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T.A. Lizarraga
Manager

**Health, Environment &
Safety**
Chevron Products Company
P. O. Box 1272
Richmond, CA 94802-0272
Tel 510 242 1400
Fax 510 242 5353
hink@chevron.com

June 20, 2007

Mr. B. B. Blevins
Executive Director
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

**Application for Small Power Plant Exemption
Chevron Richmond Power Plant Replacement Project**

Dear Mr. Blevins:

Chevron USA, Inc. (Chevron) hereby submits this Application for Small Power Plant Exemption (SPPE) for the Chevron Richmond Power Plant Replacement Project (PPRP), a nominal 60-megawatt (MW) net addition to electric generating capacity at the Chevron Richmond refinery located at 841 Chevron Way in the City of Richmond, California. The Application is being submitted in conformance with the siting regulations at California Code of Regulations (CCR), Section 1704 et seq and Appendix F.

In accordance with California Code of Regulations, Section 2308, also submitted herewith is a check in the amount of \$ 200,000 payable to the California Energy Commission as a deposit for the actual cost of processing the application. We understand that a cost reconciliation will occur following a decision on the SPPE and that Chevron will be billed for the costs that exceeded the deposit, or a refund will be provided if the costs are less than the deposit.

I hereby attest, under penalty of perjury, that the contents of this Application are true and accurate to the best of my knowledge.

Please contact Mr. Gary Carr, Chevron SPPE Permitting Manager at (510) 242-9052 or our consultant, David Stein of CH2M HILL at (510) 587-7787 if you have any questions regarding the Application.

Sincerely,

A handwritten signature in dark ink, appearing to read "Tery Lizarraga".
Tery Lizarraga

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Acronyms and Abbreviations

°C	degrees Celsius
°F	degrees Fahrenheit
µg/m ³	micrograms per cubic meter
A	amperes
AAC	aluminum conductor aluminum core
AADT	annual average daily traffic
AAQS	ambient air quality standards
AASHTO	American Association of State Highway Transportation Officials
AB	Assembly Bill
ABAG	Association of Bay Area Governments
AC	alternating current
AC Transit	Alameda-Contra Costa County Transit District
ACCC	aluminum compact conductor, composite core
ACHP	Advisory Council on Historic Preservation
ACI	American Concrete Institute
ADM	Alternate Design Method
ADT	average daily traffic
afy	acre-feet per year
AHPA	Archaeological and Historic Preservation Act
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
API	American Petroleum Institute
APLIC	Avian Power Line Interaction Committee
AQIA	air quality impact assessment
AQMD	air quality management district

ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ATC	Authority to Construct
AWG	American Wire Gauge
AWS	American Welding Society
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
BART	Bay Area Rapid Transit
BCDC	Bay Conservation and Development Commission
BMP	best management practice
BNSF	Burlington Northern Santa Fe
BP	before present
BPIP	Building Profile Input Program
BTU	British thermal unit
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CalARP	California Accidental Release Prevention Program
Cal-OSHA	California Occupational Safety and Health Administration
CAM	Compliance Assurance Monitoring
CARB	California Air Resources Board
CBC	California Building Code
CCCEHD	Contra Costa County Environmental Health Division
CCR	Code of California Regulations
CCTA	Contra Costa County Transportation Authority
CDC	California Department of Conservation
CDFG	California Department of Fish and Game
CDOGGR	California Division of Oil, Gas, and Geothermal Resources
CEC	California Energy Commission
CEDD	California Employment Development Department

CEMS	continuous emission monitoring system
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations, Title 29, Chapter XVII, Part 1910
CGS	California Geological Survey
CHP	combined heat and power
CHP	California Highway Patrol
CHRIS	California Historical Resources Information System
CHRP	Chevron Refinery Power Plant Replacement
CNDD	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO	carbon monoxide
CO ₂	carbon dioxide
Cogen 3000	proposed nominal 47-MW cogeneration train
COPC	constituent of potential concern
CPI	Chemical and Petroleum Industry
CPM	compliance project manager
CPT	control power transformer
CPUC	California Public Utilities Commission
CRHR	California Register of Historical Resources
CRS	Cultural Resources Specialist
CSC	California Species of Special Concern
CSLC	California State Lands Commission
CTG	combustion turbine generator
CTI	Cooling Tower Institute
CUP	Conditional Use Permit

CUPA	Certified Unified Program Agency
CWA	Clean Water Act
DAS	data acquisition system
dB	decibels
dBA	A-weighted decibels
DC	direct current
DCS	distributed control system
DEM	Digital Elevation Model
DNL	Day-Night Noise Level
DOC	Determination of Compliance
DOF	California Department of Finance
DOT	U.S. Department of Transportation
DSCF	dry standard cubic feet
DTSC	Department of Toxic Substance Control
DWR	California Department of Water Resources
EAC	Early Action Compact
EAF	equivalent availability factor
EBMUD	East Bay Municipal Utility District
EBRPD	East Bay Regional Park District
EERC	Energy & Environmental Research Corporation
EIR	Environmental Impact Report
EJ	Environmental Justice
EMF	electric and magnetic field
ERC	Emission Reduction Credit
ESA	ESA Environmental Associates, Inc.
FAA	Federal Aviation Administration
fc	foot-candle
FCC	Fluid Catalytic Cracker
FEMA	Federal Emergency Management Agency
FESA	Federal Endangered Species Act

FHWA	Federal Highway Administration
FM	fire marshal
FMMP	Farmland Mapping and Monitoring Program
g	unit of acceleration equal to the value of the acceleration caused by Earth's gravity at sea level
g/s	grams per second
GE	General Electric
GEP	Good Engineering Practice
GHG	greenhouse gas
GHz	gigahertz
GJ	gigajoule
GJ/hr	gigajoule per hour
GO	General Order
gpm	gallons per minute
GSU	generator step-up
GUS	global user station
H ₂	hydrogen
H ₂ -STG	proposed nominal 17-MW hydrogen plant steam turbine generator
HAP	hazardous air pollutant
HARP	Hotspots Analysis Reporting Program
HAZOP	hazards and operability study
HCP	habitat conservation plan
HHRA	human health risk assessment
HHV	higher heating value
HI	hazard index
HI	Heavy Industry
HI	Hydraulic Institute Standards
HIA	acute hazard index
HIC	chronic hazard index
HMBP	Hazardous Materials Business Plan

HMI	human-machine interface
HP	high pressure
hp	horsepower
HPC	high-pressure compressor
HPT	high-pressure turbine
HRA	Health Risk Assessment
HRSA	Health Risk Screening Analysis
HRSG	heat recovery steam generator
HTW	high-temperature water
Hz	hertz
I/O	input/output
I-580	Interstate 580
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrician and Electronic Engineers
IES	Illuminating Engineering Society
IP	intermediate pressure
IR	infrared
ISCST3	Industrial Source Complex Short-Term
ISO	International Standards Organization
KGRA	known geothermal resource area
KOP	Key Observation Point
kpph	thousand pounds per hour
kV	kilovolt
kV/m	kilovolts per meter
kVA	kilovolt-ampere
lb/day	pounds per day
lb/hr	pounds per hour
lb/MW-hr	pounds per megawatt-hour
lb/yr	pounds per year
L _{dn}	day-night noise level

LEL	lower explosion limit
L_{eq}	equivalent noise level
LHV	lower heating valve
L_{max}	maximum A-weighted sound level
L_n	percentile noise level
LORS	laws, ordinances, regulations, and standards
LP	low pressure
LPG	liquid petroleum gas
LPT	low-pressure turbine
LSA	LSA Associates, Inc.
mA	milliampere
MACL	maximum allowable contaminant limit
MACT	maximum achievable control technology
MCC	motor control center
MCP	motor circuit protector
MEIR	maximum exposed individual resident
MEIW	maximally-exposed individual worker
mG	milligauss
mg/L	milligrams per liter
mg/m ³	milligrams per cubic meter
mgd	million gallons per day
MHz	megahertz
MMBtu	million British thermal units
MMBtu/hr	million British thermal units per hour
mph	miles per hour
MSS	Manufacturers Standardization Society Practices
Mw	moment magnitude
MW	megawatt
NAAQS	national ambient air quality standards
NAD27	North American Datum 1927

NAHC	Native American Heritage Commission
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NEPA	National Environmental Policy Act
NESC	National Electric Safety Code
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
ng/J	nanograms per Joule
NO	nitric oxide
NO ₂	nitrogen dioxide
NO _x	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NPOC	non-precursor organic compounds
NPT	National Pipe Thread
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSPS	New Source Performance Standards
NSR	New Source Review
O ₃	ozone
OEHHA	Office of Environmental Health Hazard Assessment
OSD	NRCS Official Series Descriptions
OSHA	Occupational Safety and Health Administration
Pb	lead
PCC	point of common coupling
PCE	Passenger Car Equivalent
PCS	plant control system
PG&E	Pacific Gas and Electric Company
PLC	programmable logic controller
plf	pounds per linear foot

PM ₁₀	particulate matter with aerodynamic diameter less than or equal to 10 microns
PM _{2.5}	particulate matter with aerodynamic diameter less than or equal to 2.5 microns
PMI	point of maximum impact
POC	precursor organic compounds
ppbv	parts per billion by volume
ppm	parts per million
ppmvd	parts per billion by volume dry
ppmw	parts per million by weight
PPRP	Chevron Richmond Refinery Power Plant Replacement Project
ppt	parts per trillion
Project	Chevron Refinery Power Plant Replacement Project Small Power Plant Exemption
PSD	Prevention of Significant Deterioration
psf	pounds per square foot
psia	pounds per square inch absolute
psig	pounds per square inch gauge
PTO	Permit to Operate
RARE	Richmond Advanced Recycling Expansion
RCNM	Roadway Construction Noise Model
RCRA	Resource Conservation and Recovery Act
REL	Reference Exposure Level
RFG	refinery fuel gas
RI-TVI	radio interference and television interference
RMP	Risk Management Plan
RO	reverse osmosis
ROG	reactive organic gases
ROW	right-of-way
RP	Richmond Pacific
RPA	Registered Professional Archaeologist

rpm	revolutions per minute
RRWEW	Richmond Refinery Water Enhancement Wetland
RTD	resistance temperature detector
RWQCB	San Francisco Bay Regional Water Quality Control Board
SAIC	Science Applications International Corporation
SARA	Superfund Amendment and Reauthorization Act
SCR	selective catalytic reduction
SER	significant emission rate
SHPO	State Historic Preservation Officer
SIGT	steam-injected gas turbine
SLC	State Lands Commission
SO ₂	sulfur dioxide
SOP	standard operating procedure
SOSS	Standard Oil Switching Station
SPCC	spill prevention control and countermeasures
SPPE	Small Power Plant Exemption
SSPC	Steel Structures Painting Council
State	State of California
STG	steam turbine generator
SWPPP	stormwater pollution prevention plan
SWRCB	State Water Resources Control Board
TAC	toxic air contaminant
TBACT	Best Available Control Technology for Toxics
TDS	total dissolved solids
TIBL	thermal internal boundary layer
TMDL	total maximum daily load
TPH	total petroleum hydrocarbon(s)
TPS	Total Plant Solution
tpy	tons per year
TQ	Threshold Quantity

TSO	Traffic Service Objective
UL	Underwriter Laboratories Inc.
UP	Union Pacific
UPC	Uniform Plumbing Code
UPS	uninterruptible power supply
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
USNPS	U.S. National Park Service
UTM	Universal Transverse Mercator
UTM	Universal Transverse Mercator Projection
V	volt
V/C	volume-to-capacity
Vac	volts alternating current
Vdc	volts direct current
VMS	variable message sign
VOC	volatile organic compound
vph	vehicles per hour
WDR	waste discharge requirements
West County	West Contra Costa County
WGNCEP	USGS Working Group on Northern California Earthquake Potential

Executive Summary

1.1 Introduction

This application for a Small Power Plant Exemption (SPPE) for the proposed Chevron Richmond Refinery (hereinafter referred to as **the Refinery**) Power Plant Replacement Project (hereinafter referred to as **the PPRP** or **the Project**) has been prepared by Chevron in accordance with the California Energy Commission's (CEC's) Power Plant Site Certification Regulations (August 2000). This Executive Summary provides an overview of the proposed Project.

This SPPE Application has been prepared in accordance with CEC guidelines and provides:

- A detailed description of the proposed Project
- An assessment of the Project's likely impact on the existing environment
- Mitigation measures developed by Chevron to assure that environmental impacts are properly and responsibly addressed
- A discussion of compliance with applicable laws, ordinances, regulations, and standards (LORS) provided within the project description and each resource section

1.2 Project Overview

Chevron is proposing the PPRP to add an additional 60 megawatts (MW) net generation to its existing Refinery electrical generation located within Chevron's Richmond Refinery in the City of Richmond (see Figure 1.2-1) in Contra Costa County, California. The proposed PPRP will be integrated into Chevron's plans to meet its growing Refinery electrical load, and produce steam to replace an existing boiler plant that is approaching its end of life. The PPRP is a subset of the larger Chevron Renewal Project (hereinafter referred to as the Renewal Project) that is concurrently undergoing California Environmental Quality Act (CEQA) review by the City of Richmond. The California Energy Commission has exclusive jurisdiction for only the PPRP portion of the Renewal Project that is the subject of this application.

The PPRP will consist of the following four facilities, which are located in separate areas of the Refinery:

- A nominal 43-MW (net) cogeneration train (hereinafter referred to as Cogen 3000), located in the existing Refinery cogen facility. Cogen 3000 consists of one natural gas or liquid petroleum gas (butane)-fired combustion turbine generator (CTG); a refinery fuel gas-fired heat recovery steam generator (HRSG); 115-kV existing switchyard tie-in; 13.8-kV, 2.4-kV, and 480-V switchgear; ancillary equipment; and adjacent onsite service connections for fuel, water, wastewater, and steam on existing piperacks.

- Reconductoring to upgrade ampacity of approximately 4,000 ft of existing on-site double-circuit overhead 115-kV transmission line (hereinafter referred to as Cogen Lines 1 and 2), located between the cogen facility substation and the Refinery's main switchyard. The reconductoring will reuse existing transmission line structures with no modifications to the structures.
- A nominal 17-MW (net) steam turbine generator (hereinafter referred to as H₂-STG), located in a new hydrogen production facility. The H₂-STG consists of an extraction, condensing steam turbine generator, an associated wet cooling tower and pumps, 12.47-kV and 480-V switchgear, and adjacent onsite service connections for, recycled water, water, wastewater, steam and electricity on existing piperacks, installed as part of the new hydrogen production facility. The remainder of the hydrogen plant is under review by the City of Richmond as part of the Renewal Project. The new hydrogen plant (including the H₂-STG and related equipment) will be installed, owned and operated by a third party under contract to Chevron and will be a net generator of steam for both the H₂-STG and the Refinery steam system.
- Shutdown of the existing Refinery steam boilers located at the existing No. 1 power plant (hereinafter referred to as No. 1 PP). No. 1 PP, which currently provides steam to the Refinery, will be retired after startup of the PPRP.

The Cogen 3000 portion of the PPRP will occupy approximately 0.5 acre within an existing 5.2-acre cogeneration facility, and the H₂-STG and associated equipment will occupy approximately 0.5 acre within a new 7.9-acre hydrogen plant that will be built as part of the Renewal Project. The PPRP will be located well within the heart of the existing 2,900-acre Richmond Refinery. Temporary construction laydown and parking for the PPRP will be provided in various existing laydown areas within the Refinery that are currently used for ongoing maintenance and project laydown. A complete description of the PPRP is provided in Section 2.0.

The Chevron Richmond 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, reliability, and operational efficiency; produce reformulated gasoline in accordance with state and federal requirements; and comply with applicable environmental regulations. The proposed PPRP will be integrated into Chevron's plans to meet its growing Refinery electrical load, and produce steam to replace the existing boiler plant that is approaching its end of life.

The new Cogen 3000 will consist of one General Electric Frame 6B CTG and associated support equipment that will be linked to the Pacific Gas & Electric (PG&E) power grid by existing, onsite Refinery-owned double-circuit 115-kV transmission lines (Cogen Lines 1 and 2). Cogen Lines 1 and 2 run approximately 4,000 feet from the existing Chevron Substation 5 located within the existing Refinery cogen facility to the existing onsite Standard Oil Switching Station (SOSS). The SOSS is the point of common coupling with PG&E and interties to existing PG&E 115-kV El Sobrante 1 and 2 transmission lines. Substation 5, SOSS, and Cogen Lines 1 & 2 are located completely within the boundaries of the Refinery. As part of the Project, Cogen Lines 1 & 2 will be reconducted to increase

their ampacity. No new transmission line towers will be required, nor will any existing towers be modified or replaced.

Fuel for Cogen 3000 will be taken from existing fuel headers in the existing cogen facility main piperack. The new sections of line serving the new cogen train will be approximately 200 ft in length. Present fuel system capacity is adequate to serve Cogen 3000. With other Renewal Project fuel reductions, no increase in Refinery fuel usage is anticipated with the installation of the Project.

Water for Cogen 3000 CTG evaporative cooling system makeup will be treated water from the existing on-site reverse osmosis (RO) plant and tapped off of an existing header within the Refinery. Makeup water flow to this evaporative cooling system will be relatively small, from 0 gallons per minute (gpm) in cold weather to 15 gpm at the hottest peak ambient temperatures, with an annual average of less than 10 gpm.

Water for cycle makeup for Cogen 3000 will also come from the existing onsite RO plant. The RO plant is being upgraded to serve existing and Renewal Project needs. There will be no net increase in Refinery water usage due to Cogen 3000. The existing water feed to the RO plant will later be converted to recycled water from the EBMUD RARE project, if constructed.

The H₂-STG will be located within the proposed new hydrogen plant that will be installed, owned and operated by a third party, Praxair, under contract to Chevron. The H₂-STG will consist of a Dresser-Rand 17.8-MW (gross output) condensing, extraction steam turbine generator electrically tied to new 12.47-kV metalclad switchgear in the new hydrogen plant. This switchgear will inter-tie to existing 12.47-kV switchgear at Substation 4 via new and existing dual 12.47-kV power cables within the Refinery. The new approximately 800-foot section of 12.47-kV power cables will be routed in cable tray along a new piperack that will be installed in the hydrogen plant, then along existing piperack. The new section of cables will tie-in to existing power cables that are routed on poles to Substation 4. The power output from the STG will normally be mostly utilized by the new hydrogen plant. During normal operation Praxair expects to have approximately 1.4 MW of surplus power from the H₂-STG that will be exported to the Refinery electrical system for use by the Refinery. The Hydrogen plant will also export high pressure steam to the Refinery, and when additional steam is needed by the Refinery, will be able to shift their steam/power production balance on the H₂-STG to export more steam and produce less power.

Water for H₂-STG cooling tower makeup will be recycled water from EBMUD and will be tapped off of an existing recycled water header that currently serves the Refinery in the area of the Hydrogen plant.

Water for cycle makeup for the H₂-STG will also come from the existing onsite RO plant. The only cycle makeup water usage attributable to the H₂-STG is minor amounts due to turbine gland losses (about 15 gpm). Other than this, the turbine does not consume water that would not otherwise be used in the Hydrogen Plant. There will be no net increase in Refinery fresh water usage due to the H₂-STG.

As previously mentioned, usage of potable water by the Refinery is planned to be reduced in the future by approximately 3 to 4 mgd when a recycled water treatment plant being planned for installation on Refinery property by EBMUD comes on-stream. The new

recycled water treatment plant, known as the RARE project, will treat reclaimed water by micro-filtration, ultra-filtration, and reverse osmosis. The resultant RARE treated water will displace the existing potable water feed to the Refinery RO plant to supply all uses that are currently served by RO plant water such as boiler water makeup. The RARE project is expected to be operational some time after the PPRP is completed. The RARE project is being permitted by EBMUD and is not part of the Renewal Project.

1.2.1 Project Objectives

Chevron's Project objectives are described in more detail in Section 9.0, Alternatives. Some of Chevron's basic Project objectives include the following:

- To safely construct and operate a nominal 60-MW addition to Refinery generation
- To provide additional electrical generation to meet the Refinery's growing electrical load
- To shut down the aged boiler plant steam supply and replace it with a more efficient state-of-the-art cogeneration system steam supply
- To improve the reliability of critical Refinery operations by reduced dependence on power imported from the PG&E grid
- To assist the State of California (State) by reducing the amount of utility power used by the Refinery, thus helping to reduce the state's dependence on imported power
- To contribute to the diversification of the area's economic base by providing increased employment opportunities during construction and additional tax base
- To enhance the reliability of local power supply through self-generation of power

1.2.2 Project Site Selection

Chevron's approach to Project site selection focused on identifying potential sites that satisfy Chevron's basic Project objectives and that have low potential for environmental impacts. The proposed Project sites are consistent with these site selection criteria and were based, in part, on the following key selection criteria:

- Location within the Refinery and in close proximity to existing power generation utilities and Operations infrastructure
- Availability of sufficient clear plot space for new facilities, including construction and maintenance access
- Proximity to existing transmission and distribution lines and/or an existing substation
- Proximity to water supply headers
- Proximity to Refinery fuel supply headers
- Proximity to Refinery steam supply headers
- Consistency with the City or Richmond and Contra Costa County General Plans and zoning ordinances, height restrictions, and existing land uses

- The ability, with implementation of reasonable mitigation measures, to have a less-than-significant impact on the environment
- Location in an area consistent with future Refinery development

1.3 Project Ownership

Chevron USA, Inc. owns all of the property on which the generating sites will be located as well as all capital improvements proposed for the Cogen 3000 site. The capital improvements for the H₂-STG site will be owned and operated by Praxair under contract to Chevron.

1.4 Project Schedule

Construction of the H₂-STG is planned to take place from the third quarter of 2007 to the first quarter of 2009. Construction of Cogen 3000 is planned to take place over approximately 16 months, from second quarter 2008 to fourth quarter 2009. Plant testing is planned to commence in the first quarter of 2010, and commercial operation is expected to commence no later than the second quarter 2010.

1.5 Project Alternatives

The CEC conducts its review of alternatives to satisfy the Warren-Alquist Act and CEQA. Appendix F of the CEC Guidelines requires a discussion of the range of reasonable alternatives to the Project, or to the location of the Project, which would feasibly attain most of the basic objectives of the Project but would avoid or substantially lessen any of the significant effects of the Project. To enable this review, the criteria and objectives that led to the selection of the site and design features of the proposed Project are provided, along with a detailed discussion of the range of alternatives considered (see Section 9.0).

A “No Project” alternative was considered and rejected as inconsistent with Chevron’s objectives, which include the need to develop additional electrical generation sources and to replace the steam supply from an aged boiler plant. In addition, the “No Project” alternative could result in greater fuel consumption and air pollution if the older, less-efficient No. 1 PP were not replaced by the proposed cleaner, more-efficient PPRP. Other possible alternative sites in the general vicinity of the proposed site were reviewed and found to be less acceptable than the proposed site.

Several alternative generating technologies were reviewed in a process that led to the selection of a modern, proven, combustion turbine cogeneration arrangement for PPRP using natural gas or LPG for fuel. The alternative technologies included natural-gas-fired boilers, and other less efficient combustion turbine generators in desired size range. None of these are feasible alternatives to the technology selected for PPRP. A complete discussion of Project alternatives is presented in Section 9.0.

1.6 Environmental Considerations

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 Section 8.0 of this document.

1.6.1 Air Quality

Activities associated with 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 potentially significant impact that would be mitigated to a less than significant level through the implementation of standard construction air quality mitigation measures identified in the Bay Area Air Quality Management District's (BAAQMD's) CEQA Guidelines.

Operational activities associated with the implementation of the proposed Project would not increase air pollutant emissions by potentially significant values. Operational impacts from criteria pollutant emissions would be less than significant.

1.6.2 Biological Resources

Proposed sites for Project components are within currently developed areas of the operating Refinery. They do not provide potential habitat for special-status species. No wetlands or other waters are located on or adjacent to these sites. 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 San Pablo 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 will assure that potential biological pollutant discharge increases remain at less-than-significant levels.

1.6.3 Noise

Project construction is not expected to produce 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.

Project operations would result in less than significant noise impacts on sensitive receptors.

1.6.4 Visual Resources

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 significant adverse effect on a scenic vista and would not discernibly degrade the existing visual character or quality of the site and its surroundings. Temporary, minor increases in night lighting at the Refinery would occur during peak construction times, when night-time work shifts are planned.

