicles in California that reduce the amount of airborne air emissions from automobiles. Refineries are required to produce these special formulations approved by the California Air Resources Board.
Catalyst	In classical chemistry terms, a catalyst promotes a chemical reaction without itself being consumed in the reaction. A catalyst accelerates a chemical reaction so it will proceed at a reasonable rate at lower temperatures and pressures than the reaction would without a catalyst. Typically, refinery catalysts are round or cylindrical in shape and are materials called zeolots, or alumina, or are silica or elemental carbon, called coke. These catalysts deteriorate over time and require replacement or regeneration when their activity drops below a specified level.
Caustic	The <i>caustic</i> used in most proposed processes is sodium hydroxide (NaOH)
Caustic Scrubber	Equipment in which a sodium hydroxide or a sodium hydroxide solution is used as the liquid chemical in a stripper.
Chlorosorb	A trademark process from Universal Oil Products for CCRR which adsorbs chlorine and dioxins on regenerated catalysts thereby reducing air emissions.

Name	Description
Claus Process (sulfur removal)	The Claus Process converts hydrogen sulfide to elemental sulfur in a two stage process. In the first stage, hydrogen sulfide is combusted with oxygen to form sulfur dioxide. In the second step the sulfur dioxide is reacted with hydrogen sulfide in the presence of a catalyst to form molten sulfur which is then stored in a tank at the refinery.
CO	Carbon monoxide, a toxic gas generated by incomplete combustion. CO is a <i>criteria air pollutant</i> .
Cogeneration	An energy producing process where fuel is burned and the combustion gases are first used to generate electricity (as in a turbine) and then afterwards usually to generate steam from the heat remaining in the gases.
Condensed Vapor	When a gas is cooled at a specified, constant pressure, the vapor will change physical state from a gas phase to a liquid phase. The change occurs at the condensation temperature.
Continuous Catalyst Regenerating Reformer	A reformer reactor in a refinery which regenerates a small fraction of the catalyst continuously in contrast to a reformer reactor where the catalyst is regenerated in a batch fashion during a periodic shut down. A catalyst is an agent that promotes or accelerates a chemical reaction without being consumed itself in the reaction. The original reformer catalyst consisted of platinum metal dispersed on porous aluminum beads. The catalyst can withstand the temperatures and pressures of the process equipment. With greater understanding of the chemical reactions and pathways occurring in the reformer reactors, catalysts have been developed to improve the characteristics of the products. One of the improvements of reforming catalysts was to create both metal active sites and acid metal sites. The combination of the two sites on the catalyst promotes sequences of individual chemical reactions and improves desired pathways and product yield of the catalyst. Although catalysts are not consumed in the reactions occurring in the reformer, over time they become deactivated and the overall effectiveness of the reformer unit decreases. One main mechanism of the deactivation is the covering of the catalyst beads with coke (carbon). The coke presents a physical barrier to the contact of hydrocarbon reactants with the active sites on the catalyst beads. Catalyst deactivation can be compensated by changing the reformer operational parameters, such as the temperature of the reactors. Catalyst activity can be recovered by burning off the coke layer in a process called catalyst regeneration.
Cooling Water Tower	Equipment in chemical plants requires cooling that is usually provided by water in a heat exchanger. Water that picks up heat in the process is sent to a cooling tower where the water is dispersed into thin streams over which air is passed. The air evaporates a small amount of the water and the evaporation cools down the water, which is then pumped back to the heat exchanger again for further reuse.
Cracking	<i>Cracking</i> uses heat and <i>catalyst</i> to break large hydrocarbons into smaller ones. Cracking is used to produce more gasoline from each barrel of crude oil than naturally exists in the crude. The heavier cuts or <i>fractions</i> from the crude unit and the <i>gas oils</i> that are purchased as <i>feedstocks</i> consist of large, heavy <i>hydrocarbon</i> molecules, which are too large to have the desired properties. However, when hydrocarbons are heated to about 900°F they begin to break, or crack, into smaller molecules. <i>Cracking</i> converts some of the larger molecules of heavy oils into shorter-chained molecules, such as <i>naphthenes</i> , and ring-shaped molecules, such as <i>aromatics</i> . Both <i>naphthenes</i> and <i>aromatics</i> are desirable components of gasoline.
Criteria Air Pollutant	An air pollutant for which acceptable levels of exposure can be determined and for which an ambient air quality standard has been set. Examples include: ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, and PM ₁₀ and PM _{2.5} .