1.6.5 Water Resources

Rainwater runoff from stockpiles of contaminated soils excavated during site preparation of the building sites for the hydrogen plant STG 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.

Net water consumption for the Refinery is expected to remain the same or decrease slightly over historic levels. Consumption of potable water will be reduced by 3 to 4 mgd if the RARE project is completed.

1.7 Key Benefits

1.7.1 Environmental

The Project will replace existing aged steam generation facilities with modern facilities providing improved reliability, energy efficiency, and additional environmental controls.

1.7.2 Employment

The Project will provide increased employment during the construction period. After construction no additional increase or decrease in current Refinery staffing is anticipated as a result of the Project.

1.7.3 Other

The Project will provide additional electrical and steam energy supply to help ensure the Refinery's ability to process future crude and gas oil supplies. This will increase the portion/percentage of the Refinery's total gasoline production that can meet California specifications and be distributed to local markets by 5 to 6 percent.

The Project will also invest in Refinery upgrades that produce a competitive return on capital.

1.8 Applicant Contacts and Proof of Service List

The following individuals listed in Table 1.8-1 should receive any correspondence regarding the SPPE review and be included on the CEC's Proof of Service list for the Project.

Appendix 1.0-A presents a list of the persons who prepared the SPPE.

TABLE 1.8-1

Applicant Contacts and Proof of Service List

Name and Role	Mailing Address and Phone No.
Gary Carr SPPE Permitting Manager (Applicant – Primary SPPE Contact)	Chevron 1450 Marina Way S. Richmond, CA 94804-3747 (510) 242-9052 gcch@chevron.com
Bob Chamberlin Renewal Project Permitting Manager (Applicant)	Chevron Richmond Refinery 841 Chevron Way Tech Center, Room 329 P.O. Box 1272 Richmond, CA 94802 rtch@chevron.com
Paul Millner Manager – Business Development (Applicant)	Chevron Richmond Refinery 841 Chevron Way Admin, Room 314 Richmond, CA 94802 PAMR@chevron.com
David A. Stein, PE Vice President (Consultant - SPPE Project Manager)	CH2M HILL 155 Grand Avenue, Suite 1000 Oakland, CA 94612 (510) 587-7787 dstein@ch2m.com
Jerry Salamy Senior Project Manager (Consultant – SPPE Deputy Project Manager)	CH2M HILL 2485 Natomas Park Drive Suite 600 Sacramento, CA 95833 (916) 286-0207 jsalamy@ch2m.com
Evelyn Kahl (Project Counsel)	Alcantar & Kahl, LLP 120 Montgomery St, Ste 2200 San Francisco Ca 94104 ek@a-klaw.com



SECTION 2.0

Project Description

This section provides a detailed project description of the proposed Chevron Richmond Refinery (Refinery) Power Plant Replacement Project (PPRP, or the Project) to be located in the City of Richmond, California. The design and operation of the proposed project, associated electric transmission lines, natural gas supply line, and water lines are presented here, while site selection and alternative sites considered are presented in Section 9.0, Alternatives.

Section 2.1 provides a description of the generating facility, its design, and its proposed operation. Section 2.2 discusses the safety design of the facility. Section 2.3 describes the expected facility reliability.

2.1 Generating Facility Description, Design, and Operation

Chevron proposes to add an additional cogen train (Cogen 3000) and a third-party installed, owned, and operated extraction, condensing steam turbine generator system (H₂-STG) at its Richmond Refinery. The Cogen 3000 will be located on an existing previously developed site within the existing 5.2-acre cogeneration area of the Richmond Refinery. The new H₂-STG will be installed as part of and be located in a new hydrogen production plant being installed by third-party owner, Praxair. The hydrogen plant is also situated within the heart of the existing Refinery.

The Refinery is located along the western edge of the city of Richmond, in Contra Costa County, California, at 841 Chevron Way (See Figure 2.1-1). The approximately 2,900-acre Refinery occupies most of the Point San Pablo Peninsula with east and south boundaries near 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 access to the Refinery through a number of entrances.

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 (LPG), 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.

The Refinery's existing power generation includes two Alstom ABB GT8 combustion turbine generators, a backpressure steam turbine generator, and a motor-generator used in one of the refinery processing units. The Refinery was placed in operation in 1902 and has been in continuous operation, undergoing upgrades over the years, for the past 105 years.

Cogen 3000 will be a nominal 43-megawatt (MW) net power output (at 59 degrees Fahrenheit [°F]) GE Frame 6B combustion turbine generator (CTG), which will have an inlet

evaporative cooling system to maximize power output from the machine. The CTG exhaust will discharge through a heat recovery steam generator (HRSG) that will be equipped with refinery fuel gas-fired duct burners to provide steam production up to 430,000 pounds per hour (430 thousand pounds per hour [kpph]). Cogen 3000 will connect to the electrical transmission system via existing dual-circuit 115-kilovolt (kV) lines that loop from the existing cogen switchyard (Sub 5) to the refinery main substation, called the Standard Oil Switching Station (SOSS), which is the point of common coupling with the Pacific Gas and Electric (PG&E) existing 115-kV El Sobrante transmission lines. In addition to Cogen 3000, the H₂-STG in the new hydrogen plant will be a nominal 17 MW maximum net output. The H₂-STG will tie-in to the refinery electrical system at the 12.47-kV level via a 2,000-foot-long onsite interconnection that will connect through the refinery distribution system to the SOSS. The combined net output of the new Cogen 3000 and new H₂-STG will be 60 MW.

The Refinery proposes to burn natural gas, medium-Btu gas, or LPG (butane and propane) in the CTG, and refinery fuel gas (RFG) in the HRSG duct burner. Natural gas and medium-Btu gas for the facility will be delivered via existing pipelines. The Refinery currently imports natural gas for energy use at an approximate rate of 90 million cubic feet per day. Natural gas is both a raw material and an energy source for the Refinery. This use rate has remained approximately the same since Chevron implemented its Reformulated Gasoline and Fluid Catalytic Cracker (FCC) Upgrade Project in 1995. Natural gas consumption after implementation of the Refinery Renewal Project, which includes Cogen 3000 among other projects, is expected to remain at this level or be slightly reduced, depending on the size of the facilities actually built and the impact of energy conservation benefits of the proposed Project.

For cooling tower makeup, the H₂-STG will use up to 485 acre feet per year (afy) of recycled water provided by the East Bay Municipal Utility District (EBMUD). Cooling water will be cycled in the H₂-STG cooling tower approximately 3.5 times. The blowdown will be sent to the refinery wastewater treatment system.

The recycled water will be delivered to the H₂-STG cooling tower from an existing recycled water pipeline. Additional in-plant water distribution piping will be added to route the recycled water to the new cooling tower.

For Cogen 3000 cycle makeup, evaporative cooling makeup, and other uses, Cogen 3000 will use approximately 863 afy of refinery-treated (RO plant) water. The refinery-treated water is supplied from EBMUD. This is the same water supply currently serving the existing steam boilers.

Potable water for drinking, safety showers, fire protection, and service water uses will be served from the existing EBMUD potable water system that currently serves the refinery. No additional sanitary wastewater disposal will be required for the PPRP.

2.1.1 Site Arrangement and Layout

The site plan on Figure 2.1-2 and typical elevation views on Figures 2.1-3 and 2.1-4 illustrate the location and size of the proposed Cogen 3000 train. The site plan typical elevation views on Figure 2.1-5 illustrate the location and size of the proposed H₂-STG and associated equipment. Both sites are located well within the boundaries of the refinery at least 3,000 feet from the closest refinery property line.

The existing cogen plant is paved around all operating and process equipment. The new Cogen 3000 train will also be paved similarly. Any areas that are not paved will have gravel surfacing. The Cogen 3000 train will be located just north of the two existing cogen trains with a maintenance access road between the new train and the existing train.

The Cogen 3000 generator will connect via a new generator step-up transformer (GSU) to the existing 115-kV Substation 5 switchyard. A single-line diagram for Cogen 3000 is shown in Figure 2.1-6. Power from the new train will be transmitted to the SOSS via two existing fully redundant 115-kV transmission lines (Cogen Line # 1 and Cogen Line # 2). The SOSS is the point of common coupling with the electric utility, PG&E. From the SOSS, power is distributed throughout the refinery via four 115-kV main transmission lines (Line #1, Line #2, Tap #1, and Tap #2). A single-line diagram of the 115-kV distribution system is shown in Figure 2.1-7. The physical layout of the lines, including the towers and poles, is shown schematically in Figure 2.1-8.

The H₂-STG and related equipment will have concrete foundations and stoned areas around them. No paving will be installed in the operating areas. The H₂-STG will be located on the north end, toward the west side of the hydrogen plant site. The cooling tower supporting the STG will be located east of the steam turbine generator (STG) in the hydrogen processing area.

The H₂-STG will connect to new 12.47-kV switchgear to be installed in the new hydrogen plant. The H₂-STG and hydrogen plant single line diagram is shown in Figure 2.1-9. This switchgear will tie-to the existing refinery distribution system via two existing, fully redundant 12.47-kV overhead distribution lines on poles, via two new redundant, approximately 800-foot-long interconnecting cables routed in cable tray on piperack in the hydrogen plant. The two existing distribution lines are approximately 2,000 feet in length and terminate at existing circuit breakers in the existing refinery 12.47-kV switchgear SWGR 36PS-1 at substation 4. SWGR 36PS-1 connects to the refinery 115-kV distribution system via two existing redundant step-up transformers located at Sub 4. The STG inter-tie to the refinery electrical system is shown on Figure 2.1-10.

2.1.2 Process Description

Cogen 3000 will consist of one GE Frame 6B CTG equipped with standard diffusion combustors with steam injection for nitrogen oxide (NO_x) control; one HRSG with duct burners; a deaerator; evaporative cooling for inlet conditioning of the CTG; and associated support equipment providing a nominal generating capacity of 43 MW net (at average annual ambient conditions of 60°F, 59 percent relative humidity, with duct burners in operation. The CTG exhaust gases will be used to generate steam in the HRSG. The HRSG will be a two-pressure design with duct firing. Steam from the HRSG will be fed into the existing 850 pounds per square inch gauge (psig) refinery steam supply header at the cogen plant. The project is expected to have an overall annual availability of 96 to 98 percent.

The Cogen 3000 base load operation heat balance is shown on Figure 2.1-11. This balance is based on an ambient dry bulb temperature of 60°F (annual average), an ambient wet bulb temperature of 53°F (annual average), with duct burners and inlet evaporative cooling in operation. In addition, Figure 2.1-12 shows the heat balance at maximum temperature

(105°F dry bulb), and Figure 2.1-13 shows the heat balance at minimum temperature (35°F dry bulb).

Associated Cogen 3000 equipment will include emission control systems necessary to meet the proposed emission limits. NO_x emissions will be controlled at the stack to 2.5 parts per million by volume, dry basis (ppmvd), corrected to 15 percent oxygen by a combination of water-injected diffusion combustors in the CTGs and a selective catalytic reduction (SCR) system in the HRSG. An oxidation catalyst will be installed in the HRSG to limit stack carbon monoxide (CO) emissions to 4.0 ppmvd. VOC emissions will also be limited to 2 ppmvd, corrected to 15 percent oxygen.

The H₂-STG will consist of a condensing, extraction, axial discharge steam turbine; a surface condenser; a four-cell mechanical-draft cooling tower; and associated support equipment providing a nominal maximum net generating capacity of 17 MW output at average ambient conditions. The hydrogen production process is exothermic and is a net producer of steam (although a portion of the steam is reused in the production process). At the optimal efficiency point, the STG will receive 930 psig steam from the hydrogen plant steam header and will return a nominal 226 kpph of 535 psig process steam back to the hydrogen plant process via an extraction port. The remainder of the steam will be passed through the low pressure section of the STG for power generation and condensed in the surface condenser. At these steam flow rates the STG will produce 14 MW net output. The surface condenser will utilize approximately one-half of the capacity of the four-cell, mechanical-draft cooling tower for condensing water. The balance of the cooling tower capacity will be used for cooling other non-power generation related hydrogen plant loads.

Figure 2.1-14 shows a simplified flow diagram referencing heat and mass balance information provided on Figure 2.1-15. These figures show the heat balances for a hot day (ASHRE 1% – 85°F DB), average day (60°F DB), and cold day (ASHRE 1% – 43°F). The heat balances show the steam flows to the STG and extraction rates at the optimum STG operating point. Figure 2.1-18 shows the average water balance for the H₂-STG.

2.1.3 Generating Facility Cycle

In the CTG of Cogen 3000, combustion air flows through the evaporative cooling media, the inlet air filters, associated air inlet ductwork, and is compressed in the gas turbine compressor section. High-pressure compressed air then flows to the CTG combustor. Natural gas, medium Btu gas, or vaporized LPG (butane with minor amount of propane) fuel is injected into the compressed air in the combustor and ignited. The hot combustion gases expand through the high pressure and low pressure turbine sections of the CTG, causing the shaft to rotate and drive the electric generator and CTG compressor section. The hot combustion gases exit the turbine at approximately 1,020°F and enter the HRSG. The HRSG is equipped with a duct burner so that supplemental heat can be provided when additional steam production is needed. In the HRSG, boiler feedwater is converted to superheated steam and delivered to the refinery steam systems at two pressures: high pressure (HP) and low pressure (LP). The use of two steam delivery pressures increases cycle efficiency and flexibility. Steam exiting the LP section of the HRSG is supplied to the refinery 30 psig steam header for use in deaerator heating and for other refinery LP steam loads.

In the H₂-STG, high-pressure steam generated in the hydrogen production process expands through the HP section of the steam turbine. A portion of the expanded HP steam is extracted part way through the turbine at 535 psig. The extracted steam is supplied back to the hydrogen plant to enter into the hydrogen production process. The balance of the steam in the STG after extraction is then expanded through the remainder of the steam turbine. Steam leaving the STG exhaust enters the surface condenser where it is condensed. The heat energy of the condensing steam transfers to a circulating water loop, which, in turn, exhausts heat to the atmosphere by means of the mechanical-draft cooling tower.

2.1.4 Combustion Turbine Generators, Heat Recovery Steam Generators, Steam Turbine Generator, and Condenser

Electricity is produced by the CTG and the H₂-STG. The following sections describe the major components of the two generating systems.

2.1.4.1 Combustion Turbine Generator

Thermal energy is produced in the CTG through the combustion of gaseous fuel, which is converted into mechanical energy required to drive the combustion turbine compressor and electric generator. One General Electric Frame 6B CTG has been selected for the PPRP.

The CTG system consists of a stationary combustion turbine generator, supporting systems, and associated auxiliary equipment. The Frame 6B is a single-shaft heavy-duty industrial gas turbine.

The major engine components of the Frame 6B are:

- 17-stage compressor
- 10 combustion chambers
- 3-stage air-cooled turbine
- Main speed reduction gear box
- Electrical generator

The gas turbine has a 17-stage compressor, the design of which is based on earlier successful General Electric gas turbine compressors. The compressor rotor consists of individual discs for each stage, which are connected by through bolts. In the compressor, air is compressed in stages by a series of alternate rotating (rotor) and stationary (stator) airfoil shaped blades. Compressed air is extracted from the compressor for turbine cooling, for bearing sealing, and for compressor pulsation control during startup and shutdown. One row of stator blades (inlet guide vanes) is variable to aid in limiting the air flow during startup and to improve the part load efficiency of combined-cycle plants.

The combustion system is of the reverse-flow type and consists of canted combustion chambers arranged around the periphery of the compressor discharge casing. This system also includes the fuel nozzles, spark plug ignition system, flame detectors, and crossfire tubes. Hot gases, generated from burning fuel in the combustion chambers, are used to drive the turbine. High-pressure air from the compressor discharge is directed around the transition pieces and into the annular spaces that surround each of the 10 combustion chamber lines. This air enters the combustion liners through small holes and slots that cool the liner, and through other holes that control the combustion process. Fuel is supplied to

each combustion chamber through a nozzle designed to disperse and mix the fuel with the proper amount of combustion air within the liner. Each combustion chamber is equipped with a fuel nozzle, which performs the functions of metering and injection. Gaseous fuel is admitted directly into each combustion chamber through the calibrated holes of the nozzle cap.

Thermal NO_x is generated in the primary zone of the combustion liner where the temperature is higher than 1,800 degrees Celsius (°C). The NO_x generation is tightly linked to the temperature and any slight temperature drop involves a significant decrease of the NO_x without affecting the combustion efficiency. Steam injection is provided in the liner to reduce the temperature in the primary zone. The injection rate (steam-to-fuel ratio) is a function of the requested reduction of the NO_x emission level. Increased steam injection affects the gas turbine performances as follows:

- Increases turbine output
- Increase of the turbine efficiency (decrease of the heat rate)
- Increases the production of CO from the combustor

The turbine rotor consists of three stages, with one wheel for each stage. The turbine rotor wheels are assembled by through bolts similar to the compressor, and with two spacer pieces: one between the first and second stage wheels, the other between the second and third stage wheels. The entire rotor assembly is supported by two bearings.

All turbine stages utilize precision-cast, segmented nozzles, which are supported from the stationary shrouds. This arrangement removes the hot gas path from direct contact with the turbine shell. The turbine stages also have precision-cast, long-shank buckets and this feature effectively shields the wheel rims and bucket dovetails from the high temperatures of the main gas stream.

The gas turbine unit casings and shells are split and flanged horizontally for convenience of disassembly. Compressor discharge air is contained by the discharge casing and turbine shell. The 10 combustion casings are mounted from the discharge casing.

The CTG will be equipped with the following required accessories to provide safe and reliable operation:

- Inlet air filters
- Inlet air evaporative cooling
- Metal acoustical enclosure
- Lube oil cooler
- Diffusion combustion system equipped with steam injection for NO_x control
- Compressor wash system
- Fire detection and protection system

The metal acoustical enclosure, which contains the CTG and accessory equipment, will be located outdoors.

2.1.4.2 Heat Recovery Steam Generator

The HRSG provides for the transfer of heat from the exhaust gases of the CTG to the feedwater, which is turned into steam. Major components of the HRSG include a feedwater

heater, an LP evaporator, LP steam drum, HP economizer, HP evaporator, HP separator, and HP superheater.

The feedwater heater receives, via the condensate pumps, a mixture of makeup water from the existing refinery reverse osmosis (RO) plant and return condensate from the refinery process. From the feedwater heater, the condensate is directed to the deaerator where it is stripped of oxygen and other non-condensable gases. Additional steam is fed to the deaerator as needed to heat the water for proper non-condensable stripping. The hot deaerated water exiting the deaerator is fed to the LP evaporator and the HP economizer. The feedwater heater is the final heat transfer section to receive heat from the combustion gases prior to exhausting them to the atmosphere, and providing a lower temperature water to it via incoming makeup before heating in the deaerator allows more of the exhaust gas heat to be captured in the HRSG instead of being wasted up the stack and simultaneously reduces the amount of steam needed for heating the feedwater in the deaerator.

The boiler feed pumps draw suction from the deaerator and send the feedwater to the LP evaporator and the HP economizer. Steam from the LP evaporator, at 30 psig, flows into the existing refinery LP steam system header.

High-pressure feedwater flows through the HP economizer to the HP evaporator, and to the HP superheaters prior to exiting the HRSG to flow into the refinery HP steam header. Saturated steam forms in the evaporator tubes as energy from the combustion turbine exhaust gas and auxiliary duct burner is absorbed. The steam bubbles and heated water flow by natural convection from the evaporator tubes into the steam drum. The saturated water is returned from the steam drum by natural circulation to the HP evaporator tubes, while the steam separates in the steam drum and continues on to the HP superheaters. Within the HP superheaters, the temperature of the HP steam is increased above its saturation temperature, or "superheated," prior to exiting the HRSG.

A duct burner installed in the HRSG will provide additional heat to augment the turbine exhaust heat so that the HRSG is capable of producing the volume of HP steam required by the Refinery. The duct burner will be fired with refinery fuel gas supplied from a fuel gas mixing drum and will be capable of adding sufficient heat to the CTG exhaust stream to enable the HRSG to produce up to 440 kpph of HP steam.

The HRSG will be equipped with an SCR emission control system that uses anhydrous ammonia (which is produced in the refinery processes) in the presence of a catalyst to reduce NO_x in the exhaust gases. The catalyst module will be located within the HRSG casing. Ammonia from the refinery anhydrous ammonia system piping will be injected into the CTG exhaust gas stream via a grid of nozzles located upstream of the catalyst module. The subsequent chemical reaction will reduce NO_x to nitrogen and water, resulting in an exhaust gas NO_x concentration leaving the HRSG stack of no greater than 2.5 ppmvd corrected to 15 percent oxygen.

An oxidation catalyst will also be installed within the HRSG casing to control the concentration of CO in the exhaust gas leaving the HRSG stack to no greater than 4.0 ppmvd corrected to 15 percent oxygen. The oxidation catalyst will also control VOC emissions in the exhaust gas leaving the HRSG stack to no greater than 2.0 ppmvd corrected to

15 percent oxygen. Exhaust from the HRSG will be discharged from a 138.5-foot-tall, 11.9-foot-diameter (inside) exhaust stack.

2.1.4.3 Steam Turbine Generator

The hydrogen steam turbine system will consist of a condensing, extraction STG with gland steam system, lubricating oil system, hydraulic control system, and steam extraction valving.

Superheated steam from the hydrogen plant process heat recovery steam generators at 930 psig will enter the steam turbine through the inlet steam system. The steam will expand through multiple stages of the turbine, imparting rotary force to the turbine shaft and driving the generator. A portion of the steam will be extracted part way through the turbine at 535 psig for use in the hydrogen production process. On exiting the turbine from the axial exhaust, the exhaust steam will be directed into the surface condenser where its latent heat of condensation will be removed by water circulating through tubes in the condenser. The condenser circulating water will be cooled by water from a four-cell mechanical draft cooling tower. Condensed exhaust steam will be pumped from the condenser hotwell back to the hydrogen plant steam generation equipment.

2.1.5 Major Electrical Equipment and Systems

The bulk of the electric power produced by both generators will be utilized in the refinery. At certain times, depending on refinery electrical load and CTG power generation, a small amount of electric power from Cogen 3000 may be exported to the utility grid. A portion of the CTG power will be used within the cogen plant to power auxiliaries such as fuel gas compressor, chiller, pumps and fans, control systems, and general facility loads including lighting, heating, and air conditioning. A small portion will also be converted from alternating current (AC) to direct current (DC), which is used as backup power for control systems and other uses. Transmission and auxiliary uses are discussed in the following sections.

2.1.5.1 AC Power—Transmission

Power will be generated in the cogen plant by Cogen 3000 at 13.8 kV. The Cogen 3000 power will be stepped up by a generator step-up transformer to 115 kV for transmission to the refinery main substation. An overall single-line diagram of the facility's electrical system is shown on Figure 2.1-6. The CTG generator will be connected by non-segmented bus duct to 13.8-kV switchgear and from there via solid dielectric underground cable to the oil-filled step-up transformer that increases the voltage to 115 kV as indicated on the single-line diagram. Surge arresters will be provided at the high-voltage bushings to protect the transformer from surges on the 115-kV system caused by lightning strikes or other system disturbances. The transformer will be set on a concrete pad that will be supported on existing pilings that were installed during a previous switchyard upgrade. The high-voltage side of the step-up transformer will be connected to a ring bus in the plant's existing 115-kV open-air cogen substation (Substation 5). From Substation 5, power will be transmitted via two redundant 115-kV transmission lines (Cogen #1 and Cogen #2) to the SOSS. In order to handle with full redundancy, the additional power that will be generated at the cogen facility, Cogen #1 and Cogen #2 will be upgraded in capacity by reconductoring them with composite core compact aluminum conductor (type ACCC TW).

Power will be generated in the hydrogen plant by the STG at 12.47 kV. The STG will connect via a generator output breaker to 12.47-kV Bus #3, rated at 1,200 amps. Bus #3 will connect from one end via circuit breakers to 12.47-kV Bus #1 and from the other end via circuit breakers to 12.47-kV Bus #2 in the hydrogen plant. These busses are part of the hydrogen plant electrical distribution system. The 12.47-kV busses #1 and #2 will each connect by insulated cable to existing refinery 12.47-kV switchgear located at existing Substation 4. The power cable will be routed aboveground, part way in cable tray on piperack, then transitioned to an overhead line to an existing pole-mounted cable run. The only new portion of these two transmission line runs will be an approximate 800-foot section located within the hydrogen plant and running in a new cable tray. The 12.47-kV switchgear at Substation 4 ties-in to the refinery 115-kV system through two existing step-up transformers at Substation 4. Substation 4 connects back to the SOSS via 115-kV lines No. 1 and No. 2, which are fully redundant.

Power generated by the STG will be mostly consumed within the hydrogen plant. Under some operating conditions there may be up to 3.2 MW excess generation that will feed the refinery distribution system. In situations where the STG is shut down, power will flow from Substation 4 into the hydrogen plant switchgear where it will be distributed to the hydrogen plant loads.

2.1.5.2 AC Power—Distribution to Auxiliaries

Auxiliary power to the Cogen 3000 train will be supplied at 2.4-kV AC by a double-ended 2.4-kV switchgear lineup and at 480-volt AC by a double-ended 480-volt switchgear lineup. Four oil-filled, auxiliary step-down transformers, two at 13.8 kV to 2.4 kV, and two at 13.8 kV to 480 volts will supply primary power to the switchgear in a redundant configuration. The high-voltage side (13.8 kV) of the unit auxiliary transformers will be connected to the output of the CTG via a 13.8-kV switchgear lineup. This connection will allow the switchgear to be powered from the CTGs or from the 115-kV switchyard by back-feeding power through the generator step-up transformer. A 13.8-kV generator circuit breaker will be provided for the generator. This circuit breaker is used to isolate and synchronize the generator, and will be located in the 13.8-kV switchgear adjacent to the CTG enclosure. The 13.8-kV switchgear will be an arc-resistant design to provide a high level of safety against arc flash incidents.

The 2.4-kV switchgear lineup will supply power to the various 2.4-kV motors via a 2.4-kV motor control center. The switchgear will be of arc-resistant design and have vacuum interrupter circuit breakers for the main incoming feeds and for power distribution.

The 480-volt load center transformers will be liquid-filled and supply 480-volt, 3-phase power to each end of the double-ended load center and MCC. Two feeds from the 480-volt switchgear will supply 480-volt power to the 480-volt MCC of the CTG for operation of the CTG auxiliaries.

The 480-volt MCCs will distribute power to 480-volt motors, to 480-volt power distribution panels, and lower voltage lighting and distribution panel transformers. Power for the AC power supply (120-volt/208-volt) system will be provided by the 480-volt MCCs and 480-volt power panels. 480-120/208-volt dry-type transformers will provide transformation of 480-volt power to 120/208-volt power.

For the H₂-STG, auxiliary power will be supplied at 4,160 volts by a triple-fed 4,160-volt switchgear lineup and at 480 volts AC by a triple-fed 480-volt MCC lineup. One feed to the 4,160-volt switchgear will be from 12.47-kV Bus #3 via a 12.47-kV to 4,160-volt stepdown transformer. The other two feeds will be from the two other 4,160-volt busses in the hydrogen plant, each fed by their own separate 12.47-kV to 4,160-volt stepdown transformer.

The Bus #3 4,160-volt switchgear lineup supplies power to the various 4,160-volt motors associated with the STG and cooling tower, via a 4,160-volt motor control center. The switchgear will have vacuum interrupter circuit breakers for the main incoming feeds.

The 480-volt load center transformer will be liquid-filled and supply 480-volt, 3-phase power to one feed of the triple-fed load center and MCC. The transformer will be fed from 4,160-volt bus #3. The other two feeds to 480-volt Bus #3 are from the two other 480-volt busses in the hydrogen plant, each fed by their own separate 4,160-volt to 480-volt stepdown transformers from their respective 4,160-volt busses (4,160-volt Bus #1 and Bus #2). The Bus #3 480-volt MCC lineup also supplies power to the various 480-volt motors associated with the STG and cooling tower, via a 480-volt MCC.

2.1.5.3 125-Volt DC Power Supply System

For the Cogen 3000, one common 125-volt DC power supply system consisting of one 100-percent-capacity battery bank, two 100-percent-capacity static battery chargers, a switchboard, and two or more distribution panels will be supplied for balance-of-plant equipment. The CTG will be provided with its own separate battery system and redundant chargers.

Under normal operating conditions, the battery chargers will supply DC power to the DC loads. The battery chargers will receive 480-volt, three-phase AC power from the AC power supply (480-volt) system and continuously charge the battery banks while supplying power to the DC loads.

Under abnormal or emergency conditions, when power from the AC power supply (480-volt) system is unavailable, the batteries will supply DC power to the DC system loads. Recharging of a discharged battery will occur whenever 480-volt power becomes available from the AC power supply (480-volt) system. The rate of charge will depend on the characteristics of the battery, battery charger, and the connected DC load during charging. The anticipated maximum recharge time will be 12 hours.

The 125-volt DC system will be used to provide control power to the 2,400-volt switchgear, the 480-volt circuit breakers, critical control circuits, and emergency DC motors.

For the H₂-STG, one common 125-volt DC power supply system consisting of one 100-percent-capacity battery bank, one 100-percent-capacity static battery charger, and a distribution panel will be supplied for STG equipment. The three hydrogen plant switchgear buildings will have similar DC supply systems that supply the hydrogen plant DC loads.

Under normal operating conditions, the STG battery charger supplies DC power to the STG DC loads. The battery charger receives 480-volt, three-phase AC power from the AC power

supply (480-volt) system and continuously charge the battery banks while supplying power to the DC control power loads.

Under abnormal or emergency conditions, when power from the AC power supply (480-volt) system is unavailable, the batteries supply DC power to the DC system loads. Recharging of a discharged battery occurs whenever 480-volt power becomes available from the AC power supply (480-volt) system. The rate of charge depends on the characteristics of the battery, battery charger, and the connected DC load during charging. The anticipated maximum recharge time will be 12 hours.

The remaining three 125-volt DC system will be used to provide control power to the 12.47-kV switchgear, and to the 4,160-volt switchgear.

2.1.5.4 Uninterruptible Power Supply System

Cogen 3000 Electrical Systems

The Cogen 3000 electrical systems will have an essential service 120-volt AC, single-phase, 60-hertz (Hz) uninterruptible power supply (UPS) to supply 120 VAC power to essential instrumentation, critical equipment loads, and unit protection and safety systems that require uninterruptible AC power.

Redundant UPS inverters will supply 120-volt AC single-phase power to the UPS panel boards that supply critical AC loads. The UPS inverters will be fed from the station 125-volt DC power supply system. Each UPS system will consist of one full-capacity inverter, a static transfer switch, a manual bypass switch, an alternate source transformer, and two or more panelboards.

The normal source of power to the system will be from the 125-volt DC power supply system through the inverter to the panelboard. A solid-state static transfer switch will continuously monitor both the inverter output and the alternate AC source. The transfer switch will automatically transfer essential AC loads without interruption from the inverter output to the alternate source upon loss of the inverter output.

A manual bypass switch will also be included to enable isolation of the inverter for testing and maintenance without interruption to the essential service AC loads.

The distributed control system (DCS) operator stations will be supplied from the UPS. The continuous emission monitoring (CEM) equipment, DCS controllers, and input/output (I/O) modules will be fed using either UPS or 125-volt DC power directly.

H₂-STG Electrical Systems

The H₂-STG electrical systems will have an essential service 480-volt AC input, single-phase, 60-Hz UPS to supply 120 VAC power to essential instrumentation and critical equipment loads and to unit protection and safety systems that require uninterruptible AC power.

UPS inverters will supply 208-volt AC three-phase power to the UPS panel boards that supply 120 VAC to critical AC loads. The UPS inverters will be fed from the station 125-volt DC power supply system. Each UPS system will consist of one full-capacity inverter, a static transfer switch, a manual bypass switch, an alternate source transformer, and two or more panelboards.

The normal source of power to the system will be from the 125-volt DC power supply system through the inverter to the panelboard. A solid-state static transfer switch will continuously monitor both the inverter output and the alternate AC source. The transfer switch will automatically transfer essential AC loads without interruption from the inverter output to the alternate source upon loss of the inverter output.

A manual bypass switch will also be included to enable isolation of the inverter for testing and maintenance without interruption to the essential service AC loads.

The DCS operator stations will be supplied from the UPS. The CEM equipment, DCS controllers, and I/O modules will be fed using 120 VAC power provided from the UPS.

2.1.6 Fuel System

The CTG will be designed to burn natural gas, medium Btu gas, or vaporized LPG. The HRSG duct burner will use refinery fuel gas (RFG) as a fuel. RFG is a blend of refinery hydrocarbon gases, generated as a result of the refining process, which has a varying composition of the gases depending on refinery operating conditions. The CTG fuel requirement during base load operation at annual average ambient temperature will be approximately 463 million British thermal units per hour (MMBtu/hr) (LHV basis). The fuel requirement for the HRSG under medium steam production conditions will be approximately 190 MMBtu/hr (LHV basis). The maximum fuel requirement, experienced during low ambient temperature operation, and full duct firing will be approximately 490 MMBtu/hr (LHV basis) for the CTG and 294 MMBtu/hr (LHV basis) for the HRSG duct burner.

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 use rate has remained approximately the same since Chevron implemented its Reformulated Gasoline and FCC Upgrade Project in 1995. Natural gas and medium Btu gas for the CTG will be tapped-off existing headers in the cogen plant main pipe rack to feed the CTG. The gas from the headers will be supplied at a pressure of 350 to 400 psig and will be directed to the CTG combustors.

Refinery fuel gas for the HRSG duct burner will come from an existing RFG header in the cogen area. A new mixing drum will be added at the cogen plant to feed RFG to the Cogen 3000 HRSG duct burners.

2.1.7 Water Supply and Use

This section describes the quantity of water required, the sources of the water supply, and water treatment requirements. Two Cogen 3000 water balance diagrams are included, representing two operating conditions. Figures 2.1-16 and 2.1-17 represent: (1) annual average operation at 60°F with the CTG operating at 100 percent load and CTG inlet evaporative cooling in operation, and (2) peak average daily operation at 85°F ambient with the CTG operating at 100 percent load and CTG inlet evaporative cooling in operation.

At average maximum temperature (85°F) Cogen 3000 will use up to 8 gallons per minute (gpm) of water for evaporative cooling makeup, and will use an average of approximately 3 gpm at the annual average ambient temperature (60°F). Cogen 3000 will utilize 532 gpm of

steam cycle makeup water at max steam production levels. The water will be provided by the existing refinery RO plant.

The H₂-STG will use up to 300 gpm of recycled water for cooling tower markup. Total recycled water use by the cooling tower would be approximately 480 afy. The recycled water will be delivered to the H₂-STG through an existing onsite recycled water header. The H₂-STG will use a small amount (approximately 15 gpm) of cycle makeup water to makeup up for gland seal leakage. The cycle makeup will be provided by the existing refinery RO plant.

Potable water will be provided to the PPRP from existing potable water lines currently serving the Refinery. It will be used by the PPRP for safety showers and service water. It will also serve as an emergency water supply, should the recycled water be unavailable for more than 8 hours.

EBMUD is planning to build a treatment plant at the Refinery to treat recycled water to a level that will allow it to serve as boiler makeup water. The plant will contain micro-filtration, ultra-filtration, and reverse osmosis. Once this plant comes on-stream, its effluent will displace the current water feed (potable) to the refinery RO plant. The RO plant water is the same water source used by the existing steam boiler plant that will be shut down as part of the PPRP. The new source of purified recycled water is expected to reduce the refinery's consumption of potable water by 3 to 5 million gallons per day (mgd) when it comes on-stream. However the on-stream date for the EBMUD plant is still uncertain as the project has been recently approved.

No additional sanitary wastewater will be produced as a result of the PPRP.

A more detailed description of the water supply system, treatment, and permits is provided in Section 8.15, Water Resources.

2.1.7.1 Water Requirements

A breakdown of the estimated average daily quantity of water, required for operation of the PPRP is presented in Table 2.1-1. The daily water requirements shown are estimated quantities at an ambient temperature of 60°F (annual average dry bulb temperature) based on the H₂-STG and Cogen 3000 operating at full load, with the inlet evaporative cooling of the Cogen 3000 CTG. Peak water requirements shown in Table 2.1-1 are based on the plants operating at full load, with evaporative cooling of the CTG inlet air, at an ambient temperature of 85°F (1 percent exceedance dry bulb temperature based upon ASHRAE). Note that the consumption of potable water by the existing steam plant, which will be shut down after PPRP is online, averages 800 gpm or 1,290 afy, which is all fresh water from EBMUD (via the RO plant).

TABLE 2.1-1

Average Daily, Maximum Daily, and Maximum Annual Water Usage and Wastewater Discharge for the PPRP

Water Use	Average Daily Use (gpm)	Maximum Daily Use (gpm)	Maximum Annual Use (afy)
Cogen evap cooler makeup ^a	3	8	5.3
Cycle makeup water ^a	532	540	944
H ₂ -STG cooling tower makeup ^b	300	330	532
Potable water service	3	10	4.9
Wastewater discharge	90	105	145

^a Evaporative cooler and cycle makeup water will come from recycled water after the RARE plant is operational at some future as yet undetermined date

^b H₂-STG cooling tower makeup will come from recycled water

2.1.7.2 Water Supply

During normal operation, approximately 36 percent of the total PPRP water demand will be for cooling tower makeup water to replace water lost to evaporation. The remaining water demands will include process cycle makeup, plant service water, and potable water for domestic uses. A detailed description of the water supply is presented in Section 8.12.

2.1.7.3 Water Treatment

Water use can be divided into the following four levels based on the quality required: (1) water for the circulating (or cooling) water system; (2) service water for the plant, which will include all other miscellaneous uses; (3) RO water for makeup to the steam cycle; and (4) potable water. Water treatment required to obtain these four levels of quality is described in the following paragraphs.

Water for the Circulating Water System

Recycled water will be fed from the existing refinery recycled water pipeline into the H₂-STG cooling tower basin as required to replace water lost to evaporation, drift, and blowdown.

To minimize corrosion and control the formation of mineral scale and biofouling, a chemical feed system will supply water conditioning chemicals to the circulating water. The cooling towers will be operated consistent with industry standards to control biological growth. To prevent biofouling in the circulating water system, sodium hypochlorite will be fed into the system. The hypochlorite feed equipment will consist of a bulk storage tank and two sodium hypochlorite metering pumps. Additional chemical storage and feed systems will be provided for feeding alternate oxidizing and non-oxidizing biocides.

Service Water

Service water includes all water uses at the plant except for the circulating water previously discussed, RO water used for makeup to the steam cycle, demineralized water used for injection into the CTG, and potable water. City (potable) water protected by a reduced pressure backflow prevention device or air gap will be used for service water. No additional treatment of the City water will be required for use as service water.

Makeup Water for the Steam Cycle

RO water will be used for makeup water for the steam cycle. RO water will be produced in an existing RO treatment plant that is located near the Cogen facility. The steam cycle makeup water needs will not impose any additional flow requirements on the RO plant because the new PPRP steam supply will be replacing current steam supply equipment that will be shut down after PPRP is in operation. In addition, the RO water, which is currently produced from potable water, will ultimately have recycled water as its feed source once the RARE project is in operation (no projection on when this will occur as the RARE project is currently undergoing review by EBMUD).

To minimize steam cycle corrosion and scale formation, chemical feed systems will feed a neutralizing amine to the condensate for corrosion control and a phosphate solution to the HRSG steam drums for pH control. The design will provide for automatic feed of the amine in proportion to condensate flow with a pH bias. The system will include an amine solution feed tank and two amine feed pumps. The amine system will include a relatively high-volume metering pump to provide sufficient quantities of chemicals to support wet lay-up of the HRSGs during short down-periods.

The phosphate feed system will be designed for operation using the low solids, coordinated phosphate, or other standard method of boiler water treatment. The phosphate feed will be manually initiated based on boiler water phosphate residual and manually biased for pH. One solution tank and one phosphate feed pump will be provided for each LP and HP steam drum with one common spare pump serving each HRSG. Existing chemical storage tanks used for the two existing cogen units will also serve the new PPRP cogen unit.

Potable Water

Potable water for drinking, safety showers, fire protection water, and service water, will be served from the existing refinery potable water service provided by EBMUD.

2.1.8 Plant Cooling Systems

For the H₂-STG, the heat rejection system will consist of a steam surface condenser, cooling tower, and circulating water system. The heat rejection system will receive exhaust steam from the low-pressure section of the steam turbine and condense it back to water for reuse. The surface condenser will be a shell-and-tube heat exchanger with the steam condensing on the shell side and the circulating water flowing in one or more passes inside the tubes. The condenser will be designed to operate at sub-atmospheric pressure, ranging from 0.66 psia to 1.96 psia, depending on ambient temperature and plant load. The condenser will remove heat from the condensing steam up to a maximum of 136.6 MMBtu/hr, depending on ambient temperature and plant load. Approximately 15,720 gpm of circulating cooling water will be used to condense the steam at maximum plant load.

The circulating water will pass through a counter-flow mechanical draft-cooling tower, which uses electric-motor-driven fans to move the air in a direction opposite the flow of the water. The heat removed in the condenser will be discharged to the atmosphere by heating the air and through evaporation of a portion of the circulating water. Drift, the fine mist of water droplets entrained in the warm air leaving the cooling tower, will be limited to 0.002 percent of the circulating water flow.

The cooling tower water system will also provide for cooling plant equipment other than the steam condenser and vacuum pumps. Equipment served by the cooling water system will include the STG lube oil coolers, STG hydraulic control system cooler (if required by STG manufacturer), STG gland seal condenser, generator cooler, boiler feed pump, seal water coolers, and sample coolers.

For the Cogen 3000 portion of the PPRP, the only heat rejection required will be from miscellaneous auxiliary coolers, such as the lube oil cooler, and the generator.

An existing closed-loop auxiliary cooling system will be expanded to provide for cooling plant equipment. Equipment served by the auxiliary cooling water system includes the CTG oil coolers, boiler feed pump lube oil and seal water coolers, CTG generator, and sample coolers. Closed-loop cooling water pumps will pump condensate quality water from the plate heat exchangers through the individual equipment coolers to remove heat. Water feeding the existing RO plant will be pumped through the heat exchangers to remove heat from the closed cooling water system. This will also preheat the RO feed water, which assists in the RO process.

2.1.9 Waste Management

Waste management is the process whereby all wastes produced at the PPRP are properly collected, treated if necessary, and disposed of. Wastes include process wastewater, nonhazardous waste, and hazardous waste, both liquid and solid. Waste management is discussed in more detail in Section 8.13.

2.1.9.1 Wastewater Collection, Treatment, and Disposal

The primary wastewater collection system will collect process wastewater from all of the plant equipment, including the HRSG, cooling tower, and water treatment equipment. The water balance diagrams, Figures 2.1-16, 2.1-17 and 2.1-18, show the expected wastewater streams and flow rates for the PPRP.

The Refinery operates its own wastewater treatment system. The system's capacity is approximately 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 wash-up water, etc. Process wastewater is treated in the Refinery effluent treatment system prior to release into the Bay.

The effluent wastewater is regulated under a National Pollutant Discharge Elimination System (NPDES) permit issued by the San Francisco Bay Regional Water Quality Control Board (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. 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 permit provides for optional conditions during periods of high intensity rainfall events.

During the winter months, in addition to the refinery 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 stormwater from wastewater has resulted in only the wastewater flow being treated by the wastewater system. As a result, the current system has excess capacity for treating wastewater. The effluent treating system was originally sized to handle simultaneously the full flow of wastewater and stormwater from a large storm.

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 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 through the granular activated carbon unit or a portion of the effluent may be routed through the three-tier constructed wetlands, Richmond Refinery Water Enhancement Wetland (RRWEW), 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 through 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 NPDES permit.

The RRWEW wetland 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 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, 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 of 1994 levels) in selenium was observed.

Circulating Water System Blowdown

Circulating water system blowdown from the cooling tower will consist of recycled water from EBMUD along with residues of the chemicals added to treat the circulating water. These chemicals control scaling and biofouling of the cooling tower, and control corrosion of the circulating water piping and the condensers. Cooling tower blowdown will be discharged to the Refinery wastewater treatment system.

Plant Drains and Oil/Water Separator

General plant drains will collect containment area washdown, sample drains, and drainage from facility equipment drains. Water from these areas will be collected in a system of floor drains, hub drains, sumps, and piping and routed to the wastewater collection system. Drains that potentially could contain oil or grease will first be routed through an existing oil/water separator.

Cogen Cycle Makeup Water Treatment Wastes

Distillate from the existing refinery RO system will be used as the feed water for the cycle makeup treatment system. Since this distillate is already very low in total dissolved solids (TDS), the cycle makeup treatment system will require no further treatment and thus no treatment waste will be generated.

HRSG Blowdown

HRSG blowdown will consist of boiler water discharged from the HRSG LP and HP steam drums to control the concentration of dissolved solids and silica within acceptable ranges. HRSG blowdown will ultimately be discharged to flash tanks where the flash steam is sent to lower pressure refinery steam systems and the condensate is cooled by cooling water in a heat exchanger. The cooled condensate will then be forwarded to one of the other refinery process units for use in that process.

2.1.9.2 Solid Wastes

The PPRP will produce maintenance and plant wastes typical of power generation operations. Generation plant wastes include oily rags, broken and rusted metal and machine parts, defective or broken electrical materials, empty containers, and other solid wastes, including the typical refuse generated by workers. 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 for disposal at the West Contra Costa Landfill. This waste is managed in large bins and is currently removed from the Refinery by Richmond Sanitary Service.

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 recycling 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.

2.1.9.3 Hazardous Wastes

Several methods will be used to properly manage and dispose of hazardous wastes generated by the PPRP. Waste lubricating oil will be either recovered and recycled by the Refinery or disposed of in accordance with regulatory requirements. Spent SCR and oxidation catalysts will be recycled by the supplier. The Refinery has a well-established, well-documented, and effective hazardous waste handling and management system that is used to collect, categorize, store and dispose of hazardous waste. This system will be utilized to deal with any hazardous wastes generated during construction or operation of the PPRP.

2.1.10 Management of Hazardous Materials

There will be a variety of chemicals stored and used during construction and operation of the PPRP. The storage, handling, and use of all chemicals will be conducted in accordance with applicable LORS. Chemicals will be stored in appropriate chemical storage facilities. Bulk chemicals will be stored in storage tanks, and most other chemicals will be stored in returnable delivery containers. Chemical storage and chemical feed areas will be designed to contain leaks and spills. Berm and drain piping design will allow a full-tank capacity spill without overflowing the berms. For multiple tanks located within the same bermed area, the capacity of the largest single tank will determine the volume of the bermed area and drain piping. Drain piping for reactive chemicals will be trapped and isolated from other drains to eliminate noxious or toxic vapors. After neutralization, if required, water collected from the chemical storage areas will be directed to the refinery wastewater collection system.

There will be no anhydrous ammonia storage at the cogen facility since anhydrous ammonia is produced at the refinery and, therefore, can be piped from the existing refinery storage system.

Safety showers and eyewashes will be provided adjacent to or near chemical storage and use areas. Plant personnel will use approved personal protective equipment during chemical spill containment and cleanup activities. Refinery personnel are properly trained in the handling of these chemicals and instructed in the procedures to follow in case of a chemical spill or accidental release. The refinery maintains a fully staffed emergency response organization that is well trained and equipped to deal with any accidental release from the PPRP. This has been documented in the Refinery's existing Risk Management Plan and California Accidental Release Plan (CalARP).

A list of the chemicals anticipated to be used at the PPRP and their storage locations is provided in Section 8.11.2, Hazardous Materials Handling. This list identifies each chemical by type, intended use, and estimated quantity to be stored onsite. Section 8.11.5 includes additional information on hazardous materials handling.

2.1.11 Emission Control and Monitoring

Air emissions from the combustion of fuels in the CTGs and HRSG duct burner will be controlled using state-of-the-art systems. To ensure that the systems perform correctly, continuous emissions monitoring for NO_x and CO will be performed. Section 8.1, Air Quality, includes additional information on emission control and monitoring.