Name	Description
Crude oil	<i>Crude oil</i> is the term used for the naturally occurring petroleum mixtures that are pumped from wells and then delivered to the refinery by tank ship, pipeline or by rail car. Crude oil is the basic petroleum feedstock that is processed at the refinery. Crude oil contains many different hydrocarbon molecules, usually with a wide range of boiling points, representing many potential products such as propane, butane, gasoline, jet fuel, diesel oil, fuel oil, wax, and asphalt. Because crude oil is a natural product, there is a wide variation in the characteristics of a crude depending mostly on the wells from which it is obtained. Crude oils usually contain some sulfur; crudes that contain low percentages of sulfur, 0.5% or less, are called “sweet” crudes, while crudes that contain high percentages of sulfur, 2.5% or more, are called “sour” crudes. Crudes with sulfur percentages in between are called “intermediate”. Crude oils also may contain other organic compounds that include nitrogen and metals, along with inorganic salts and water, again, depending on the origin of the crude oil. Crude oil consists mainly of hydrocarbons, chemical compounds made up of hydrogen and carbon atoms that are combined into molecules of different sizes, shapes, and configurations. The smallest hydrocarbon molecules, with only a few atoms of hydrogen and carbon, such as methane, ethane, propane and butane, are gases under normal conditions, while somewhat larger hydrocarbon molecules, such as gasoline and diesel, are liquids and very large hydrocarbon molecules, such as asphalt and tar, are solids. These basic physical properties result mainly from the number of carbon atoms in each compound and give the crude the name “light” or “heavy”, depending on the fractions of lighter and heavier hydrocarbons in the crude oil. Four classes or types of hydrocarbon molecules are found in crude oil mixtures. These four — <i>paraffins</i>, <i>olefins</i>, <i>naphthenes</i>, and <i>aromatics</i>— have different chemical properties. Paraffin is a saturated carbon chain Olefin is an unsaturated carbon chain containing double or triple bonds. Olefins are not normally found in crudes. Aromatic is an unsaturated carbon ring Naphthene is a saturated carbon ring The proportions of these four hydrocarbon classes in a crude oil are important indicators of the amounts of desired commercial products that can be made from that crude oil.
Cutter	Cutter stock is a refined product that is about the weight of diesel fuel. Cutter stock (Cutter) is blended with heavier products to assist with pumping those heavier products.
Deasphalted oil	Typically, the residuum or heavy gas oils, from which the asphalt has been removed.
Depentanized	A depentanizer is a fractionation column designed and operated to separate pentane (C ₅ H ₁₀) from other, heavier hydrocarbon compounds.
Diethanolamine	A chemical compound (DEA) used to remove H ₂ S from hydrogen, dry gas and LPG streams.
DNL	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.
Deisobutanizer	Separates normal butane and heavier hydrocarbons from isobutane and lighter hydrocarbons.
Distillation	The process of separating each of the chemical <i>hydrocarbon</i> compounds (fractions) in the <i>crude oil</i> mixture by heating the mixture.
Duct Burner	Secondary burner installed in the discharge duct of the cogen system after the turbine to increase the amount of steam that can be generated.
FCC Hydrotreater	A furnace and reactor vessel containing hydrosulfurization catalyst to remove hydrogen sulfide gas and ammonia in the feed stream of the fluid catalytic cracker (FCC) unit.