2.1.11.1 NO_x Emission Control

The CTG selected for the project includes steam injected diffusion combustors designed to control emissions of NO_x to 25 ppm in the CTG exhaust when natural gas or medium Btu gas fuel is used. In addition, the HRSGs will include an SCR system to further control NO_x concentrations in the exhaust stacks to 2.5 ppmv. The SCR process will use anhydrous ammonia as a reactant for NO_x reduction. Ammonia slip, or the concentration of unreacted ammonia in the HRSG stack exhaust, will be limited to 10 ppmv. The SCR equipment will include a reactor chamber, catalyst modules, ammonia vaporization and injection system, and monitoring equipment and sensors. Ammonia will be supplied from existing ammonia production facilities on site.

2.1.11.2 Carbon Monoxide and Volatile Organic Compound Emission Control

CO and VOC emissions from the CTG and HRSG duct burners will be controlled by means of a CO oxidation catalyst. CO and VOC emission rates in the HRSG stack exhaust will be limited to 4 ppmv and 2 ppmv respectively.

2.1.11.3 Particulate Emission Control

Particulate emissions will be controlled by the use of best combustion practices, the use of low-sulfur fuel, and high efficiency air inlet filtration.

PM₁₀ emissions from the STG cooling tower will be controlled through the use of high-efficiency drift eliminators which reduce the drift to 0.002 percent of the circulating water flow.

2.1.11.4 Continuous Emission Monitoring

For the CTG, CEM equipment will sample, analyze, and record fuel gas flow rate, NO_x and CO concentration levels, and percentage of oxygen in the exhaust gas from the HRSG stacks. The CEM equipment will transmit data to a data acquisition system (DAS) that will store the data and generate emission reports in accordance with permit requirements. The DAS will also include alarm features that will send signals to the plant DCS when the emissions approach or exceed pre-selected limits.

2.1.12 Fire Protection

The fire protection system will be designed to protect personnel and limit property loss and plant downtime in the event of a fire. The source of fire protection water will be the refinery's fire water system.

The Refinery has an extensive existing fire protection system that is designed to fight any type of fire that may occur within the Refinery. In addition, the Plant Protection Department within the Refinery is fully staffed with qualified and trained personnel and equipment to deal with all types of fires.

In addition to the general refinery fire protection systems, the Frame 6B turbine generator set includes controls to detect fire, unsafe temperatures or explosive atmospheres in the equipment enclosure. The system releases CO₂ if a fire is detected within the enclosure.

The CTG package enclosure is designed to reduce the hazard of fire and explosion. A wall separates the turbine and generator compartments to provide isolation. Ventilation systems, with redundant fans, create a positive pressure in the generator compartment and a negative pressure in the turbine compartment. This maintains separation and forces hydrocarbons away from the generator. The enclosure is protected by gas detectors, thermal detectors, optical flame detectors and a CO₂ extinguishing system conforming to NFPA 12.

Three manual trip stations will be located on the main enclosure; one on each side near the center of the package, and the third at the exciter end of the generator.

The CO₂ extinguishing system components will include:

- Main CO₂ storage cylinders
- Reserve CO₂ storage cylinders
- Necessary valves, piping, and wiring

Pressurized CO₂ bottles will be stored on a separate rack that will include manifolds, controls, valves, and a weigh scale. The reserve cylinders will be an “automatic backup,” and will be released, if detectors still indicate a hazard, 90 seconds after release of the main cylinders.

Piping will be provided within the main enclosure from the pressure connection to the nozzles in the turbine and generator compartment. Release of the CO₂ will be controlled by the fire system control panel or by a manual valve at the unit. Signals from the equipment-mounted sensors will be monitored by solid-state modules in the control panel. The panel-mounted unit will include logic, memory, and output functions to complete the system.

A dedicated 24 VDC battery system with charger will be provided to power the fire and gas protection system and control system. This battery system will conform to NFPA 12 requirements.

Section 8.11, Hazardous Materials Handling, includes additional information for fire and explosion risk, and Section 8.7, Socioeconomics, provides information on local fire protection capability.

During construction, the existing refinery fire protection system and emergency response team will be used to deal with any fires. Existing refinery fire protection measures, including the use of fire watches, will be used for fire prevention.

2.1.13 Plant Auxiliaries

The following systems will support, protect, and control the generating facility.

2.1.13.1 Lighting

The lighting system will provide personnel with illumination for operation under normal conditions and for egress under emergency conditions, and will include emergency lighting to perform manual operations during an outage of the normal power source. The system will also provide 120-volt convenience outlets for portable lamps and tools.

2.1.13.2 Grounding

The electrical system is susceptible to ground faults, lightning, and switching surges that result in high voltage that constitutes a hazard to site personnel and electrical equipment. The station grounding system will provide an adequate path to permit the dissipation of current created by these events.

The station grounding grid will be designed for adequate capacity to dissipate the ground fault current from the ground grid under the most severe conditions in areas of high ground fault current concentration. The grid spacing will maintain safe voltage gradients.

Bare conductors will be installed below-grade in a grid pattern. Each junction of the grid will be bonded together by an exothermic weld. The new grounding grid will be tied to the existing ground grid by exothermic welding.

Ground resistivity readings will be used to determine the necessary numbers of ground rods and grid spacing to ensure safe step and touch potentials under severe fault conditions.

Grounding conductors will be brought from the ground grid to connect to building steel and non-energized metallic parts of electrical equipment.

2.1.13.3 Distributed Control System

The DCS will provide modulating control, digital control, monitoring, and indicating functions for the plant power block systems.

The following functions will be provided:

- Controlling the STG, CTGs, HRSGs, and other systems in a coordinated manner
- Controlling the balance-of-plant systems in response to plant demands
- Monitoring controlled plant equipment and process parameters and delivery of this information to plant operators
- Providing control displays (printed logs, LCD video monitors) for signals generated within the system or received from I/O
- Providing consolidated plant process status information through displays presented in a timely and meaningful manner
- Providing alarms for out-of-limit parameters or parameter trends, displaying on alarm video monitors(s), and recording on an alarm log printer
- Providing storage and retrieval of historical data

The DCS at the hydrogen plant STG will be a redundant microprocessor-based system and will consist of the following major components:

- PC-based operator consoles with LCD video monitors
- Engineer work station
- Multiple redundant processing units
- I/O cabinets
- Historical data unit

- Printers
- Data links to the combustion turbine and steam turbine control systems

The DCS will have a functionally distributed architecture comprising a group of similar redundant processing units linked to a group of operator consoles and the engineer workstation by redundant data highways. Each processor will be programmed to perform specific dedicated tasks for control information, data acquisition, annunciation, and historical purposes. By being redundant, no single processor failure can cause or prevent a unit trip.

The Cogen 3000 will utilize the existing cogen facility DCS, which will be expanded to accommodate the additional equipment and monitoring I/O and programming.

The two DCS systems will interface with the control systems furnished by the CTG and STG suppliers to provide remote control capabilities, as well as data acquisition, annunciation, and historical storage of turbine and generator operating information.

The systems will be designed with sufficient redundancy to preclude a single device failure from significantly affecting overall plant control and operation. This also will allow critical control and safety systems to have redundancy of controls, as well as an uninterruptible power source.

As part of the quality control program, daily operator logs will be available for review to determine the status of the operating equipment.

2.1.13.4 Cathodic Protection

The cathodic protection system will be designed to control the electrochemical corrosion of designated metal piping buried in the soil. Depending upon the corrosion potential and the site soils, either passive or impressed current cathodic protection will be provided.

2.1.13.5 Service Air

The existing service air system in the cogen facility will be extended to supply compressed air to hose connections for general plant use. Service air headers will be routed to hose connections located at various points throughout the facility.

For the hydrogen plant STG, service air for hose connections in the STG and cooling tower areas will come from the hydrogen plant instrument air system.

2.1.13.6 Instrument Air

The instrument air system will provide dry air to pneumatic operators and devices. An instrument air header will be routed to locations within the facility equipment areas where pneumatic operators and devices will be located.

2.1.14 Interconnect to Electrical Grid

Cogen 3000 will feed power via existing, onsite Refinery-owned 115-kV transmission lines to the SOSS, which is the point of common coupling with the utility. No new or upgraded offsite transmission lines will be required. However the two existing 115-kV lines between the cogen switchyard (Substation 5) and the main switchyard (SOSS) will be reconducted to provide higher ampacity (see Section 5.0, Electric Transmission). Reconductoring will be

done with a composite-core cable that will provide higher ampacity without an increase in cable weight. Therefore, no changes will be required to transmission towers or foundations.

2.1.15 Project Construction

Actual construction of the hydrogen plant STG is planned to take place from the first quarter of 2008 to the first quarter of 2009. Actual construction of Cogen 3000 is planned to take place over approximately 15 months, from second quarter 2008 to first quarter 2010. Plant testing is planned to commence in the first quarter of 2010, and commercial operation is expected to commence no later than the second quarter 2010. Major milestones are listed in Table 2.1-2.

TABLE 2.1-2
Project Schedule Major Milestones

Activity	Date
Begin Construction of H2 Plant STG	First Quarter 2008
Begin Construction of Cogen	Second Quarter 2008
Startup and Test H2 Plant STG	First Quarter 2009
Startup and Test Cogen	First Quarter 2010
Commercial Operation of H2 Plant STG	First Quarter 2009
Commercial Operation of Cogen	Second Quarter 2010

For the cogen plant, there will be an average and peak workforce of approximately 119 and 181, respectively, of construction craft people, supervisory, support, and construction management personnel onsite during construction. For the hydrogen plant STG project, there will be an average and peak workforce of 14 and 25, respectively, of construction craft people, supervisory, support, and construction management personnel onsite during construction (see Tables 8.7-4 and 8.7-5).

Noisy construction will be scheduled to occur between 6 a.m. and 7 p.m. on weekdays and holidays. Additional hours may be necessary to make up schedule deficiencies, or to complete critical construction activities (e.g., pouring concrete at night during hot weather, working around time-critical shutdowns and constraints). During some construction periods and during the startup phase of the project, some activities will continue 24 hours per day, 7 days per week.

The peak construction site workforce level is expected to last from Month 14 through Month 19 of the construction period.

Table 8.9-6 provides an estimate of the construction traffic during the overall construction period for the entire Renewal Project including the PPRP and associated linear facilities. Peak trip generation is expected in the first quarter of 2008 as summarized in Table 2.1-3.

TABLE 2.1-3
Traffic Generation Estimates – First Quarter 2008

Project	Type	Daily (ADT)	AM Peak Hour (Vehicles/Hour)		PM Peak Hour (Vehicles/Hour)	
			In	Out	In	Out
Construction	Vehicle	1,595	399	0	0	399
	Trucks	172	86	0	0	0
	<i>Subtotal</i>	<i>1,767</i>	<i>485</i>	<i>0</i>	<i>0</i>	<i>399</i>
Other Projects	Vehicle	119	30	0	0	30
	Trucks	24	12	0	0	0
	<i>Subtotal</i>	<i>143</i>	<i>42</i>	<i>0</i>	<i>0</i>	<i>30</i>
Major Refinery Turnaround	Vehicle	349	87	0	0	87
	Trucks	24	12	0	0	0
	<i>Subtotal</i>	<i>373</i>	<i>99</i>	<i>0</i>	<i>0</i>	<i>87</i>
TOTAL		2,283	626	0	0	516

Notes:

ADT = Average Daily Traffic

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.

Source: Wilbur Smith Associates, 2007.

Due to the large site, accommodation for construction parking/laydown areas will be readily available. Construction laydown and parking areas will occupy about 8.9 acres at various locations around the plant site (see Figure 2.1-19). These sites are active refinery construction laydown areas dedicated for ongoing refinery construction and maintenance activities. Construction access to the plant site will generally be from Castro Street. Materials and equipment will be delivered by truck and rail. Existing railroad spurs are located within the refinery and extensive rail spurs and rail traffic exist outside of the refinery due to the heavy industrialization of the area and the proximity to the Port of Richmond.

2.1.16 Generating Facility Operation

Cogen 3000 will be operated by existing cogen and power plant facility operators, therefore, no personnel will be added to the operating, maintenance, or administrative staff for this additional facility. The hydrogen plant STG will be operated by hydrogen plant operators on an 8-hour rotating shift. There will be no operating, maintenance, or administrative staff dedicated to the STG equipment operation.

The PPRP is expected to have an annual plant availability of 98 to 99 percent. It will be possible for plant availability to exceed 98 percent for a given 12-month period. Chevron

expects to operate the PPRP primarily as a base load unit, with some amount of load following. The exact operational profile of the plant, however, cannot be defined in detail since operation of the facility depends on the variable demand in the refinery as well as the future ability and economics associated with exporting power to the grid.

The facility may be operated in one or all of the following modes:

- **Base Load.** The facility would be operated at its maximum continuous output for as many hours per year as the refinery requires. It is anticipated that the facility will operate as a base load unit throughout the summer months to supply, in conjunction with the other generation, all of the refinery's power needs and to export any available excess power to the utility grid.
- **Load Following.** During non-peak seasons (primarily spring and fall), the facility would be operated at loads that may vary between maximum continuous output (CTG operating with inlet evaporatively cooled) and minimum load (CTG operating with evaporative cooling off and producing as low as 60 to 70 percent of maximum generating capacity to meet the Refinery's demand at all times of the day.
- **Full Shutdown.** This would occur if forced by equipment malfunction, fuel supply interruption, transmission line disconnect, or scheduled maintenance.

In the unlikely event of a situation that causes a longer-term cessation of operations, security of the facilities will be maintained and appropriate agency notifications will be made in accordance with applicable LORS. Depending on the length of shutdown, a contingency plan for the temporary cessation of operations may be implemented. Such contingency plan will be in conformance with all applicable LORS and protection of public health, safety, and the environment. The plan, depending on the expected duration of the shutdown, could include the draining of all chemicals from storage tanks and other equipment and the safe shutdown of all equipment. All wastes will be disposed of according to applicable LORS. If the cessation of operations becomes permanent, the plant will be decommissioned (see Section 4.0, Facility Closure).

2.2 Facility Safety Design

The PPRP will be designed to maximize safe operation. Potential hazards that could affect the facility include earthquake, flood, and fire. Facility operators will be trained in safe operation, maintenance, and emergency response procedures to minimize the risk of personal injury and damage to the plant.

2.2.1 Natural Hazards

The principal natural hazard associated with the PPRP site is earthquakes. The site is located in Seismic Risk Zone 4. Structures will be designed to meet the seismic requirements of CCR Title 24 and the 2007 California Building Code (CBC) (See Section 8.13, Geologic Resources and Hazards). This section includes a review of potential geologic hazards, seismic ground motion, and potential for soil liquefaction due to ground-shaking. Potential seismic hazards will be mitigated by implementing the 2007 CBC construction guidelines.

Flooding of the project sites is not considered to be a probable hazard. 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. Section 8.15, Water Resources, includes additional information on the potential for flooding.

2.2.2 Emergency Systems and Safety Precautions

This section discusses the fire protection systems, emergency medical services, and safety precautions to be used by project personnel. Section 8.7, Socioeconomics, includes additional information on area medical services, and Section 8.6, Public Health, includes additional information on safety for workers. Compliance with these requirements will minimize project effects on public and employee safety.

2.2.2.1 Fire Protection Systems

The project will rely on onsite fire protection systems and fire protection personnel. 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 Supervisor of Fire Protection, 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.

The extensive refinery fire protection systems are designed to protect personnel and limit property loss and plant downtime from fire or explosion. In addition to the existing refinery systems, the project will have the following additional fire protection systems.

Steam Turbine Lube Oil Areas Water Spray System

This system will provide suppression for the steam turbine area lube oil piping and lube oil storage.

Fire Hydrants/Hose Stations

This system will supplement the plant's fixed fire suppression systems. Water will be supplied from the plant fire water system.

Fire Extinguisher

The plant Control Room and other structures will be equipped with fire suppression systems as required by the local fire department and Chevron/Praxair plant protection policies and procedures.

Refinery Fire Protection Services

In the event of a major fire, the Refinery Emergency Response Team will respond and take all necessary actions to contain and extinguish the fire. The refinery's Risk Management Plan (RMP) will include all information necessary to assess hazards and implement safe responses to fires, spills, and other emergencies.

After the PPRP 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 Project that have been identified in the HAZOP. Section 8.5, Hazardous Materials Handling, contains additional information on the Risk Management Plan.

2.2.2.2 Personnel Safety Program

The PPRP will operate in compliance with federal and state occupational safety and health program requirements. Compliance with these programs will minimize project effects on employee safety.

2.3 Facility Reliability

This section discusses the expected facility availability, equipment redundancy, fuel availability, water availability, and project quality control measures.

2.3.1 Facility Availability

Because of the refinery steam and power needs, it is anticipated that the facility will normally be called upon to operate at high average annual capacity factors. The facility will be designed to operate between about 60 and 100 percent of base load in response to the refinery's demands for electricity and steam.

The PPRP will be designed for an operating life of 30 years. Reliability and availability projections are based on this operating life. Operation and maintenance procedures will be consistent with industry standard practices to maintain the useful life status of plant components.

The percent of time that the cogen and STG is projected to be operated is defined as the "service factor." The service factor considers the amount of time that a unit is operating and generating power and steam, whether at full or partial load. The projected service factor for the cogen and the STG, which considers projected percent of time of operation, differs from the equivalent availability factor (EAF), which considers the projected percent of energy production capacity achievable.

The EAF may be defined as a weighted average of the percent of full energy production capacity achievable. The projected equivalent availability factor for the PPRP is estimated to be approximately 98 to 99 percent.

The EAF differs from the “availability of a unit,” which is the percent of time that a unit is available for operation, whether at full load, partial load, or standby.

2.3.2 Redundancy of Critical Components

The following sections identify equipment redundancy as it applies to project availability. A summary of equipment redundancy is shown in Table 2.3-1. Final design could differ.

TABLE 2.3-1
Major Equipment Redundancy

Description	Number	Note
Cogen System		
CTGs and HRSGs	One new train added to two existing trains	Three cogen trains allow one train to be down for maintenance and the other two trains to provide adequate steam production to maintain full refinery throughput. Backup power during a cogen train outage is provided by the utility grid.
HRSG feedwater pumps	Two – 100 percent capacity	One operating and one spare full capacity pump for the new cogen train.
Condensate pumps	Two – 100 percent capacity	One operating and one spare full capacity pump for the new cogen train.
2,400-volt electrical switchgear busses, supply transformers and MCCs	Two – 100 percent capacity	Each bus and MCC are redundant to the other.
480-volt electrical switchgear busses, supply transformers and MCCs	Two – 100 percent capacity	Each bus and MCC are redundant to the other.
Hydrogen Plant System		
STG	One	STG power output is backed-up by other refinery generation and by power from the utility grid. Steam for the hydrogen plant process, normally supplied by extraction from the STG will be provided by letdown of high pressure steam through letdown stations.
STG condenser	One	Condenser must be in operation for steam turbine operation. The condenser will be provided with split water boxes to allow online tube cleaning and repair.
Circulating water pumps	Three – 50 percent capacity	Two operating and one standby pumps for the STG condenser.
STG Circulating water cooling tower	One	Cooling tower is multi-cell mechanical draft design.

2.3.2.1 Cogen Trains

Three separate CTG/HRSG power/steam cogeneration trains (one new and two existing) will operate in parallel within the cogen facility. Each CTG will provide approximately 30 percent of the total cogen facility power output. The exhaust gas from each CTG will be used to produce steam in the steam generation system. Thermal energy from the steam generation system will be distributed to the Refinery for use in refinery processes. The major components of the cogen facility consist of the following subsystems.

Combustion Turbine Generator Subsystems

The combustion turbine subsystems will include the combustion turbine, inlet air filtration and inlet evaporative cooling, generator and excitation systems, turbine lube oil system, hydraulic system, and turbine control and instrumentation. The combustion turbine will produce thermal energy through the combustion of natural gas (or LPG) and the conversion of the thermal energy into mechanical energy through rotation of the combustion turbine sections that drive the compressor sections and generator. Exhaust gas from the combustion turbine will be used to produce steam in the associated HRSG. The generator will be cooled by air circulation through the generator enclosure supplied via the CTG inlet filtration system. The generator excitation system will be a solid-state static system. Combustion turbine control and instrumentation (interfaced with the DCS) will cover the turbine governing system, and the protective system.

Steam Generation Subsystems

The steam generation subsystems will consist of the HRSG with duct burner and blowdown systems. The HRSG transfers heat from the CTG exhaust gas to feedwater for steam production. This heat transfer produces steam at the pressures and temperatures required by the steam turbine. The HRSG system consists of ductwork, heat transfer sections, an SCR system, an oxidation catalyst, and exhaust stack. The blowdown system provides vents and drains for each HRSG. The system includes safety and auto relief valves and processing of continuous and intermittent blowdown streams.

2.3.2.2 Boiler Feedwater System

The boiler feedwater system transfers feedwater from the deaerator to the HP and LP sections of the HRSG. The system will consist of two pumps, each pump sized for 100 percent capacity for supplying the HRSG at full steam production. The pump will be multistage, horizontal, motor-driven with intermediate bleed-off, and will include regulating control valves, minimum flow recirculation control, and other associated piping and valves.

2.3.2.3 Condensate System

The condensate system will provide a flow path from the condensate storage tank to the deaerator. The condensate system will include three 50-percent-capacity multistage, vertical, motor-driven condensate pumps.

2.3.2.4 Cogen Cycle Makeup and Storage

The cogen cycle makeup and storage subsystem will provide makeup water storage and pumping capabilities to supply boiler feed quality water for system cycle makeup and chemical cleaning operations. Major components of the system are one condensate water

storage tank (converted from an existing diesel fuel storage tank), providing a 5-hour supply of condensate water at peak load, and two 100-percent capacity, horizontal, centrifugal, cycle makeup water pumps.

2.3.2.5 Hydrogen Plant Steam Turbine Generator

The exhaust from the expanded steam from the STG will be condensed and recycled to the hydrogen plant heat recovery boiler feedwater system. Power from the STG will be used in the hydrogen plant to power the hydrogen production process. During some operating conditions, the STG will produce a small amount of excess power that would be supplied to the Refinery to supplement other refinery power generation.

Steam Turbine Generator Subsystems

The steam turbine will convert the thermal energy in the steam to mechanical energy to drive the STG. The basic subsystems will include the steam turbine and auxiliary systems, turbine lube oil system, and generator/exciter system. The generator will be water-cooled.

The hydrogen plant STG will be served by the following systems.

Circulating Water System

The circulating water system will provide cooling water to the condenser for condensing steam turbine exhaust steam. In addition, the system will supply cooling water to the balance of the hydrogen plant for cooling heat load within the hydrogen production process. Approximately 50 percent of the cooling system capacity will be used for the STG and the balance will be used for hydrogen plant cooling loads. Major components for this subsystem will be a four-cell mechanical draft cooling tower, three 50-percent-capacity motor-driven vertical wet-pit circulating water pumps, and associated piping and valves.

Compressed Air

The compressed air system will provide instrument air and service air to points of use throughout the facility. Compressed air for the cogen will be supplied from existing air headers in the cogen facility. Compressed air for the STG will be supplied from the hydrogen plant compressed air system.

2.3.3 Fuel Availability

Fuel will be delivered via existing natural gas, medium Btu gas pipelines currently serving the Refinery and by existing refinery fuel gas systems and piping. Since the PPRP will have two independent sources of natural gas, it is unlikely that the cogen would experience a loss of fuel.

2.3.4 Water Availability

The PPRP will use up to 532 afy of recycled water provided by the EBMUD for cooling tower makeup. Cooling water will be cycled in the cooling tower five times. The blowdown will be discharged to the Refinery wastewater treatment system. Potable water will be used as an emergency supply to the cooling towers should the availability of recycled water be interrupted for more than 8 hours.

Potable water for drinking, safety showers, fire protection water, and service water, will be served from the existing refinery potable water service provided by EBMUD.

The availability of water to meet the needs of PPRP is discussed in more detail in Section 8.12, Water Resources.

2.3.5 Project Quality Control

The Quality Control Program that will be applied to the PPRP is summarized in this section. The objective of the Quality Control Program is to ensure that all systems and components have the appropriate quality measures applied; whether it is during design, procurement, fabrication, construction, or operation. The goal of the Quality Control Program is to achieve the desired levels of safety, reliability, availability, operability, constructability, and maintainability for the generation of electricity and steam.

The required quality assurance for a system is obtained by applying controls to various activities, according to the activity being performed. For example, the appropriate controls for design work are checking and review, and the appropriate controls for manufacturing and construction are inspection and testing. Appropriate controls will be applied to each of the various activities for the project.

2.3.5.1 Project Stages

For quality assurance planning purposes, the project activities have been divided into the following nine stages that apply to specific periods of time during the project:

- **Conceptual Design Criteria.** Activities such as definition of requirements and engineering analyses.
- **Detail Design.** Activities such as the preparation of calculations, drawings, and lists needed to describe, illustrate, or define systems, structures, or components.
- **Procurement Specification Preparation.** Activities necessary to compile and document the contractual, technical, and quality provisions for procurement specifications for plant systems, components, or services.
- **Manufacturer's Control and Surveillance.** Activities necessary to ensure that the manufacturers conform to the provisions of the procurement specifications.
- **Manufacturer Data Review.** Activities required to review manufacturers' drawings, data, instructions, procedures, plans, and other documents to ensure coordination of plant systems and components, and conformance to procurement specifications.
- **Receipt Inspection.** Inspection and review of product at the time of delivery to the construction site.
- **Construction/Installation.** Inspection and review of storage, installation, cleaning, and initial testing of systems or components at the facility.
- **System/Component Testing.** Actual operation of generating facility components in a system in a controlled manner to ensure that the performance of systems and components conform to specified requirements.
- **Plant Operation.** As the project progresses, the design, procurement, fabrication, erection, and checkout of each generating facility system will progress through the nine stages defined above.

2.3.5.2 Quality Control Records

The following quality control records will be maintained for review and reference:

- Project instructions manual
- Design calculations
- Project design manual
- Quality assurance audit reports
- Conformance to construction records drawings
- Procurement specifications (contract issue and change orders)
- Purchase orders and change orders
- Project correspondence

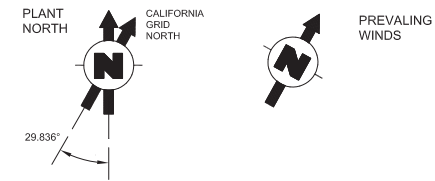
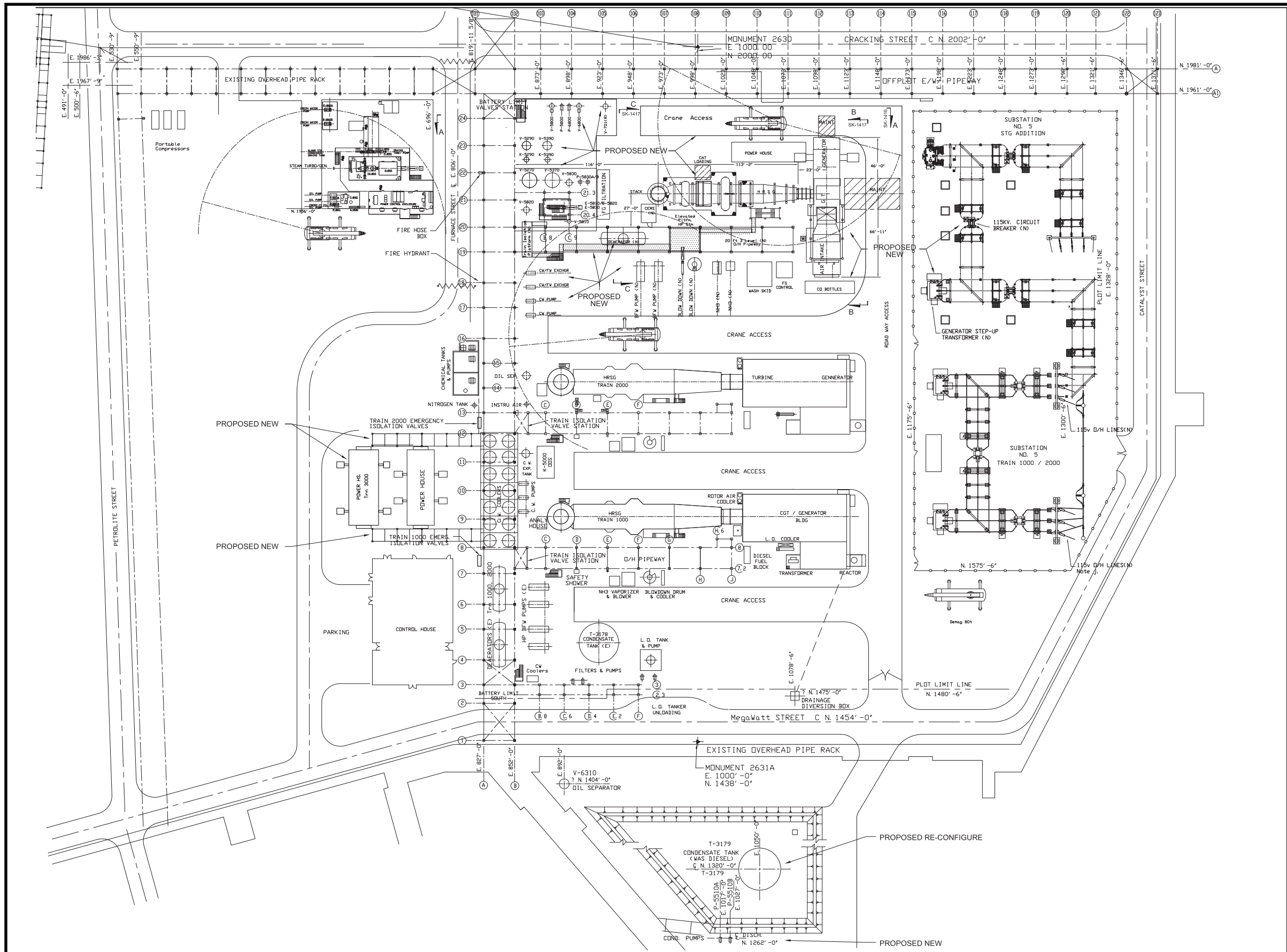
For procured component purchase orders, Chevron has a list of qualified suppliers and subcontractors that has been developed over years. Before contracts are awarded, the subcontractors' current capabilities will be evaluated. The evaluation will consider suppliers' and subcontractors' personnel, production capability, past performance, and quality assurance program.

During construction, field activities are accomplished during the last four stages of the project: receipt inspection, construction/installation, system/component testing, and plant operations. The construction contractor will be contractually responsible for performing the work in accordance with the quality requirements specified by contract.

The subcontractors' quality compliance will be surveyed through inspections, audits, and administration of independent testing contracts.

Qualified and knowledgeable refinery plant operations and maintenance personnel will be assigned to the project and formal operational assurance reviews will be conducted to ensure operation and maintenance quality. A specific program for this project will be defined and implemented during initial plant startup.





NOTES

- Plant Co-ordinate system based on Refinery Monument No. 2630. Monument based on 1983 NAD California Co-Ordinate system, Zone 3. Mon. 2630 = N 2,170,683.78 and E 6,016,684.96 Ft. Ground distances = Grid Distance x 1.0000717 Ft.

Bench Mark 48 = Elevation 11.62 Ft. Top of wall East Corner of Bridge 102, intersection of Cracking St. and Megawatt St.
H.P.F.G. Plant Elevation 0'-0" = Richmond Refinery Datum 13'-0".
Top of concrete elevation for Gas Turbine & HRSG foundations = 0'-0".
- Train 3000 to have its own isolation valves in a common area (Train Isolation platform) In keeping with the current Trains 1000 & 2000 design.
- Equipment for the HRSG/CGT Train 3000 project will include the following:
 - Heat Recovery Steam Generator - HRSG (1).
 - Gas Turbine driven power generator assembly - CGT (1).
 - NH3 Vaporizer Skid (1).
 - NH3 Injection Blower Skid (1).
 - Flame Control Module (1).
 - Lube Oil Cooler (1).
 - CEMS Enclosure (1).
 - Generator Step-up Transformer (1).
 - Circuit Breaker 115KV (1).
 - Metal Clad Switchgear 13.8KV (1).
 - Power House 2400V & 480V (1).
- Additional Equipment or changes for the 3000 project, include the following:
 - Storage Tank. Currently Diesel Fuel to be modified for Condensate service.
 - Condensate Pumps (3).
 - Boiler feed water Pumps, 1200 gpm, 1000 hp. (2).
 - Deareator (1).
 - Natural Gas Surge Drum. (1).
 - Fuel Gas Coalescer / Filters Skid (1).
 - Relief Drum, HC. and Pump. (1).
 - Cooling water Circulation Pump. (2).
 - Cooling/Fresh water Exchanger. (2).
 - Over Head Lines 115V. to be Reconduct.

Design Basis:
Heat Recovery Steam Generator with a Combustion Gas Turbine and Power Generator by General Electric. Tee shape footprint.

UTILITIES & ENVIRONMENTAL
COGENERATION 3000
PROJECT



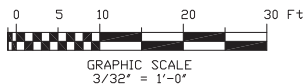
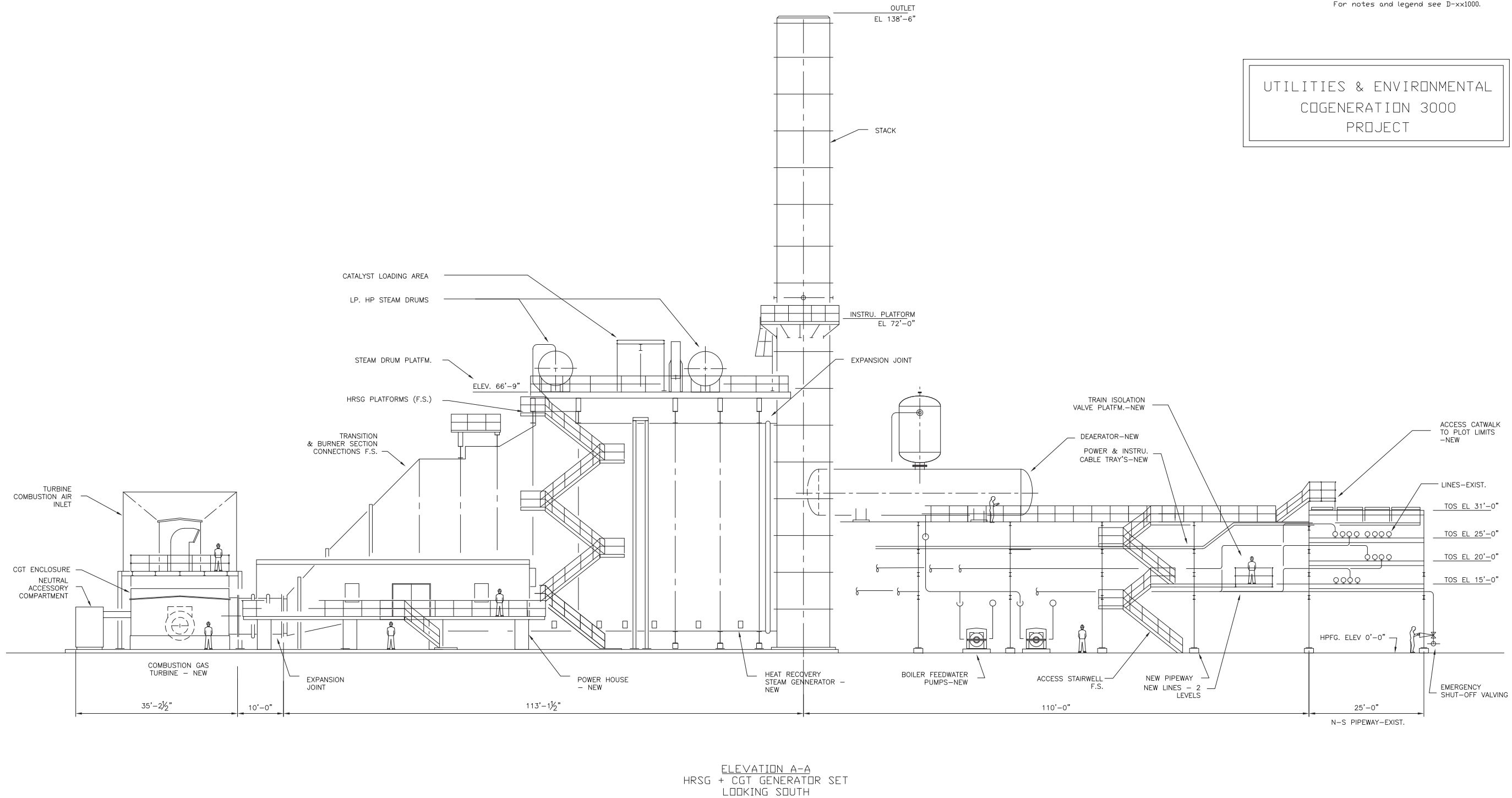
GRAPHIC SCALE: 1" = 40'-0"

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FIGURE 2.1-2
PLOT PLAN EXISTING COGEN
PLUS NEW COGEN 3000
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA

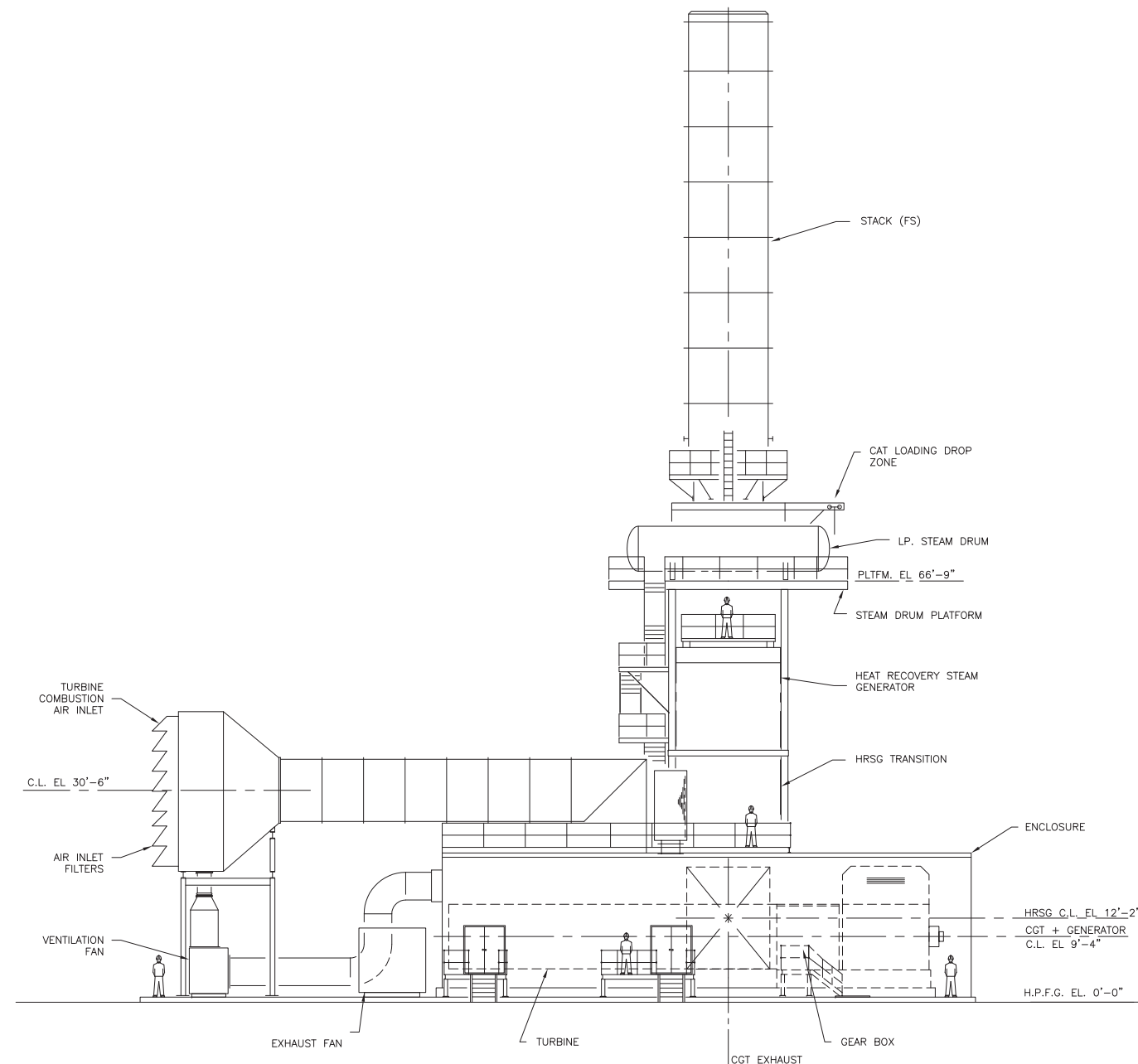
NOTES
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UTILITIES & ENVIRONMENTAL
COGENERATION 3000
PROJECT

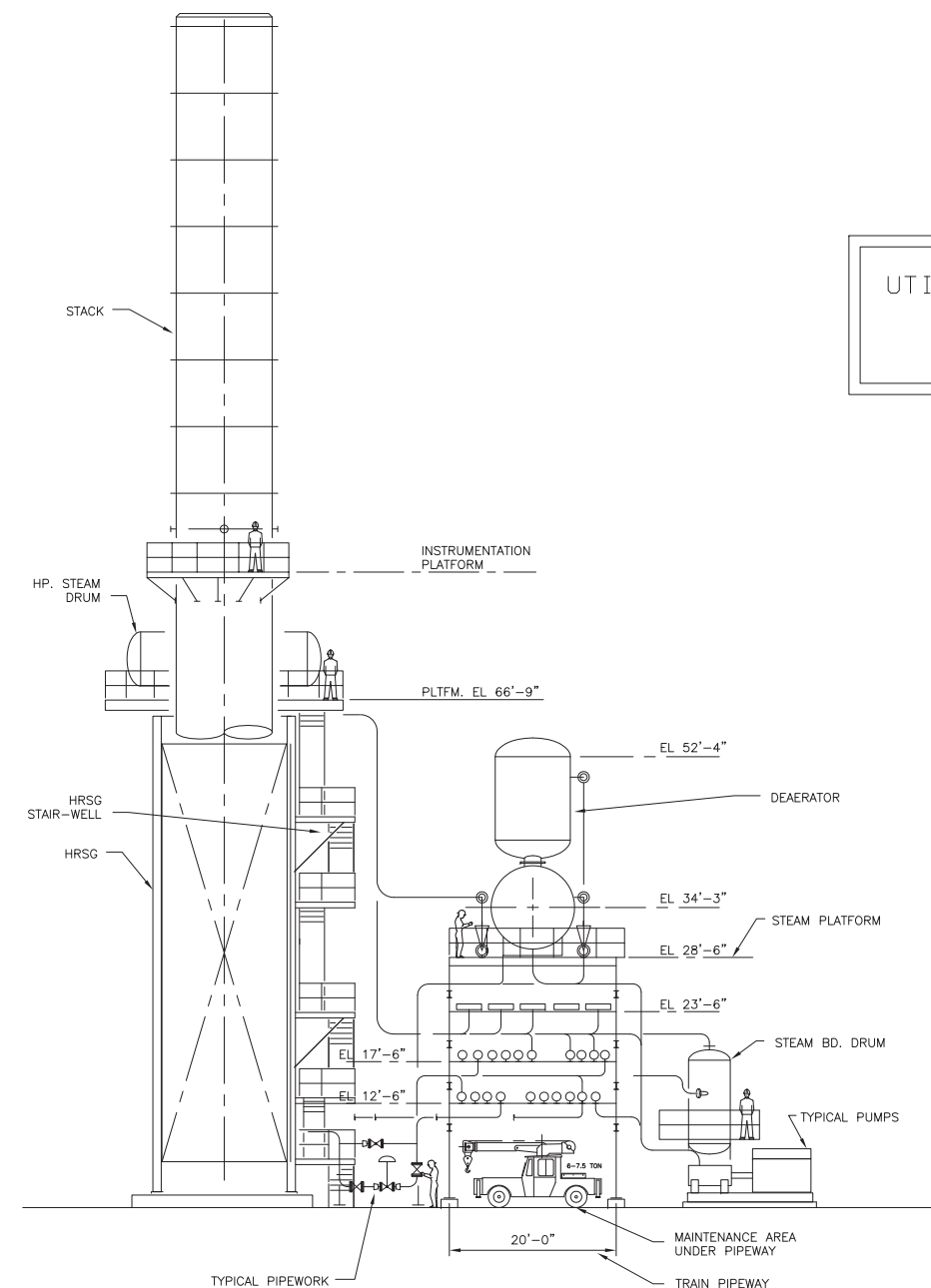


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FIGURE 2.1-3
COGEN 3000 LAYOUT - SIDE
ELEVATION (FRAME 6B)
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA



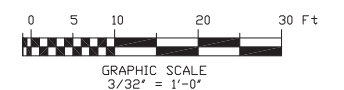
ELEVATION B-B
HRSG + CGT + GENERATOR SET
LOOKING WEST



ELEVATION C-C
HRSG + CGT GENERATOR SET
LOOKING EAST

NOTES
For notes and legend see D-xx1000.