Name	Description
Feedstock	The term “ <i>feedstock</i> ” (also called a “feed”) is commonly used to denote the fluid material that is fed into a refinery process unit. For example, <i>crude oil</i> is a <i>feedstock</i> for the crude unit. In a similar vein, the term “stream” refers to the <i>feedstock</i> and also can refer to the output of the process.
Fixed Roof Tank	One of two methods of construction of fabricating petroleum storage tanks, the other being floating roof. In the fixed roof design the top of the tank is rigid and fixed.
Flammable	A gas or solid chemical whose flash point is below 100F at atmospheric pressure.
Flare System	Upsets can occur in refinery processes. When such upsets occur, they can create excess pressure in a pipe, vessel or process unit. To make the refinery operationally safe, such over pressurization is released into a system of pipes that collect the material and direct it to the refinery flares, tall stacks where these excess gases are burned prior to release into the atmosphere. Flares have been developed so that the light created when hydrocarbons burn is only slightly visible or not visible, however, some larger upsets can result in flaring that is quite visible.
Floating Roof Tank	One of two methods of construction of fabricating petroleum storage tanks, the other being fixed roof. In the floating roof design the top of the tank rises and falls with the level of material stored in the tank. A floating roof design eliminates a vapor space above the level of the material stored in the tank and thereby eliminates any vaporization of the stored liquid.
Fraction	A generic name for the groups of hydrocarbon compounds that boil between any two temperatures. Examples of crude oil fractions, in order of the increasing number of carbon atoms, are: light ends; butanes; gasoline; naphtha; kerosene; gas oil; and residue.
Fractionation	<i>Fractionation</i> is a special form of distillation where several output streams of similar boiling point ranges are separated from hydrocarbon mixtures. In the fractionation process, the feedstock is introduced into the fractionation column and vaporized by heating. As the hydrocarbon vapors rise, they reach progressively cooler regions of the column and they eventually condense to liquids on horizontal trays inside the column. Each hydrocarbon fraction, or “cut”, is collected from a tray positioned at the height (and temperature) in the column where that particular vapor condenses into a liquid. Each cut condenses within a specific temperature range, and therefore at a specific height in the column. Each of the cuts from the column is then sent to storage tanks or is sent to other units for further processing. At the refinery: Fractionation towers are parts of many of the refinery process units, and are used to separate the output streams for further processing or handling.
Furnaces	Furnaces provide the heat sources needed in the refinery to carry out the distillation or fractionation processes and to provide the energy for cracking large hydrocarbon molecules, driving catalytic reactions to form desirable hydrocarbons, or eliminating undesirable compounds from feed streams. At the refinery, furnaces are integral parts of most refinery processes. <i>Reforming</i> and <i>cracking</i> depend on heat supplied by the furnaces, and <i>fractionation</i> processes rely on furnaces for direct heating of the feedstocks. Furnaces burn fuel gas, a byproduct of the refining process, or natural gas purchased from outside sources.
Gas Oil	<i>Gas Oil</i> is a material that has been processed in a refinery and is one of the heavier fractions resulting from the initial distillation and separation of crude oil.
Gas Turbine	A gas turbine is the first part of a CoGen unit. Hot combustion gases expand and are directed to turbine or fan blades which turn to generate electricity.
Granulated Activated Carbon	Granulated activated carbon is a powdered form of carbon that possess a large surface area. Liquid organic compounds are adsorbed on the carbon surface and removed from solutions. The base of the granulated activated carbon is made from one of a number of materials: the carbon used is selected to adsorb the liquid chemicals in wastewater or other liquid solutions.
Heavy Gasoline	Motor gasoline produced from processing units that transform the larger molecules processed from the heavier fractions of crude oil.