UTILITIES & ENVIRONMENTAL
COGENERATION 3000
PROJECT



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FIGURE 2.1-4
COGEN 3000 LAYOUT - END
ELEVATION (FRAME 6B)
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA

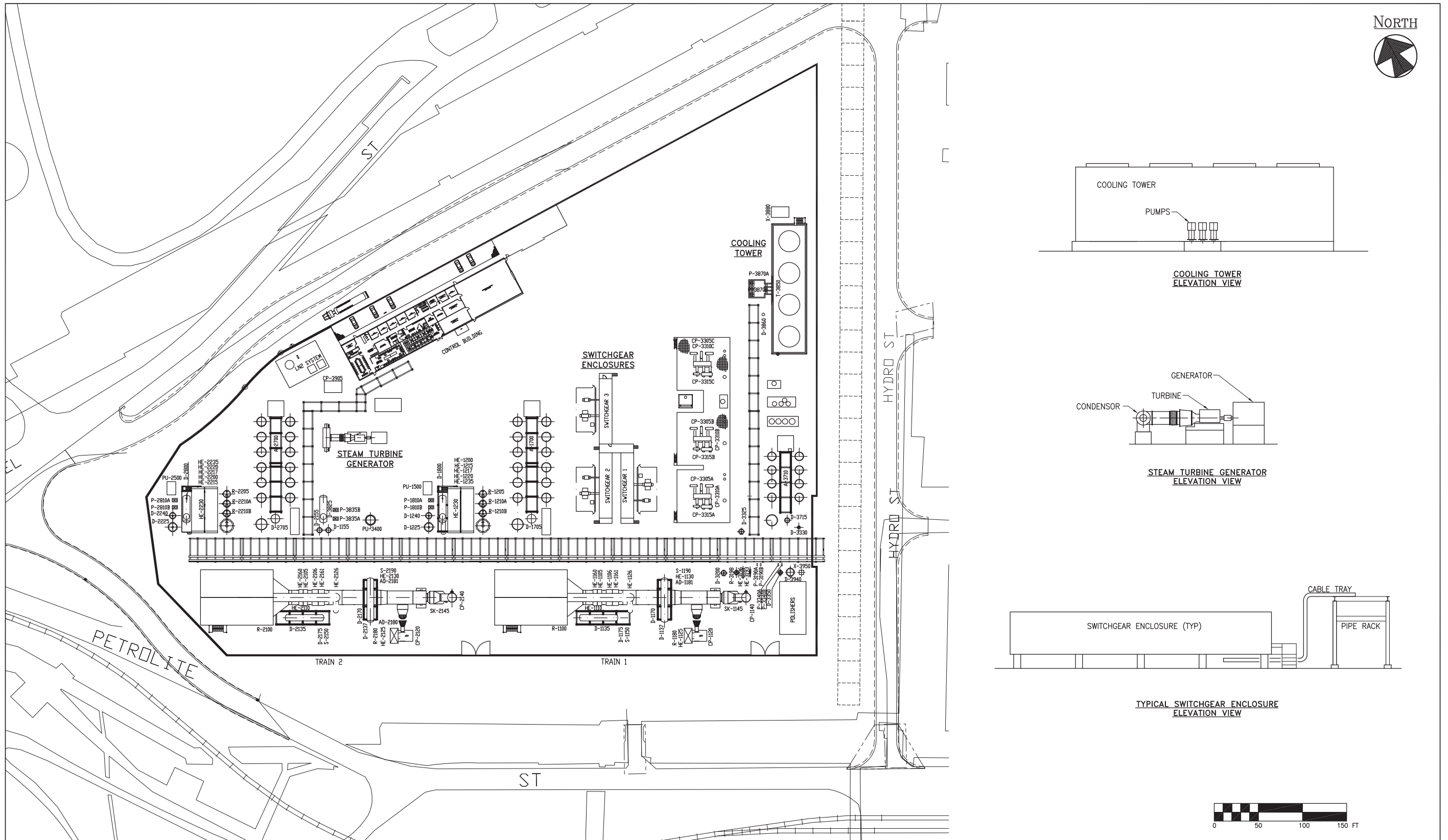


FIGURE 2.1-5
PLOT PLAN AND ELEVATIONS - H2 STG
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA

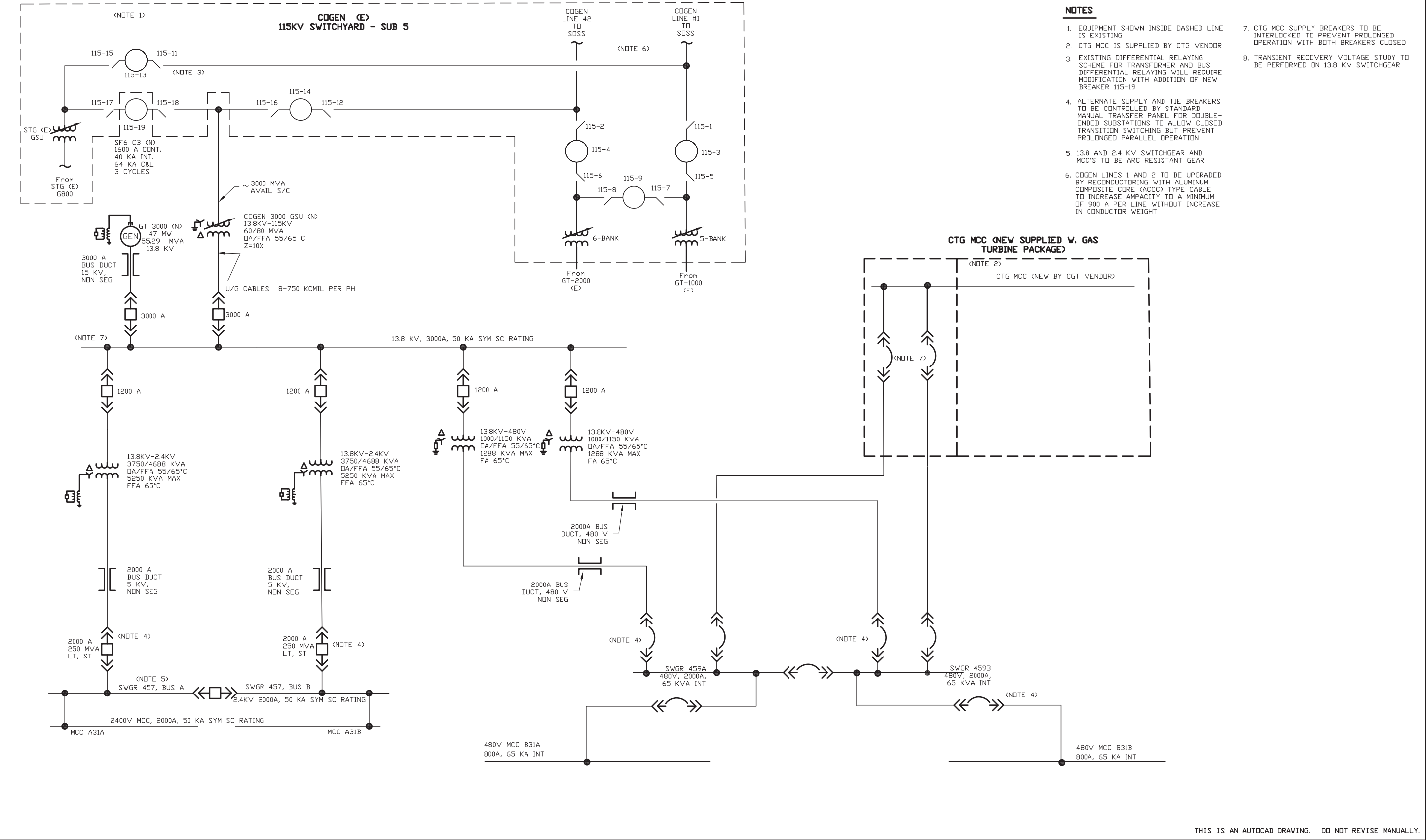


FIGURE 2.1-6
COGEN 3000 SINGLE-LINE DIAGRAM
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA

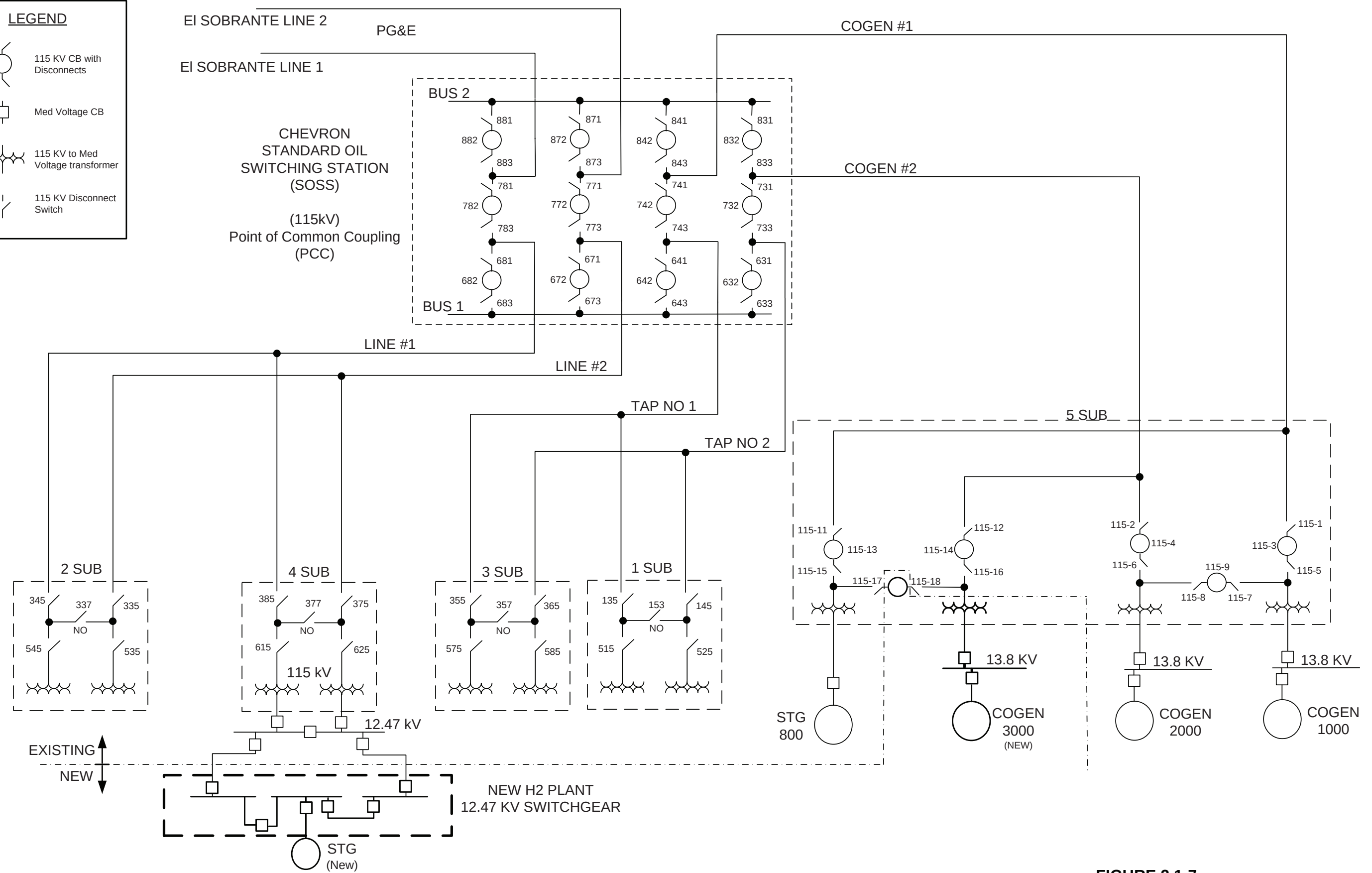
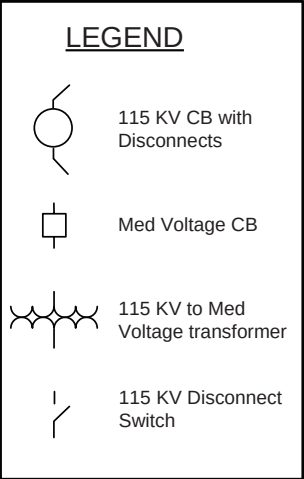
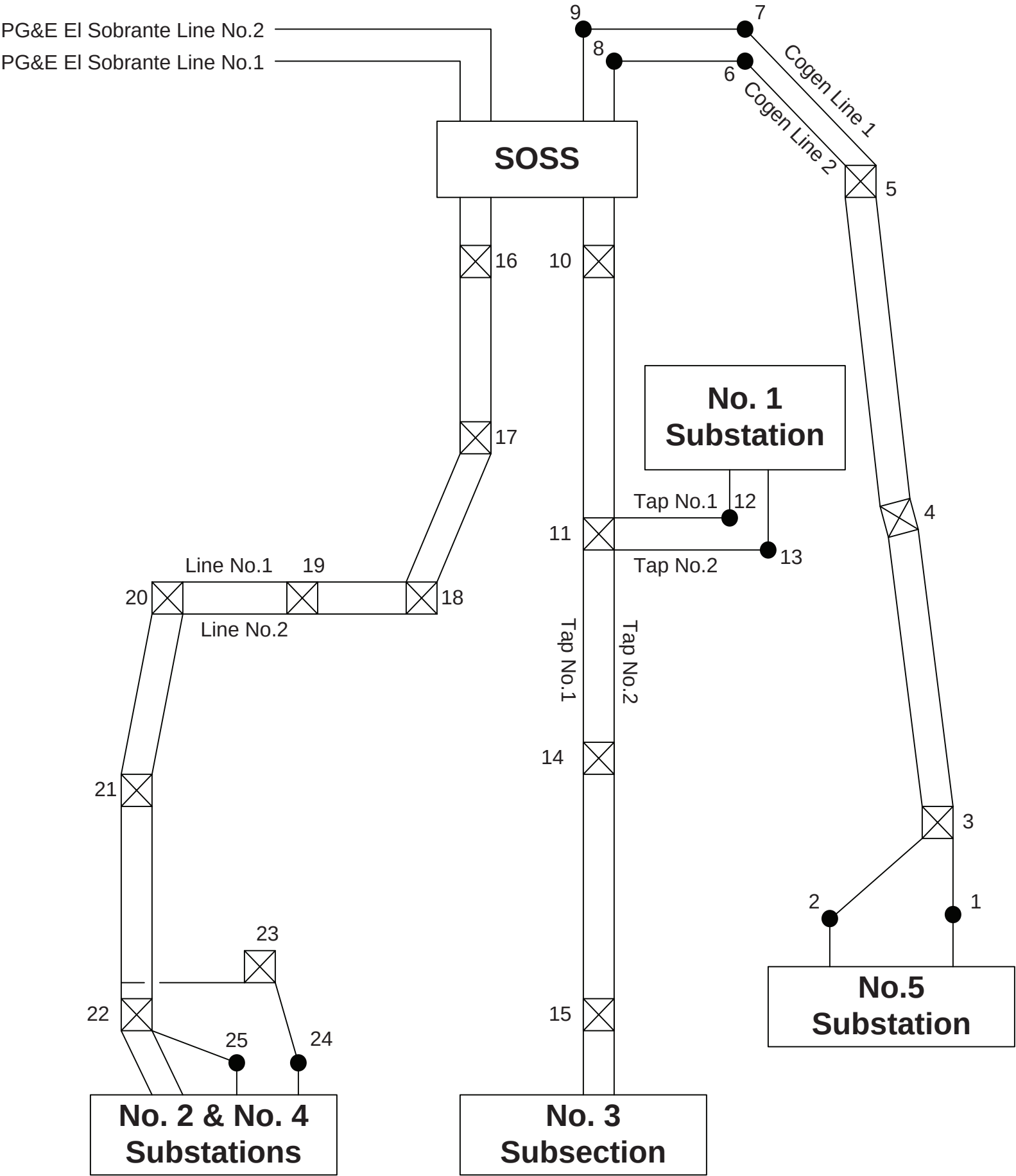


FIGURE 2.1-7
REFINERY 115-kV DISTRIBUTION SYSTEM
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA



Legend

- 115 kV Transmission Line
- ⊠ 115 kV Transmission Lattice Tower
- 115 kV Transmission Mono Pole

FIGURE 2.1-8
115-kV TOWERS
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA

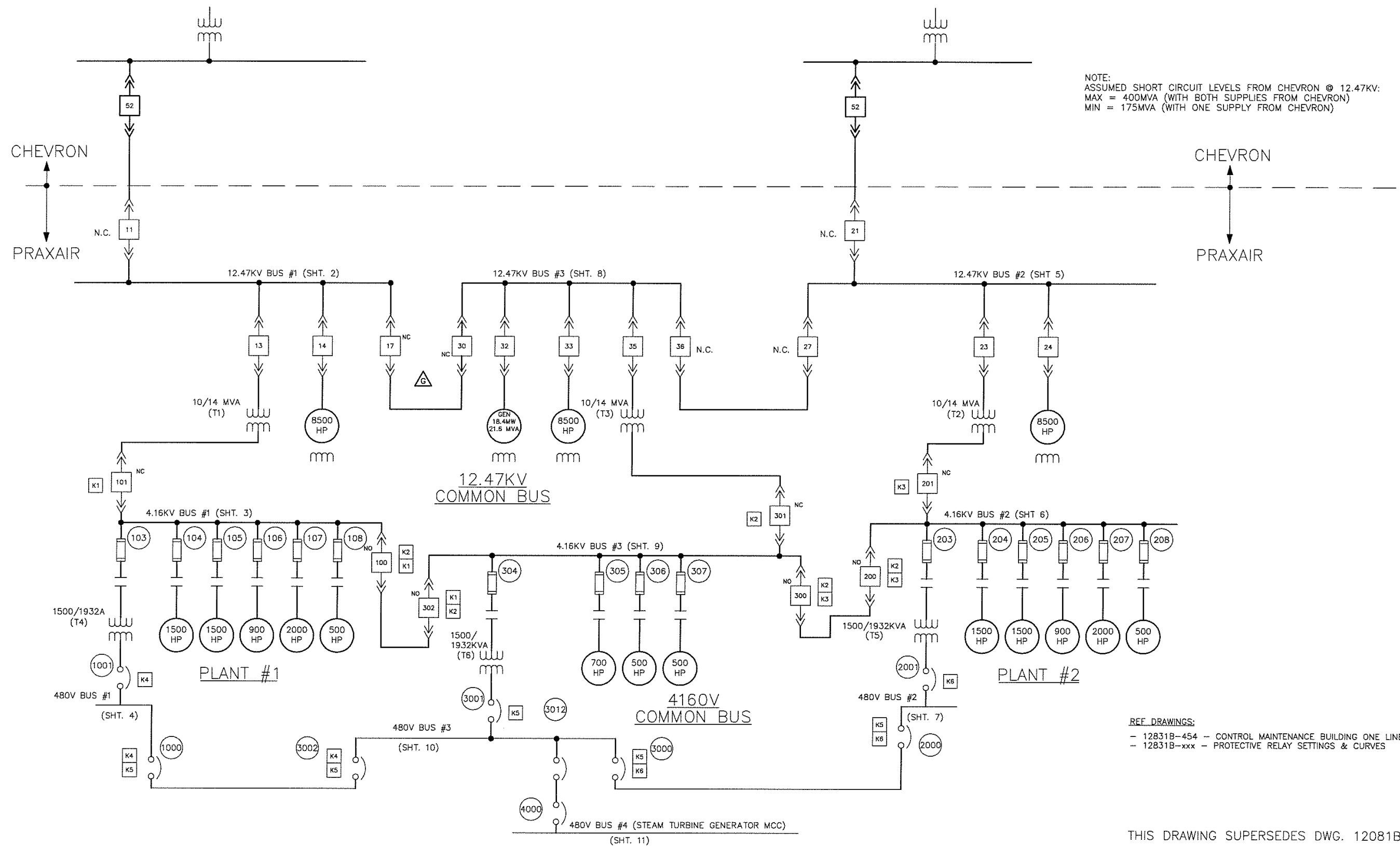
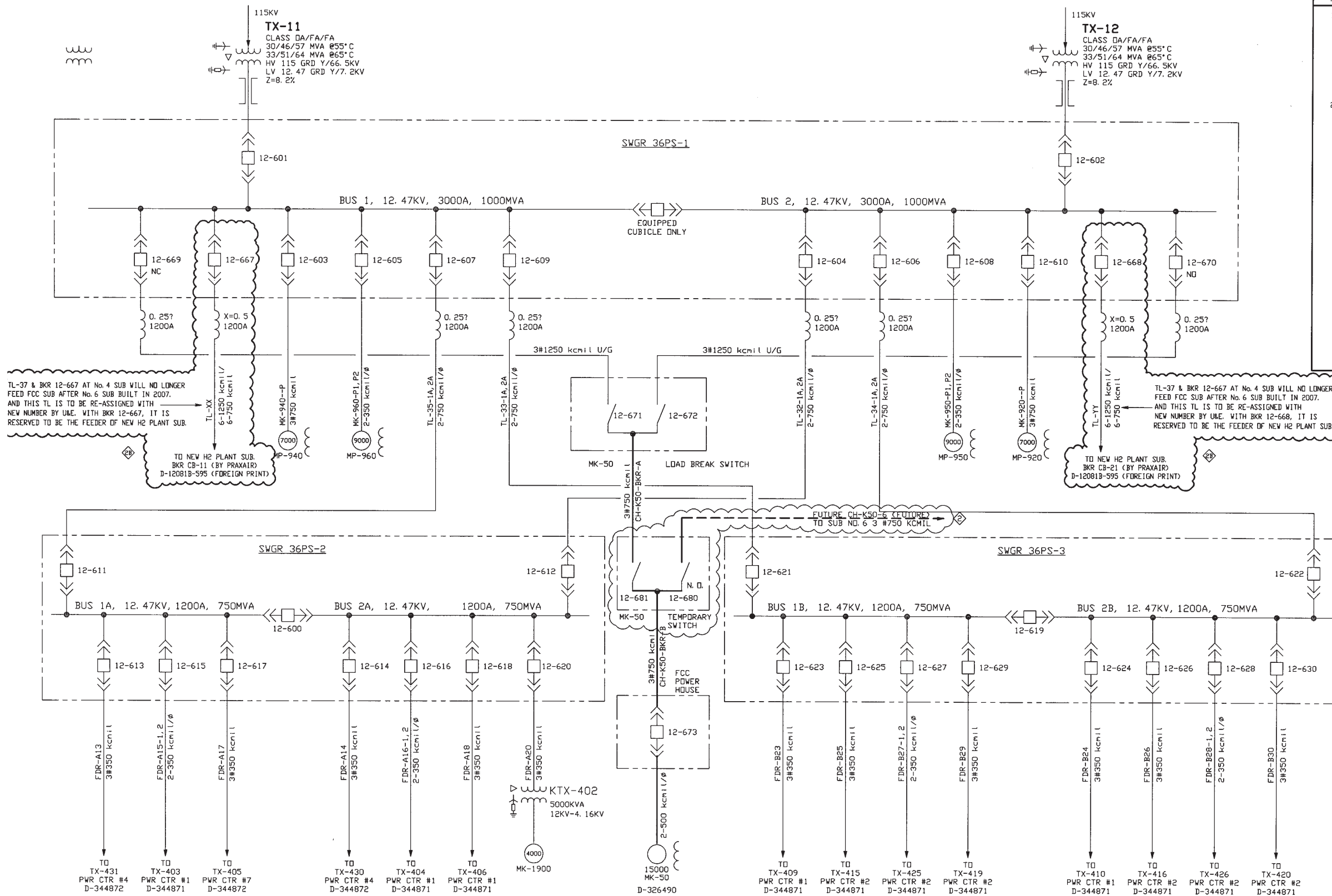


FIGURE 2.1-9
PRAXAIR COMPOSITE
SINGLE-LINE DIAGRAM
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA



NOTES:

- NEUTRAL GROUNDING TRANSFORMERS**
 7500 KVA - 400A LOW RESISTANCE
 5000 KVA - 400A LOW RESISTANCE
 3750 KVA - 400A LOW RESISTANCE
 1000 KVA - FDR 480V TRANSF SECONDARY HIGH RESISTANCE GROUNDING SEE DWG C-231986
 CAPTIVE TRANSF - 5A HIGH RESISTANCE
- ISOMAX SUB 2 HAS C-B-A OR (3-2-1) PHASE SEQUENCE ROTATION. RLOP FEEDER SUB 4 HAS A-B-C (1-2-3) PHASE SEQUENCE ROTATION. PARALLELING POWER FROM TWO DIFFERENT SUBS WITH Δ/Y STEP DOWN TRANSFORMATION MAY CREATE 60° OUT OF PHASE SEQUENCE.

PHASE SEQUENCE X1, X2, X3

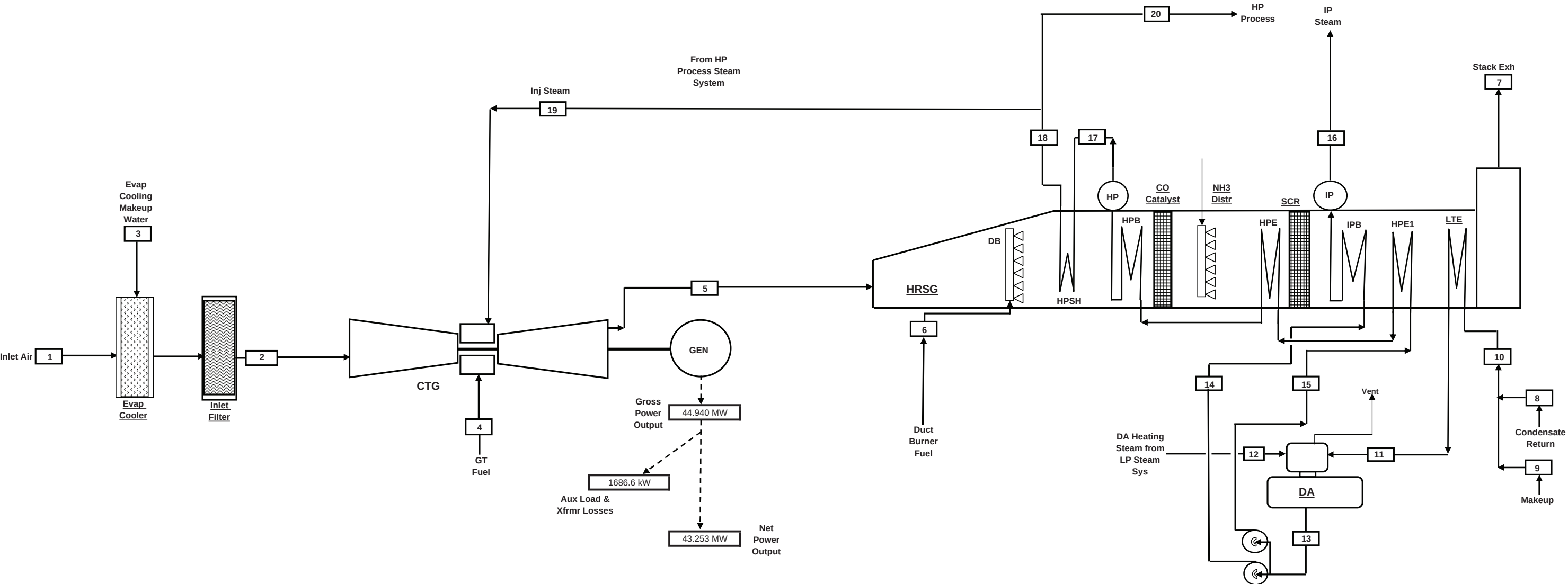
SYSTEM PHASING

PHASE SEQ ACB

P G & E
115 KV

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FIGURE 2.1-10
HYDROGEN PLANT ELECTRICAL TIE-IN TO SUB 4
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA

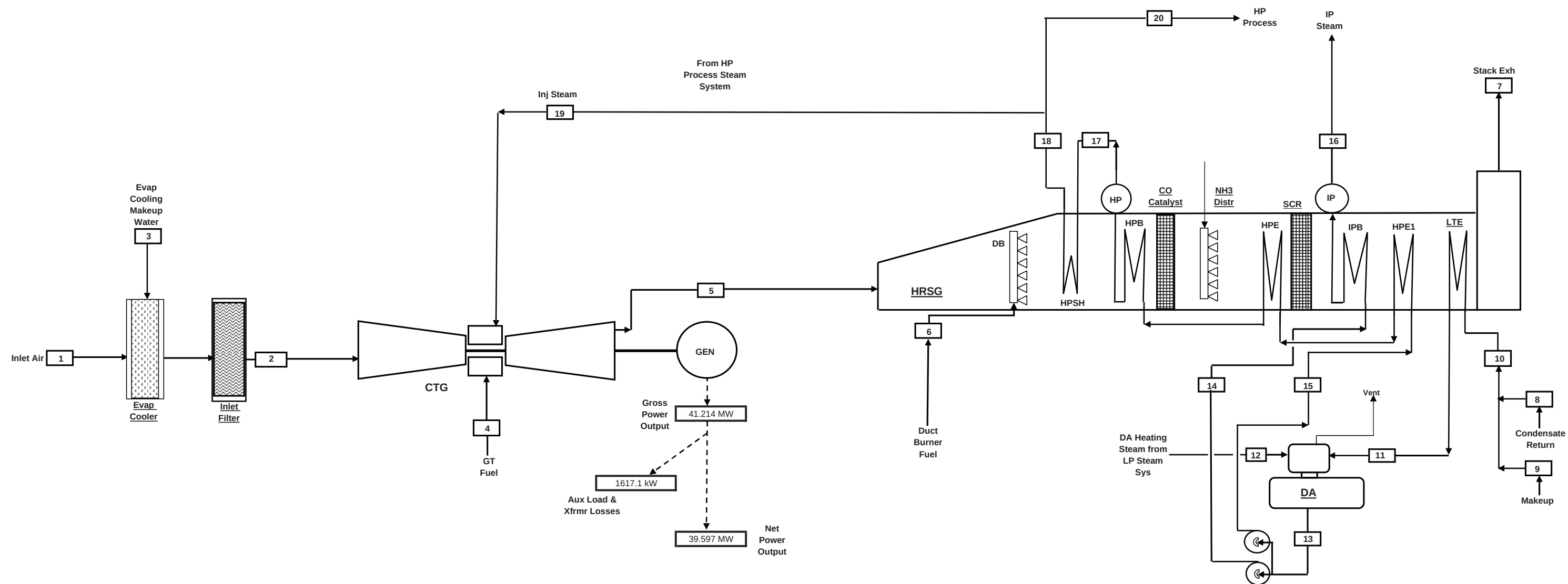


Stream No	1	2	3	4	5	6	7	8	9	10	11
Description	Ambient Air	Compressor Inlet	Evap Cooling MU	GT Fuel In	CTG Exhaust	DB Fuel	Stack Exh	Cond Return	Cycle Makeup	LTE Feed	Deaerator Feed
Flow Rate (kpph)	1147 kpph	1148 kpph	1.5 kpph	27 kpph	1205 kpph	16.01 kpph	1221 kpph	180 kpph	266 kpph	446 kpph	446 kpph
Temperature (F)	60 °F	54 °F	70 °F	70 °F	1017 °F	70 °F	162 °F	180 °F	70 °F	115 °F	211 °F
Pressure	15 psia	14 psia	89 psia	253 psia	15 psia	253 psia	15 psia	89 psia	89 psia	89 psia	20 psia

Stream No	12	13	14	15	16	17	18	19	20	21	22
Description	DA Htg Steam	FW after DA	IP BFWP Disch	FW to HPE1	IPB Steam Out	HPB Steam Out	HPSH Steam Out	GT Strm Inj	HP Proc Steam	IP Blowdown	HP Blowdown
Flow Rate (kpph)	8 kpph	454 kpph	12 kpph	442 kpph	13 kpph	437 kpph	437 kpph	30 kpph	437 kpph	0.13 kpph	4.4 kpph
Temperature (F)	250 °F	227 °F	228 °F	229 °F	302 °F	532 °F	777 °F	550 °F	770 °F	302 °F	532 °F
Pressure	30 psia	20 psia	70 psia	1057 psia	69 psia	903 psia	891 psia	650 psia	865 psia	69 psia	903 psia

Frame 6B - Heat & Mass Balance
Average Ambient Case
Full Output Power
Duct Firing to 1800 F
60 °F, 65% RH Ambient Temp
CTG Inlet Evap Cooled

FIGURE 2.1-11
COGEN 3000 - HEAT BALANCE
(AVERAGE AMBIENT - 60°F)
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA

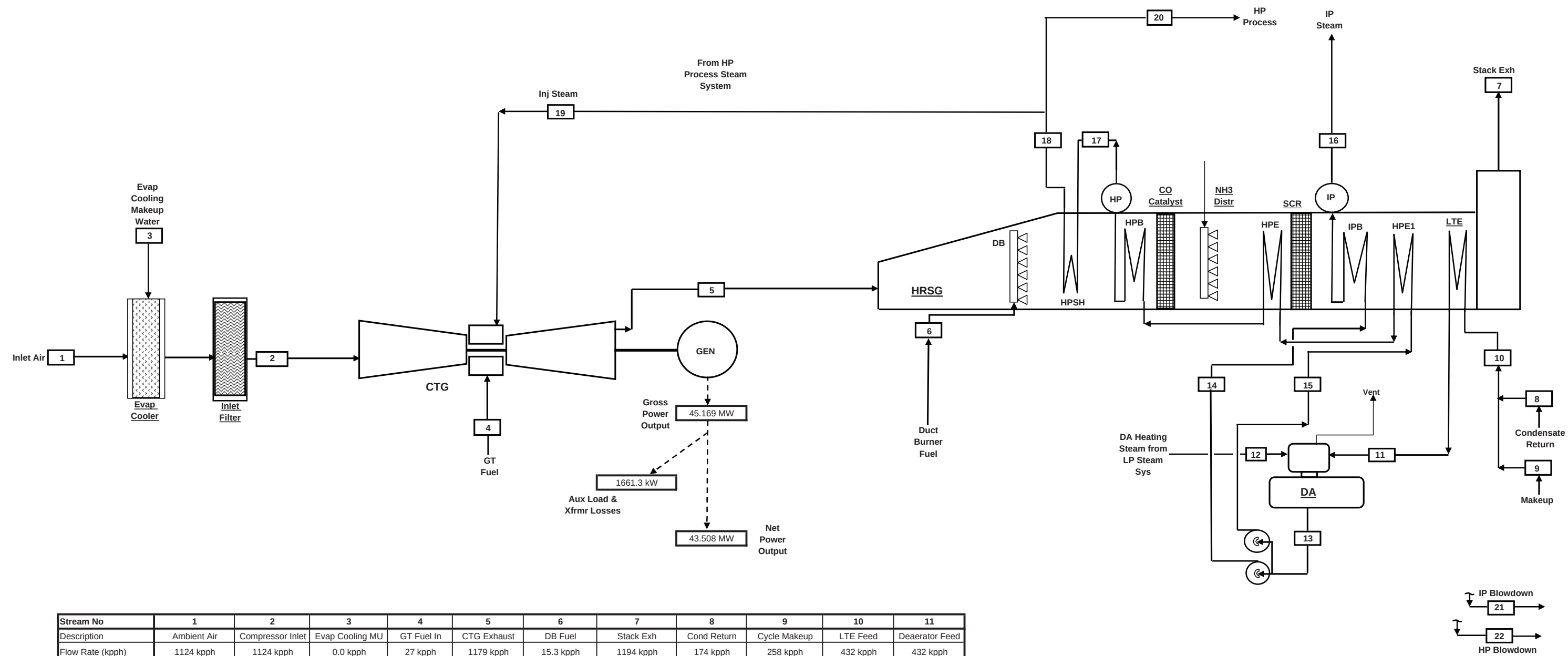


Stream No	1	2	3	4	5	6	7	8	9	10	11
Description	Ambient Air	Compressor Inlet	Evap Cooling MU	GT Fuel In	CTG Exhaust	DB Fuel	Stack Exh	Cond Return	Cycle Makeup	LTE Feed	Deaerator Feed
Flow Rate (kpph)	1074 kpph	1081 kpph	6.3 kpph	25 kpph	1133 kpph	14.9 kpph	1148 kpph	171 kpph	252 kpph	423 kpph	423 kpph
Temperature (F)	105 °F	79 °F	70 °F	70 °F	1034 °F	70 °F	159 °F	180 °F	70 °F	115 °F	210 °F
Pressure	15 psia	14 psia	89 psia	253 psia	15 psia	253 psia	15 psia	89 psia	89 psia	89 psia	20 psia

Stream No	12	13	14	15	16	17	18	19	20	21	22
Description	DA Htg Steam	FW after DA	IP BFWP Disch	FW to HPE1	IPB Steam Out	HPB Steam Out	HPSH Steam Out	GT Strm Inj	HP Proc Steam	IP Blowdown	HP Blowdown
Flow Rate (kpph)	8 kpph	430 kpph	11 kpph	420 kpph	12 kpph	413 kpph	413 kpph	27 kpph	415 kpph	0.12 kpph	4.1 kpph
Temperature (F)	250 °F	227 °F	228 °F	229 °F	301 °F	532 °F	784 °F	550 °F	770 °F	301 °F	532 °F
Pressure	30 psia	20 psia	69 psia	1019 psia	68 psia	899 psia	888 psia	650 psia	865 psia	68 psia	899 psia

Frame 6B - Heat & Mass Balance
Max Ambient Case
 Full Output Power
 Duct Firing to 1800 F
 105 °F, 25% RH Ambient Temp
 CTG Inlet Evap Cooled

FIGURE 2.1-12
COGEN 3000 - HEAT BALANCE
(MAXIMUM AMBIENT - 105°F)
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA



Stream No	1	2	3	4	5	6	7	8	9	10	11
Description	Ambient Air	Compressor Inlet	Evap Cooling MU	GT Fuel In	CTG Exhaust	DB Fuel	Stack Exh	Cond Return	Cycle Makeup	LTE Feed	Deaerator Feed
Flow Rate (kpph)	1124 kpph	1124 kpph	0.0 kpph	27 kpph	1179 kpph	15.3 kpph	1194 kpph	174 kpph	258 kpph	432 kpph	432 kpph
Temperature (F)	35 °F	35 °F	70 °F	70 °F	1024 °F	70 °F	161 °F	180 °F	70 °F	115 °F	211 °F
Pressure	15 psia	15 psia	89 psia	253 psia	15 psia	253 psia	15 psia	89 psia	89 psia	89 psia	20 psia

Stream No	12	13	14	15	16	17	18	19	20	21	22
Description	DA Htg Steam	FW after DA	IP BFWP Disch	FW to HPE1	IPB Steam Out	HPB Steam Out	HPSH Steam Out	GT Stm Inj	HP Proc Steam	IP Blowdown	HP Blowdown
Flow Rate (kpph)	7 kpph	439 kpph	12 kpph	428 kpph	13 kpph	422 kpph	422 kpph	28 kpph	423 kpph	0.13 kpph	4.2 kpph
Temperature (F)	250 °F	227 °F	228 °F	229 °F	302 °F	532 °F	778 °F	550 °F	770 °F	302 °F	532 °F
Pressure	30 psia	20 psia	69 psia	1044 psia	69 psia	900 psia	889 psia	650 psia	865 psia	69 psia	900 psia

Frame 6B - Heat & Mass Balance
 Min Ambient Case
 Full Output Power
 Duct Firing to 1740 F
 35 °F, 90% RH Ambient Temp

FIGURE 2.1-13
COGEN 3000 - HEAT BALANCE
(MINIMUM AMBIENT - 35°F)
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA

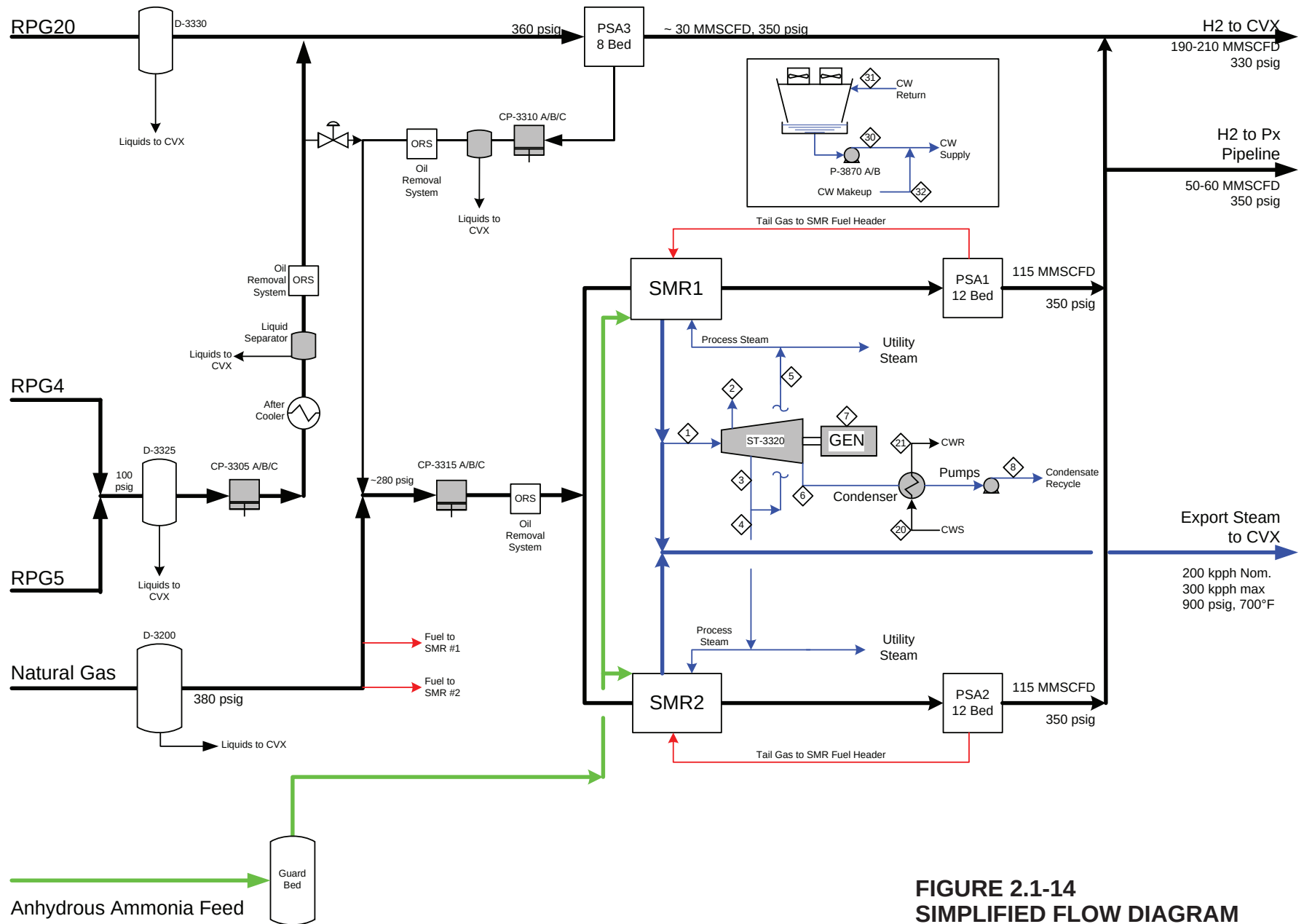


FIGURE 2.1-14
SIMPLIFIED FLOW DIAGRAM
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA

Case 1: 1% Hot Day Case (Design Basis)

Dry Bulb Temperature	85 °F											
Mean Coincident Wet Bulb Temp	68 °F											
Cooling Water Temp	80 °F											
Relative Humidity	41.1 %											
Humidity Ratio	0.01075 lbs H2O/lbs air											
Power Generation	17,822 kW											
Steam Number	1	1A	2	3	4	5	6	20	21	30	31	32
Description	Turbine Inlet	Turbine Inlet less Gland Losses	Gland Losses	Extraction Flow	Plant 2 Process + Utility Steam	Plant 1 Process + Utility Steam	Condensate Flow	CW To Condenser	CW From Condenser	CWS from Tower	CWR to Tower	CW Makeup
Temperature (F)	704.0	704.0	704.0	582.0	582.0	582.0	126.1	80.0	97.2	79.9	97.2	70.0
Pressure (psig)	960.0	960.0	960.0	535.0	535.0	535.0	100.0	60.3	55.3	0.0	55.3	0.0
Mass Flow (lb/hr)	363,784	360,146	3,638	210,120	105,060	105,060	150,026	7,855,466	7,855,466	7,740,050	7,855,466	115,416
Heat Flow (Btu/hr)	-2.01E+09	-1.99E+09	-2.01E+07	-1.17E+09	-5.85E+08	-5.85E+08	-1.01E+09	-5.34E+10	-5.33E+10	-5.34E+10	-5.33E+10	-7.86E+08
Molecular Weight	18.02	18.02	18.02	18.02	18.02	18.02	18.02	18.02	18.02	18.02	18.02	18.02

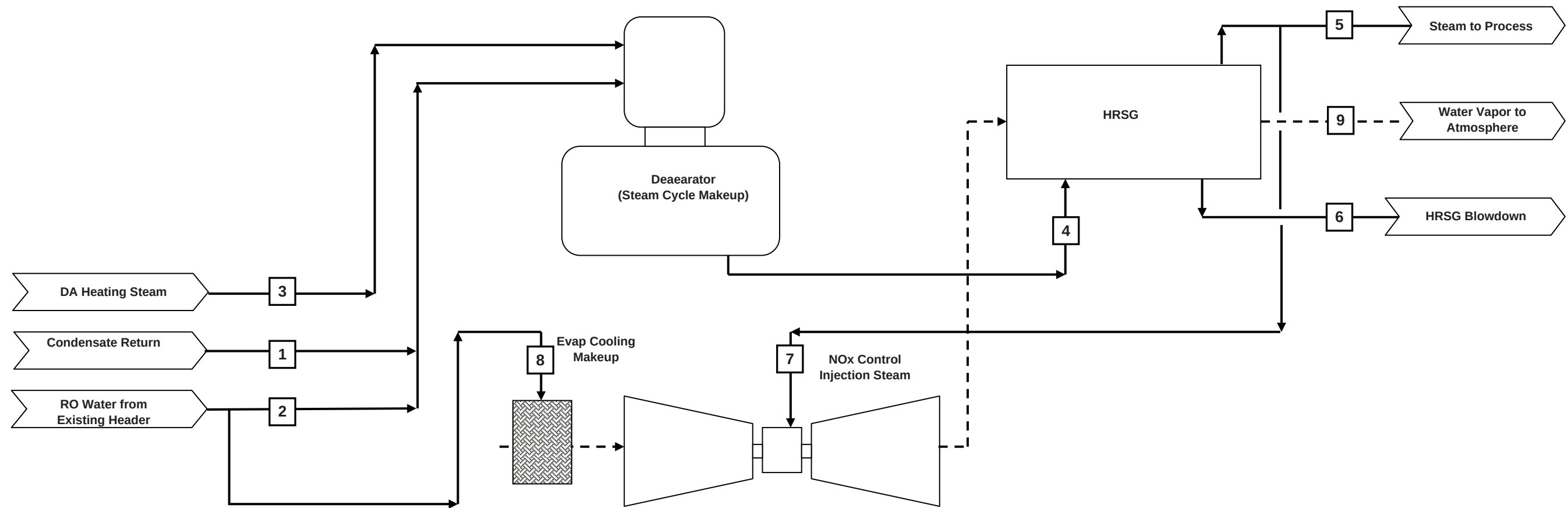
Case 2: Average Day Case

Dry Bulb Temperature	60 °F											
Mean Coincident Wet Bulb Temp	54 °F											
Cooling Water Temp	64 °F											
Relative Humidity	67.7 %											
Humidity Ratio	0.00749 lbs H2O/lbs air											
Power Generation	17,822 kW											
Steam Number	1	1A	2	3	4	5	6	20	21	30	31	32
Description	Turbine Inlet	Turbine Inlet less Gland Losses	Gland Losses	Extraction Flow	Plant 2 Process + Utility Steam	Plant 1 Process + Utility Steam	Condensate Flow	CW To Condenser	CW From Condenser	CWS from Tower	CWR to Tower	CW Makeup
Temperature (F)	704.0	704.0	704.0	582.0	582.0	582.0	126.1	64.0	91.8	64.1	91.8	70.0
Pressure (psig)	960.0	960.0	960.0	535.0	535.0	535.0	100.0	45.0	40.0	0.0	40.0	0.0
Mass Flow (lb/hr)	363,784	360,146	3,638	210,120	105,060	105,060	150,026	4,837,900	4,837,900	4,740,552	4,837,900	97,348
Heat Flow (Btu/hr)	-2.01E+09	-1.99E+09	-2.01E+07	-1.17E+09	-5.85E+08	-5.85E+08	-1.01E+09	-3.30E+10	-3.28E+10	-3.30E+10	-3.28E+10	-6.63E+08
Molecular Weight	18.02	18.02	18.02	18.02	18.02	18.02	18.02	18.02	18.02	18.02	18.02	18.02

Case 3: 1% Cold Day Case

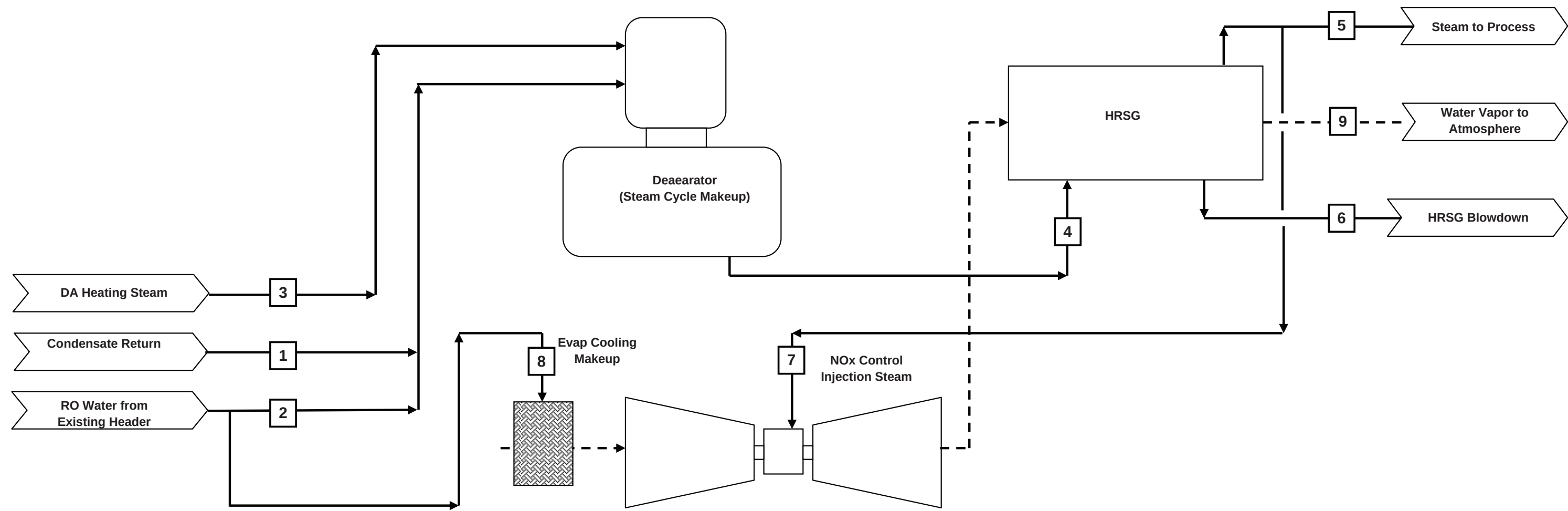
Dry Bulb Temperature	43 °F											
Mean Coincident Wet Bulb Temp	40 °F											
Cooling Water Temp	50 °F											
Relative Humidity	77.5 %											
Humidity Ratio	0.00452 lbs H2O/lbs air											
Power Generation	17,822 kW											
Steam Number	1	1A	2	3	4	5	6	20	21	30	31	32
Description	Turbine Inlet	Turbine Inlet less Gland Losses	Gland Losses	Extraction Flow	Plant 2 Process + Utility Steam	Plant 1 Process + Utility Steam	Condensate Flow	CW To Condenser	CW From Condenser	CWS from Tower	CWR to Tower	CW Makeup
Temperature (F)	704.0	704.0	704.0	582.0	582.0	582.0	126.1	50.0	88.6	50.5	88.6	70.0
Pressure (psig)	960.0	960.0	960.0	535.0	535.0	535.0	100.0	45.0	40.0	0.0	40.0	0.0
Mass Flow (lb/hr)	363,784	360,146	3,638	210,120	105,060	105,060	150,026	3,489,308	3,489,308	3,403,402	3,489,308	85,906
Heat Flow (Btu/hr)	-2.01E+09	-1.99E+09	-2.01E+07	-1.17E+09	-5.85E+08	-5.85E+08	-1.01E+09	-2.38E+10	-2.37E+10	-2.38E+10	-2.37E+10	-5.85E+08
Molecular Weight	18.02	18.02	18.02	18.02	18.02	18.02	18.02	18.02	18.02	18.02	18.02	18.02