Name	Description
Hydrocarbons	Molecules made up primarily of hydrogen and carbon atoms. Methane is the simplest of the hydrocarbons, with one carbon atom and 4 hydrogen atoms. When one of methane's hydrogen atoms is replaced by a second carbon atom and three more hydrogen atoms, the new compound is called ethane. The molecular formula for ethane is C_2H_6. If another hydrogen atom is replaced by a third carbon atom and three more hydrogen atoms, the chemical compound formed is propane. Adding a fourth carbon atom and three more hydrogen atoms to the chain forms butane. Methane, ethane, propane and butane are all gases at room temperature and normal atmospheric pressure. All may act as fuels. Methane (the principal component of natural gas) and propane are currently used as alternative fuels for vehicles. These compounds are members of the <i>alkane</i> series—a family of hydrocarbons having the general molecular formula C_nH_{2n+2}. In this formula, "n" stands for the number of carbon atoms. The formula states that the number of hydrogen atoms in any <i>alkane</i> is two times the number of carbon atoms, plus two. For example, propane has three carbon atoms. Therefore, <i>propane</i> has $(2 \times 3) + 2$ hydrogen atoms. Its molecular formula is C_3H_8. An <i>alkane</i> in organic chemistry is a saturated hydrocarbon without carbon rings; that is, an acyclic hydrocarbon in which the molecule has the maximum possible number of hydrogen atoms and so has no double bonds. <i>Alkanes</i> are also often known as <i>paraffins</i>, especially the high molecular weight <i>alkane</i> hydrocarbons for which n is greater than about 20.
Hydrocracking	Hydrocracking adds hydrogen at high temperature and pressure to the <i>cracking</i> process. The added hydrogen is needed to produce more of the smaller hydrocarbon molecules. The presence of the hydrogen also helps remove impurities from the hydrocarbons.
Hydrofining	<i>Hydrofining</i>, also called <i>hydrotreating</i>, is a process used primarily to control the sulfur content of a feedstock or stream. In hydrofining, hydrogen is added to the petroleum stream with heat in the presence of a desulfurizing <i>catalyst</i> either to create a separable sulfur compound or to capture the sulfur on the surface of the <i>catalyst</i>. <i>Hydrofining</i> also removes some of the nitrogen compounds in the hydrocarbon feeds by converting them to ammonia. At the refinery, each of the hydrofiner units is named for the petroleum stream that is treated in that unit. For example, the Naphtha Hydrofiner removes sulfur from the Naphtha stream and the Jet Fuel Hydrofiner removes sulfur from jet fuel.
Hydrogen Production and Use	Hydrogen gas is generated in several ways in a refinery. Hydrogen is produced primarily in a <i>Catalytic Reformer</i>, where natural gas is reacted with steam to release hydrogen gas. Hydrogen gas also is released from liquid hydrocarbons as a part of the processes that occur in the various process <i>reformers</i> (see Reforming, below). Hydrogen also can be recovered from streams of hydrogen-rich gas that occur in other process units, such as the <i>Hydrofining</i> Units. Large amounts of hydrogen are consumed in the refinery for changing the configuration of the chemical bonds in some molecules or in processes that convert sulfur-containing and nitrogen-containing compounds to gases that can be separated easily from the hydrocarbon molecules. These processes include <i>Hydrocracking</i> and <i>Hydrofining</i>.
Hydrogen sulfide	Hydrogen sulfide, H_2S , is a gas that smells like rotten eggs. H_2S is dangerous to human health at concentrations greater than 100 parts per million in air.
Hydrotreater	Removes sulfur, as H_2S , and nitrogen from gas oils. Also reduces the olefin and sulfur content of heart-cut gasoline fractions.
Isobutane	A hydrocarbon with four carbon atoms with a branched, not a straight chain structure.
Isomax	A process where heavy gas oils are cracked into motor gasoline product streams.
Isomerate	Isomerate is the desired product of the Isomax process.
Iso-octane	A branched-chain saturated hydrocarbon with 8 carbons in each molecule, with a fuel <i>octane</i> number of 100.
Iso-octene	A branched-chain unsaturated hydrocarbon with 8 carbons in each molecule but fewer hydrogen atoms than <i>Iso-octane</i> .

Name	Description
Jet Fuel	A product of the refinery suitable for combustion in a jet aircraft engine.
Main Exhaust Stack	Exhausts from several refinery processes are piped to and then released to the atmosphere through a tall exhaust stack. The stack is tall enough to allow the pollutants that are released to be mixed with the air, so that pollutant concentrations in the exhaust and on the ground satisfy all regulatory requirements.
Mercaptan	An odorous hydrocarbon compound that contains sulfur
Methane	A hydrocarbon molecule with one carbon atom. Methane is an <i>alkane</i> .
Naphtha	<i>Naphtha</i> is an intermediate distillation stream that boils in the same boiling range as gasoline. Coal tar naphtha is a colorless or reddish to brown colored, mobile liquid with an aromatic odor. It is a mixture of comprised of varying percentages of aromatic hydrocarbons including toluene, xylene, benzene, and cumene. The benzene content is higher in the coal tar naphthas with low boiling points.
Nitric Oxide, NO	Nitric oxide is a precursor of ozone, nitrogen dioxide (NO ₂), and nitrates; nitric oxide is usually emitted from combustion processes. <i>Nitric oxide</i> is converted to nitrogen dioxide (NO ₂) in the atmosphere, and then becomes involved in the photochemical processes and/or particulate formation. (See also <i>Nitrogen Oxides</i> .)
Nitrogen	An element that is a gas at normal temperatures and pressures.
Nitrogen Oxides, NO _x	A general term pertaining to compounds of <i>nitric oxide</i> (NO), nitrogen dioxide (NO ₂), and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes, and are major contributors to smog formation and acid deposition. NO ₂ is a <i>criteria air pollutant</i> and may result in numerous adverse health effects.
Octane (motor fuel rating)	A measure of fuel performance in an internal combustion engine resulting from the tendency of that fuel to ignite spontaneously under compression. <i>Heptane</i> , a hydrocarbon with seven carbon atoms, ignites spontaneously at low compression ratios, while <i>octane</i> , a hydrocarbon with eight carbon atoms, can be compressed to high ratios without igniting spontaneously. As the percentage of <i>octane</i> in a mixture with <i>heptane</i> is increased, the compression ratio that the fuel mixture will reach before igniting spontaneously also is increased. An 89-octane fuel would have the same spontaneous ignition under compression as a mixture of 89% octane and 11% heptane. That mixture spontaneously ignites at a specific compression ratio, and so can only be used in engines that operate at or below that compression ratio. In practice, motor gasoline is made of many combinations of hydrocarbons, but their tendency to ignite spontaneously under compression is referenced to the octane-to-heptane mixture standard.
Oil Water Separators	Equipment that uses the physical property differences between oil and water, such as density and or surface tension, for example to separate oil from water.
Olefin	The group of unsaturated <i>hydrocarbon</i> compounds that has one or more double or triple bonds between carbon atoms in the linear chain. Olefins have the general formula C _n H _{2n} . Ethylene, with the chemical formula C ₂ H ₄ , is the smallest olefin molecule.
Oxygen Enrichment	In the first step of Claus reaction, using a combustion oxygen source in which the concentration of oxygen exceeds that of oxygen found in air - 21 percent. To enrich the combustion oxygen, pressure swing adsorption is used to separate oxygen from air. This high concentration oxygen is blended into the combustion air for the first step in the Claus process sequence.
Paraffins	Paraffins are <i>alkanes</i> , especially the high molecular weight <i>alkane</i> hydrocarbons for which n is greater than about 20. <i>Paraffins</i> are typically solids at room temperatures.
Pentane	A hydrocarbon molecule with five carbon atoms and 12 hydrogen atoms. Pentane is one of the <i>paraffins</i> or <i>alkanes</i> .
Perchloroethylene	A chlorinated hydrocarbon which is used to provide chloride atoms to reforming catalyst which prepares the catalyst surface to promote the preferred reaction sequences.

Name	Description
Pilot	In a flare, a pilot is a small burner which provides an ignition source for the combustion of hydrocarbons vapors sent to the flare from refinery equipment due to pressure exceeding the set pressure of a relief valve. The combustion transforms the hydrocarbon vapor primarily into carbon dioxide and water.
Pressure Relief System	In the refinery, the pressure relief system is a system of piping and equipment connecting the discharge side of the pressure relief valves on equipment. When the pressure in the gas piping exceeds the relief valve setting, the valve opens and gases are vented into the relief valve system until sufficient gas has been removed and the pressure drops below the relief valve setpoint, and subsequently the relief valve closes. The safety relief valves protect refinery equipment from dangerous, damaging overpressurization. The vapors in the pressure relief system are directed to a vessel where as much as possible of the vapor is condensed into a liquid and are recycled back to the refinery. The remaining vapors are directed to a flare where the hydrocarbons are combusted into carbon dioxide and air.
Pressure Swing Adsorption	Pressure Swing Adsorption applies a material that will adsorb a specific molecule, like hydrogen, more at one pressure than at another pressure. This differential adsorption is used to purify gases. In the refinery, a continuous hydrogen purification process is created with two vessels of adsorbent, one of which is adsorbing hydrogen from a hydrogen-rich gas while the other vessel is desorbing purified hydrogen. When the first vessel has adsorbed hydrogen to its capacity, the flows are switched and the second vessel adsorbs hydrogen while the first vessel is desorbing purified hydrogen.
Propane	A hydrocarbon molecule with three carbon atoms and eight hydrogen atoms. Propane is an <i>alkane</i> .
Propylene	A hydrocarbon molecule with three carbon atoms and six hydrogen atoms. In contrast to propane, propylene has one carbon-carbon bond where two electrons are shared resulting in a molecule with fewer hydrogen atoms than propane. Propylene is an <i>olefin</i> .
Reforming	<i>Reforming</i> modifies the chemical structure of the feedstock hydrocarbons into more valuable hydrocarbon compounds. Reformers use a special catalyst to create <i>aromatics</i> and other cyclical <i>hydrocarbon</i> molecules from <i>naphthenes</i> in the streams fed into the reformer. The <i>aromatics</i> and other cyclical hydrocarbons perform better in cars and have higher economic value than the straight-chain molecules from which they are made. As a by-product, <i>reformers</i> also make <i>hydrogen</i> gas.
Reid Vapor Pressure	Refers to the <i>vapor pressure</i> of the fuel expressed in the nearest hundredth of a pound per square inch (PSI) with a higher number reflecting more gasoline evaporation.
Regenerate	Term used to describe the process that regains the initial activity to a catalyst. In use in the refinery, catalysts are slowly deactivated in chemical processing, usually due to the physical blocking of the catalyst surface by carbon. In regeneration, this carbon is removed by oxidization in a controlled burning of the carbon, converting it to carbon dioxide. The catalyst surface is usually reconditioned with sulfur and chloride and then the catalyst has regained most of its initial activity. Regeneration in a reformer can take place in the reforming reactor, but then the refinery cannot use the process or a continuous regenerating process where a small amount of catalyst is removed continuously from the reformer and is regenerated and reconditioned and then is returned to the reactor.
Residuum	The higher boiling point material in crude oil that remains when other hydrocarbons are removed in the initial distillation and vacuum distillations of crude oil at the refinery
Safety Relief Valve	A Safety Relief Valve is a valve which is held closed by a spring until the pressure of the fluid exceeds the spring force. When the pressure exceeds the force, the safety relief valve opens and enough fluid is released to drop the fluid pressure to a level below the spring force and the spring resets the valve. SRV protect against overpressure and maybe required by regulations on some vessels and pipelines.
Scrubber	Scrubbing is a term used for a chemical process where a component of a gas stream is removed from the gas and is transferred into a liquid. Scrubbing hazardous compounds from gases is a primary pollution control technology, as well as being used to separate non-hazardous compounds as well.
Selective Catalytic Reduction	A NO _x emission control system.

Name	Description
Selective Hydrogenation	Selective hydrogenation removes di-olefins and converts light <i>mercaptans</i> into heavier sulfides.
Selective Methane Reactor	The Selective Methane Reactor (SMR) is one of the key parts of hydrogen production. In the SMR - a hydrogen methane mixture is mixed with steam and in the presence of a catalyst is converted to hydrogen, carbon dioxide and carbon monoxide. The heat liberated in this reaction is used to generate steam.
Selenium Removal	Some crude oils contain sufficient selenium that it enters the sour water system. If the selenium concentration in the refinery waste water exceeds levels deemed to be dangerous, then the selenium concentration must be reduced prior to discharge. Selenium has been demonstrated to be successfully removed by a chemical process or by a biological process.
Sodium Sulfite	In a sulfur recovery unit, sodium sulfite is used to absorb the sulfur dioxide exiting the sulfur reactors and is pumped back to a stripping column where the sulfur dioxide is recycled back into the reactor chain of the Sulfur Recovery Unit.
Sour Water	Sour water is water in which ammonia and sulfur-bearing compounds are dissolved. It has a very sour strong aroma.
Sulfur Dioxide	A gas consisting of one sulfur and two oxygen atoms. The chemical formula is SO ₂ . <i>Sulfur Dioxide</i> is a criteria pollutant whose emissions are regulated by the Bay Area Air Quality Management District.
Sulfur Recovery Unit	In a Sulfur Recovery Unit, <i>hydrogen sulfide</i> is absorbed from refinery gases to reduce their sulfur content so that the refinery gases can be burned for heating refinery intermediate streams. The hydrogen sulfide is desorbed by steam heating the solution and the hydrogen sulfide is burned to form sulfur oxides which are absorbed and converted to molten sulfur using the Claus process. The Sulfur Recovery Unit and the processes taking place inside its equipment are very common and are found in almost all refineries.
T90, T50	T90 and T50 are the temperatures, in degrees F, at which 90% and 50%, respectively, of the gasoline will evaporate.
Tanks	In a refinery, large tanks are used to store incoming petroleum raw materials such as crude oil, intermediate refinery products such as gas oil, and final products that can be blended for consumer products such as gasoline. All raw materials and products are pumped through pipelines that connect the tanks, refinery process units and refinery shipping terminals. The tanks typically are equipped with a special floating roof to reduce the evaporation of raw hydrocarbons into the air.
Tar	Tar is another term used for a mixture of high boiling point hydrocarbons that are a solid state at normal temperatures and pressures.
Tetramer	A polymer with 4 substructure units.
Tertiary Polishing	The third step of removing pollutants in the waste water treatment system in the Refinery
Toxic Substances Control Act	The Toxic Substances Control Act, TSCA, regulates the use and management of polychlorinated biphenyls (PCBs) in electrical equipment and sets forth detailed safeguards to be followed during the disposal of such items (40 Code of Federal Regulations).
Turnaround	Refers to the period of time when a refinery equipment is down for maintenance and inspections and not available to process feedstocks, as opposed to a refinery equipment's typical 24 hour a day, 365 day a year operation.
Vapor Pressure:	The pressure, often expressed in millimeters of mercury (mm Hg) or in pounds per square inch (PSI) that is characteristic at any given temperatures of a vapor in equilibrium with its liquid or solid form.
Volatile Organic Compounds	Carbon-containing compounds that evaporate into the air (with a few exceptions). Volatile Organic Compounds (VOCs) contribute to the formation of smog and/or may themselves be toxic. VOCs often have an odor. Examples include gasoline, alcohol, and the solvents used in paints.

Name	Description
Wastewater Treatment	Equipment in which the water wastes from the refining process are treated and monitored to insure that the refinery discharge meets the regulations of the San Francisco Regional Water Quality Control Board (SFRWQCB), the responsible state agency. The wastewater treatment plant also treats runoff from process areas.

8.2 Acronyms Used in this EIR

ABAG	Association of Bay Area Governments, a regional planning agency
ACMs	Asbestos-containing materials.
AMSL	Above Mean Sea Level
ANS	Alaskan North Slope
APE	Area of Potential Effect
ASTM	American Standard Testing Method
ASME	American Society of Mechanical Engineers
AvGas	Aviation Gasoline
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
BCDC	Bay Conservation and Development Commission
BLEVE	Boiling Liquid Vapor Cloud Explosion
BLL	Blood Lead Level
BMP	Best management practices
Btu	British thermal unit
CalEPA	California Environmental Protection Agency
CAP	Corrective Action Plan, under RCRA
CARB	California Air Resources Board
CaRFG2	The CARB's acronym for phase 2 reformulated gasoline.
CaRFG3	The CARB's designation for phase 3 reformulated gasoline.
CAER	Community Awareness Emergency Response
CBC	California Building Code, a portion of California Building Standards Code
CCRR	Continuous Catalyst Regenerating Reformer
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CGS	California Geological Survey
CMI	Corrective Measures Implementation, a part of the RCRA CAP process.

CMP	Countywide Congestion Management Plan
CMS	Corrective Measures Study, a part of the RCRA CAP process.
CNEL	Community Noise Equivalent Level
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CoGen	Cogeneration – as in the cogeneration of electric power and process steam.
CTR	California Toxics Rule
CWA	Federal Clean Water Act
DEA	Diethanolamine
DOT	U.S. Department of Transportation.
DTSC	California Department of Toxic Substances Control
DPM	Diesel Particulate Matter
EIR	CEQA Environmental Impact Report
CAA	Federal Clean Air Act, as amended by the Clean Air Act Amendments of 1990
FCC	Fluid Catalytic Cracking unit
FEMA	Federal Emergency Management Agency
H ₂ S	Hydrogen sulfide
HAPs	Hazardous Air Pollutants
HAZOP	Hazard and Operability Study
HEPA Filter	HEPA filters are high-efficiency filters that remove at least 99.97 percent of all particles that are greater than 0.3 microns in size.
HD 2007	Heavy Diesel 2007
HNC	Heavy Neutral Cracker
HRA	Health Risk Assessment
HWHF	Hazardous Waste Handling Facility
ICM	Interim Corrective Measures, a part of the RCRA CAP process.
LPG	Liquefied Petroleum Gas - (light hydrocarbons)
LOS	Level of Service
LTA	Land Treatment Act
MACT	Maximum Achievable Control Technology
MEA	Monoethanolamine
MGD	Million Gallons per Day
MSDS	Material Safety Data Sheet
MSL	Mean Sea Level

MW	MegaWatts
NAHC	Native American Heritage Commission
NPDES	National Pollutant Discharge Elimination System
NESHAPs	National Emission Standards for Hazardous Air Pollutants
OEHHA	California Office of Environmental Health Hazard Assessment
OSHA	U.S. Occupational Safety and Health Administration
PAH	Polycyclic Aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PG&E	Pacific Gas & Electric
PHA	Preliminary Hazard Analysis
PM	Particulate Matter
PM _{2.5}	PM less than 2.5 microns in size
PM ₁₀	PM less than 10 microns in size
PSA	Pressure Swing Adsorption
PSM	Process Safety Management program
RCRA	Resource Conservation and Recovery Act. Establishes requirements for the design, installation, and operation of underground storage tanks (USTs).
RFG	Refinery Fuel Gas
RMP	Risk Management Plan or Regional Monitoring Program
RMPP	Risk Management and Prevention Program
RWQCB	Regional Water Quality Control Board
SCF	Standard Cubic Feet
SCFD	Standard Cubic Feet per Day
SCR	Selective Catalytic Reduction
SIP	State Implementation Plan
SHBC	State Historical Building Code
SHPO	State Historic Preservation Officer
SHU	Selective Hydrogenation Unit
SLC	State Lands Commission
SMR	Selective Methane Reactor.
SO ₂	Sulfur Dioxide
SPCC	Spill Prevention Control and Countermeasure
SRU	Sulfur Recovery Unit
STS	Stan Trans Services
SWMP	Storm Water Monitoring Plan

SWMU	Solid Waste Management Unit
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	California State Water Resources Control Board
TAC	Toxic Air Contaminants
TBACT	Best Available Control Technology for Toxics
TDS	Total Dissolved Solids
TKC	TKC – is a trade name and is used in reference to the Fluid Catalytic Cracker (FCC) Feed Hydrotreater at the Refinery.
TKN	TKN – is a trade name and is used in reference to the TKN Hydrocracker Unit at the Refinery.
TMDL	Total Maximum Daily Loads
TSCA	Toxic Substances Control Act, which regulates the use and management of polychlorinated biphenyls (PCBs) in electrical equipment and sets forth detailed safeguards to be followed during the disposal of such items (40 Code of Federal Regulations).
UBC	Uniform Building Code
ULSD	Ultra Low Sulfur Diesel
U.S. EPA	U.S. Environmental Protection Agency
USGS	U. S. Geological Survey
VCE	Vapor Cloud Explosion
U.S. FWS	US Fish and Wildlife Service
UST	Underground storage tank
VOC	Volatile Organic Compounds
WAR	Wet Air Regeneration
WDR	Waste Discharge Requirements

8.3 Measurement Units Used in this EIR

BBL	Barrel, in the Petroleum industry, a volume of 42 gallons.
Btu	British Thermal Unit, the total energy needed to raise the temperature of 1 pound of water by 1 degree, F.
CFM	Cubic feet per minute, a rate of flow or use.
CFS	Cubic feet per second, a rate of flow or use.
dB	Decibel, one-tenth of a Bel, a measure of noise intensity.
dBA	A-weighted decibels, a measure of noise intensity.
DNL	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.
°F	Temperature in degrees Fahrenheit.

Hz	Hertz – cycles per second
k	The “k” or kilo, is a prefix multiplier applied to many measurement units. The prefix “kilo” multiplies the unit by 1,000. For example, a kilowatt (kW) is one thousand Watts. See <i>Watts</i> , below.
MGD	Million gallons per day, a rate of liquid use or flow.
Micron	A micron is a linear measure of one-millionth of a meter, or less than one-25,000th of an inch. For comparison, human hair is 50 or more microns in diameter. A micron also can be represented by the Greek letter Mu (μ).
μ	The Greek letter Mu (μ), “micro”, a prefix multiplier applied to many measurement units to multiply the unit by one-millionth. For example, a microgram (μg) is one millionth of a gram. See also $\mu\text{g}/\text{m}^3$, below.
$\mu\text{g}/\text{m}^3$	Micrograms per cubic meter, one millionth of a gram per cubic meter.
M	M or mega, is a prefix multiplier applied to many measurement units to multiply the basic unit by 1,000,000. For example, a megawatt (MW) is one million Watts. See <i>Watts</i> , below.
MM	Modified Mercalli, a measure of earthquake shaking intensity
MPH	Miles per hour, a measure of velocity.
MW	Megawatt, one million Watts. See <i>Watts</i> , below.
MWh	MegaWatt-hours, one million watt-hours, a measure of total energy. See <i>Watt-hour</i> , below.
ng/m^3	Nanogram per cubic meter. Concentration in billionths of a gram per cubic meter. The “n” or nano is a prefix that multiplies the basic unit by one one-billionth.
PSI	Pounds per square inch, a measure of pressure.
ppb	Parts per billion, a measure of concentration.
ppm	Parts per million, by weight, a measure of concentration.
ppmv	Parts per million by volume, a measure of concentration.
SCF/hr	Standard cubic feet per hour
SCF	Standard Cubic Feet, a measure of gas volume under standard conditions of pressure and temperature.
Therm	A measure of the energy value of natural gas. One Therm is equal to 100,000 Btu, which is roughly the energy value contained in 100 cubic feet of natural gas.
VA	Volt-Amperes, product of voltage and amperage in a conductor. (1 VA is equal to 1 Watt in a direct current circuit or if the voltage is in phase with the amperage in an alternating current circuit.) Do we need this??
Watt	A measure of the rate of energy consumed or passing through an electric conductor or device. In a direct current circuit, 1 watt = volts x amps. See VA, above.
Watt-hour	A measure of total energy. The product of watts (the rate of energy use) times the number of hours. A 100 watt light burning for 1 hour uses 100 watt-hours of total energy.