FIGURE 2.1-15
H2 STG AND H&M BALANCE
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA



Stream No	1	2	3	4	5	6	7	8	9
Description	Condensate Return	Steam Cycle Makeup	DA Heating Steam	FW to HRSG	Steam to Process	HRSG Blowdown	Steam Injection to CTG	Evap Cooler Makeup	Water Vapor to Atmosphere
Flow	180.2 kpph	266.1 kpph	7.6 kpph	453.9 kpph	413.3 kpph	3.3 kpph	29.8 kpph	1.5 kpph	31.3 kpph
Flow (gpm)	360.4 gpm	532.2 gpm	15.1 gpm	907.71 gpm	826.5 gpm	6.5 gpm	60 gpm	3 gpm	63 gpm

FIGURE 2.1-16
COGEN 3000 WATER BALANCE
(AVERAGE AMBIENT - 60°F)
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA



Stream No	1	2	3	4	5	6	7	8	9
Description	Condensate Return	Steam Cycle Makeup	DA Heating Steam	FW to HRSG	Steam to Process	HRSG Blowdown	Steam Injection to CTG	Evap Cooler Makeup	Water Vapor to Atmosphere
Flow	174.4 kpph	257.1 kpph	7.7 kpph	439.2 kpph	399.3 kpph	3.1 kpph	28.2 kpph	3.9 kpph	32.0 kpph
Flow (gpm)	348.8 gpm	514.2 gpm	15.3 gpm	878.33 gpm	798.5 gpm	6.2 gpm	56 gpm	8 gpm	64 gpm

FIGURE 2.1-17
COGEN 3000 WATER BALANCE
(MAXIMUM AMBIENT - 85°F)
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA

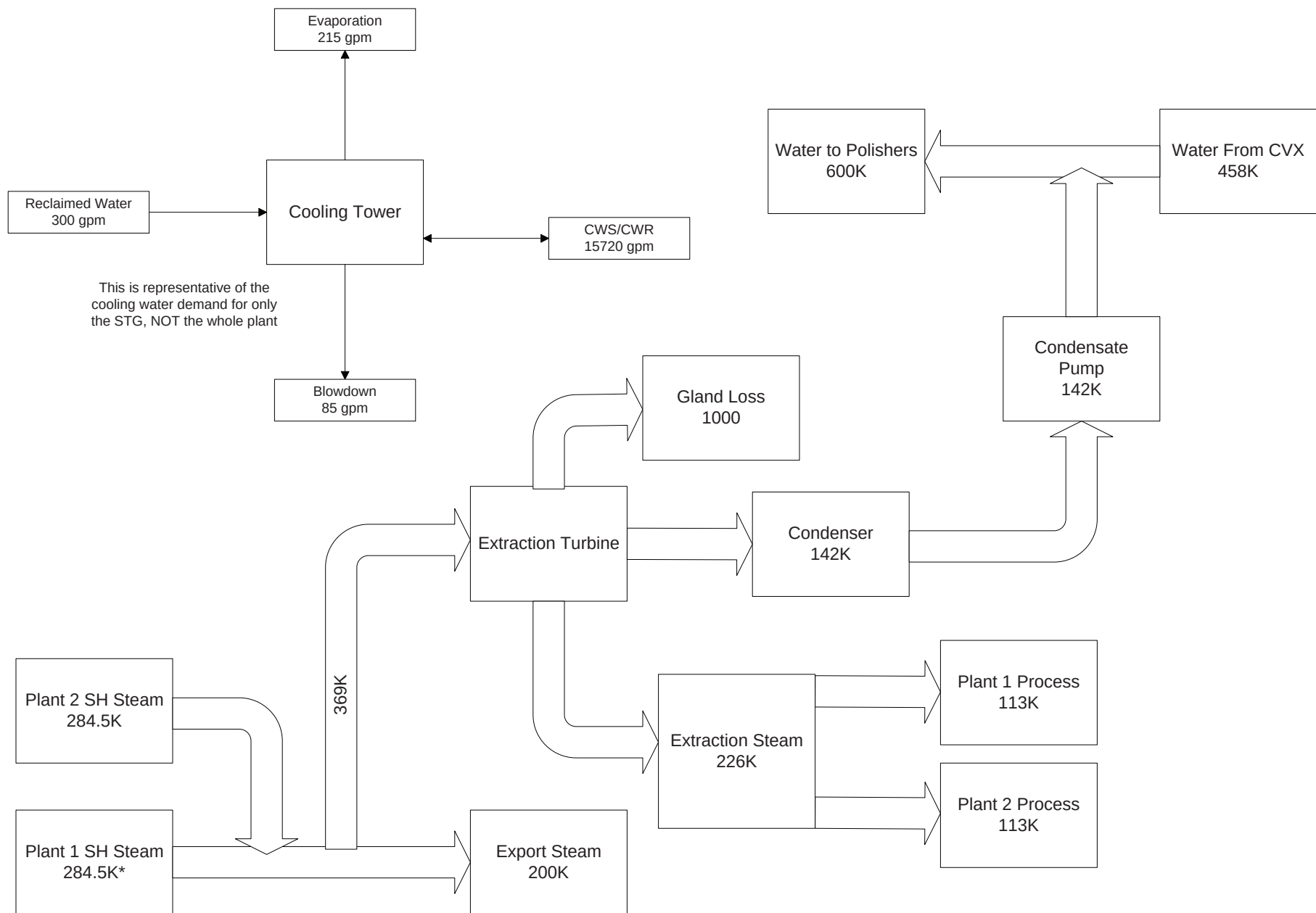
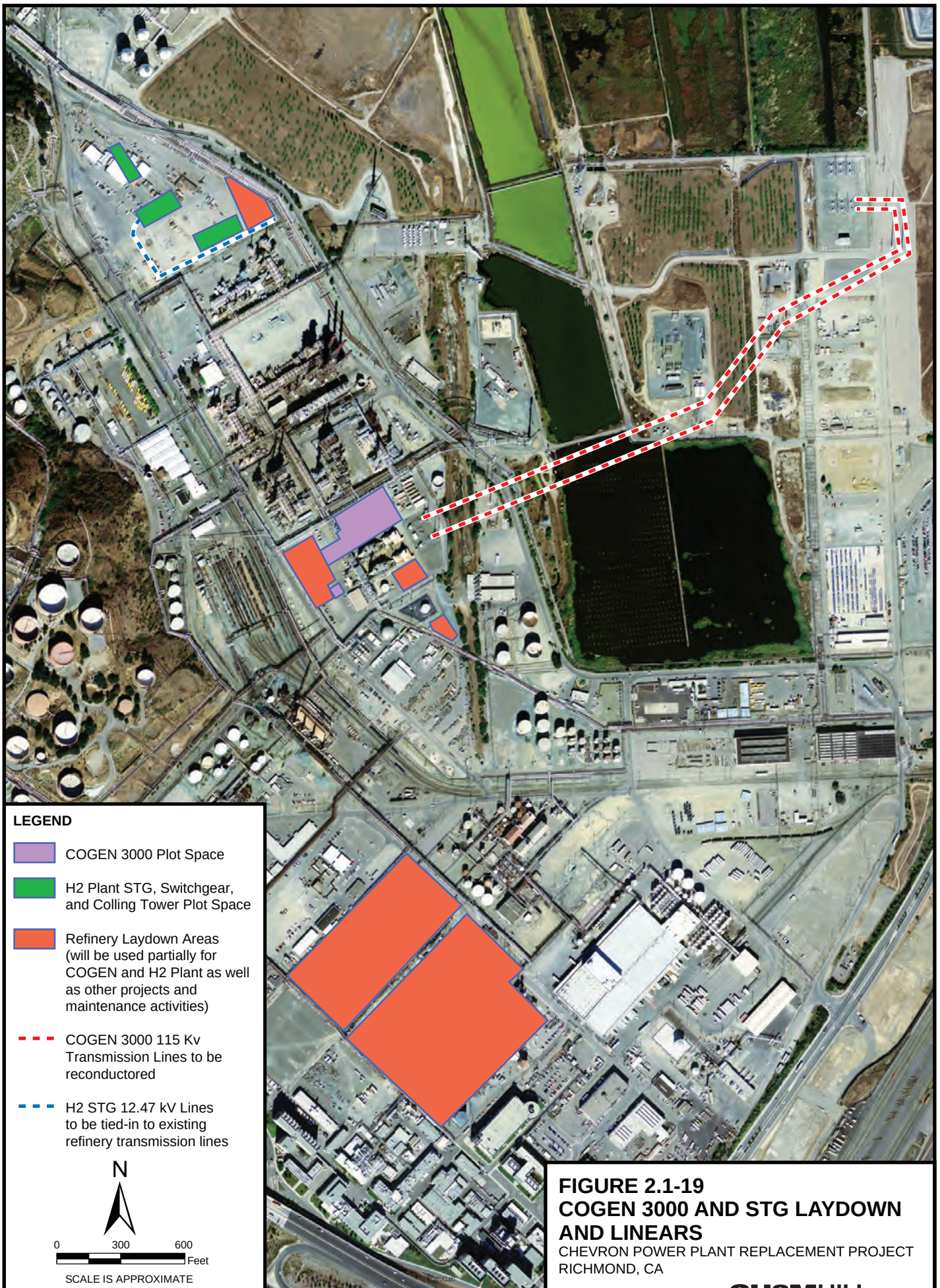


FIGURE 2.1-18
AVERAGE WATER BALANCE FOR THE H2 STG
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA

*Process flows in pounds per hour



SECTION 3.0

Demand Conformance

As of January 1, 2000, the California Energy Commission (CEC) is no longer required to determine if a proposed project conforms with an integrated assessment of need. Senate Bill 110, which took effect on January 1, 2000 (Cal. Const. Art. 4, Section 8), states:

“Before the California electricity industry was restructured the regulated cost recovery framework for power plants justified requiring the commission to determine the need for new generation, and site only power plants for which need was established. Now that power plant owners are at risk to recover their investments, it is no longer appropriate to make this determination.”

Facility Closure

4.1 Introduction

Facility closure can be temporary or permanent. Temporary closure is defined as a shutdown for a period exceeding the time required for normal maintenance, including for overhaul or replacement of the electrical generation equipment and related facilities. Causes for temporary closure include a disruption in the supply of raw materials or damage due to earthquake, fire, storm, or other natural acts. Permanent closure is defined as a cessation in operations with no intent to restart operations owing to equipment age, damage to the equipment beyond repair, economic conditions, or other reasons. As the Power Plant Replacement Project (PPRP, or the Project) is integral to the Chevron Richmond Refinery's operation, temporary closure of the proposed Project will be unlikely. Therefore, the remainder of this section addresses the permanent closure of the Project.

4.2 Permanent Closure

Chevron is routinely in a position of decommissioning units after installation of replacement process units. The decommissioned units remain in place after the necessary decommissioning activities occur to that ensure that workers, public safety, and the environment are protected. In most cases this involves the removal of product from storage facilities and piping and disposal of waste materials. Piping and equipment is then sealed until demolition occurs. All wastes are disposed of according to applicable laws, ordinances, regulations, and standards (LORS).

Removal of decommissioned units is an ongoing activity at the Refinery. When decommissioned units are scheduled for removal, Chevron applies to the City of Richmond for demolition and grading permits.

SECTION 5.0

Electric Transmission

5.1 Introduction

This section describes the electric transmission facilities associated with the Chevron Power Plant Replacement Project (PPRP) located in the City of Richmond (City), California. Section 5.2 discusses the laws, ordinances, regulations, and standards (LORS) associated with the PPRP facility. Section 5.3 provides a description of the transmission facilities. Section 5.4 addresses the transmission interconnection engineering. Section 5.5 addresses transmission line safety and nuisance.

5.2 Applicable Laws, Ordinances, Regulations, and Standards

This section provides a list of LORS that apply to the proposed subtransmission line engineering as well as subtransmission line safety and nuisance.

5.2.1 Federal

There are no federal LORS related to transmission system engineering or transmission line safety and nuisance.

5.2.2 State

5.2.2.1 Design and Construction

Table 5.2-1 lists the LORS applicable to the design and construction of the proposed transmission line.

TABLE 5.2-1
Design and Construction LORS

LORS	Applicability
Title 8 CCR, Section 2700 et seq. "High Voltage Electrical Safety Orders"	Establishes essential requirements and minimum standards for installation, operation, and maintenance of electrical installation and equipment to provide practical safety and freedom from danger.
ANSI/IEEE 693 "IEEE Recommended Practices for Seismic Design of Substations"	Provides recommended design and construction practices.
IEEE 1119 "IEEE Guide for Fence Safety Clearances in Electric-Supply Stations"	Provides recommended clearance practices to protect persons outside the facility from electric shock.
IEEE 998 "Direct Lightning Strike Shielding of Substations"	Provides recommendations to protect electrical system from direct lightning strikes.
IEEE 980 "Containment of Oil Spills for Substations"	Provides recommendations to prevent release of fluids into the environment.

Notes:

ANSI = American National Standards Institute

CCR = California Code of Regulations

IEEE = Institute of Electrical and Electronics Engineers

5.2.2.2 Electric and Magnetic Fields

The LORS pertaining to electric and magnetic field (EMF) interference are shown in Table 5.2-2.

TABLE 5.2-2
Electric and Magnetic Field LORS

LORS	Applicability
ANSI/IEEE 644-1994 "Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines."	Standard procedure for measuring EMF from an electric line that is in service.

5.2.2.3 Hazardous Shock

Table 5.2-3 lists the LORS regarding hazardous shock protection for the PPRP.

TABLE 5.2-3
Hazardous Shock LORS

LORS	Applicability
Title 8 CCR Section 2700 et seq., "High Voltage Electrical Safety Orders."	Establishes essential requirements and minimum standards for installation, operation, and maintenance of electrical equipment to provide practical safety and freedom from danger.
ANSI/IEEE 80 "IEEE Guide for Safety in AC Substation Grounding."	Presents guidelines for assuring safety through proper grounding of AC outdoor substations.
NESC, ANSI C2, Section 9, Article 92, Paragraph E; Article 93, Paragraph C.	Covers grounding methods for electrical supply and communications facilities.

Note:

NESC = National Electric Safety Code

5.2.2.4 Communication Interference

The LORS pertaining to communication interference are shown in Table 5.2-4.

TABLE 5.2-4
Communications Interference LORS

LORS	Applicability
Title 47 Code of Federal Regulations (CFR) Section 15.25, "Operating Requirements, Incidental Radiation."	Prohibits operation of any device emitting incidental radiation that causes interference to communications. The regulation also requires mitigation for any device that causes interference.
California Energy Commission (CEC) staff, Radio Interference and Television Interference (RI-TVI) Criteria (Kern River Cogeneration Project 82-AFC-2, Final Decision, Compliance Plan 13-7).	Prescribes the CEC's RI-TVI mitigation requirements, developed and adopted by the CEC in past siting cases.

5.2.2.5 Aviation Safety

Table 5.2-5 lists the aviation safety LORS that may apply to the proposed construction and operation of the PPRP.

TABLE 5.2-5
Aviation Safety LORS

LORS	Applicability
Title 14 CFR Part 77 "Objects Affecting Navigable Air Space."	Describes the criteria used to determine whether a "Notice of Proposed Construction or Alteration" (NPCA, FAA Form 7460-1) is required for potential obstruction hazards.
Federal Aviation Administration (FAA) Advisory Circular No. 70/7460-1G, "Obstruction Marking and Lighting."	Describes the FAA standards for marking and lighting of obstructions as identified by Federal Aviation Regulations Part 77.

5.2.2.6 Fire Hazards

Table 5.2-6 shows the LORS governing fire hazard protection for the PPRP.

TABLE 5.2-6
Fire Hazard LORS

LORS	Applicability
Title 14 CCR Sections 1250-1258, "Fire Prevention Standards for Electric Utilities."	Provides specific exemptions from electric pole and tower firebreak and electric conductor clearance standards, and specifies when and where standards apply.
ANSI/IEEE 80 "IEEE Guide for Safety in AC Substation Grounding."	Presents guidelines for assuring safety through proper grounding of AC outdoor substations.
General Order 95 (GO-95), CPUC, "Rules for Overhead Electric Line Construction" Section 35.	CPUC rule covers all aspects of design, construction, operation, and maintenance of electrical transmission line and fire safety (hazards).

Notes:

CPUC = California Public Utilities Commission

IEEE = Institute of Electrical and Electronics Engineers

In addition to the above LORS, Chevron voluntarily adopts portions of CPUC general orders and decisions listed in Table 5.2-7 for incorporation into Chevron standards.

TABLE 5.2-7
CPUC General Orders and Decisions

LORS	Applicability
General Order 95 (GO-95), CPUC, "Rules for Overhead Electric Line Construction."	CPUC rule covers required clearances, grounding techniques, maintenance, and inspection requirements.
General Order 128 (GO-128), CPUC, "Rules for Construction of Underground Electric Supply and Communications Systems."	Establishes requirements and minimum standards to be used for the station AC power and communications circuits.
General Order 52 (GO-52), CPUC, "Construction and Operation of Power and Communication Lines."	Applies to the design of facilities to provide or mitigate inductive interference. Covers all aspects of the construction, operation, and maintenance of power and communication lines and specifically applies to the prevention or mitigation of inductive interference.
CPUC Decision 93-11-013.	CPUC position on EMF reduction.
General Order 131-D (GO-131), CPUC, Rules for Planning and Construction of Electric Generation, Line, and Substation Facilities in California.	CPUC construction-application requirements, including requirements related to EMF reduction.
Public Utilities Code (PUC), Sections 21656-21660.	Discusses the permit requirements for construction of possible obstructions in the vicinity of aircraft landing areas, in navigable air space, and near the boundary of airports.

5.2.3 Local

There are no local LORS related to transmission system engineering or transmission line safety and nuisance.

5.3 Transmission Facilities

The PPRP cogeneration plant (Cogen 3000) will require reconductoring of approximately 4,000 feet of existing, Refinery-owned double-circuit 115-kV transmission lines (Cogen Lines 1 & 2) located entirely within the Refinery property. The reducted line will extend from the existing Chevron Substation 5 adjacent to the PPRP site (Figure 5.3-1) to the Standard Oil Switching Station (SOSS). The SOSS is the point of common coupling with PG&E and interties to existing PG&E 115-kV El Sobrante 1 and 2 transmission lines. Substation 5 and SOSS, like Cogen Lines 1 & 2, are located completely within the boundaries of the Refinery. The physical layout of the lines, including the towers and poles, is shown schematically in Figure 5.3-2. A single-line diagram of the 115-kV interconnection including both Cogen 3000 and the proposed hydrogen plant steam turbine generator (STG) is shown in Figure 5.3-3. The proposed new hydrogen plant STG switchgear will inter-tie to the existing 12.47-kV switchgear at Substation 4 via new and existing dual 12.47-kV power cables within the Refinery. The new approximately 1,500-foot section of 12.47-kV power cables will be routed in conduit along the new piperack to be installed in the hydrogen plant

to the existing piperack where it will tie-in to existing power cables that are routed on poles to Substation 4.

Given the short distance of the transmission line route, alternative interconnections were not considered.

5.4 Transmission Interconnection Engineering

Load flow studies are expected to indicate that there is adequate system performance of the existing SOSS, El Sobrante 1 and 2 transmission lines and beyond to facilitate the interconnection without significant impacts. An interconnect application for the proposed additional generation and modified interconnection to SOSS was submitted to PG&E on May 21, 2007. As a result of this application, PG&E will perform a facility study and make a determination of whether a System Impact Study (SIS) is required. If they determine that an SIS is required, they will proceed with it following the facility study. The SIS will document PG&E's findings, including an evaluation of "N-1" contingencies, transients and short-circuit analysis. The SIS is expected to be completed by early October 2007 and will be submitted to the CEC as soon as it is available.

5.5 Transmission Line Safety and Nuisance

5.5.1 Electrical Clearances

Typical high-voltage overhead transmission lines are composed of bare conductors connected to supporting structures by means of porcelain, glass, or plastic insulators. The air surrounding the energized conductor acts as the insulating medium. Maintaining sufficient clearances, or air space, around the conductors to protect the public and utility workers is paramount to safe operation of the line. The safety clearance required around the conductors is determined by normal operating voltages, conductor temperature, short-term abnormal voltages, wind-blown swinging conductors, contamination of the insulators, clearances for workers, and clearances for public safety. Minimum clearances are specified in the CPUC General Order 95 (GO-95). Utilities, regulators, and local ordinances may specify additional clearances. Clearances are specified for:

- Distance between each energized conductor
- Distance between the energized conductors and the supporting structure
- Distance between the energized conductors and other power or communication wires on the same supporting structure, or between other power or communication wires above or below the conductors
- Distance from the energized conductors to the ground and features such as roadways, railroads, driveways, parking lots, navigable waterways, etc.
- Distance from the energized conductors to buildings and signs
- Distance from the energized conductors to other parallel power lines

The proposed reconductoring of the 115-kV transmission interconnection will be designed to meet all applicable code clearance requirements. The dimensions of the existing transmission structures will not be substantively modified to accommodate the higher ampacity conductors. The minimum ground clearance for 115-kV conductors per GO-95 is 30 feet, based on the road-crossing minimum. This is the design clearance for the 60° F operating temperature of the line. The new conductors will be composite core type ACCC (aluminum compact conductor, composite core) with very low sag values at high temperature. The higher tensile strength of the composite core and its corresponding lower sag allows the same sized ACCC conductors as the existing AAC (aluminum conductor aluminum core) to carry substantially higher values of current. The final design value will be consistent with GO-95.

5.5.2 Electrical Effects

The electrical effects of high-voltage transmission lines fall into two broad categories: corona effects and field effects. Corona is the ionization of the air that occurs at the surface of the energized conductor and suspension hardware due to very high electric field strength at the surface of the metal during certain conditions. Corona may result in radio and television reception interference, audible noise, light, and production of ozone. Field effects are the voltages and currents that may be induced in nearby conducting objects. A transmission line's 60 Hertz (Hz) electric and magnetic fields cause these effects.

5.5.2.1 Electric and Magnetic Field Evaluation

Power lines, electrical wiring, and electrical machinery and appliances all produce electric and magnetic fields, commonly referred to as EMF. The EMF produced by the power system of the United States has a frequency of 60 Hz, meaning that the intensity and orientation of the field changes 60 times per second.

The 60-Hz power line fields are considered extremely low frequency as compared to AM radio, which operates at up to 1,600,000 Hz (1,600 kHz); television at 890,000,000 Hz (890 MHz); cellular telephones at 900 MHz; microwave ovens at 2,450,000,000 Hz (2.4 GHz); and X-rays at about 1 billion Hz. Higher frequency fields have shorter wavelengths (the wavelength is the physical distance between repeating units of a wave pattern) and greater energy in the field. Microwave wavelengths are several inches and have enough energy to cause heating in conducting objects. Higher frequencies such as X-rays have enough energy to cause ionization (breaking of molecular bonds.) At the frequency associated with electric power transmission (60 Hz), the electric and magnetic fields have a wavelength of 3,100 miles and have very low energy that does not cause heating or ionization.

Transmission line electric fields are produced by electrical charges (voltage) on the energized conductor. The electric field strength is directly proportional to the line's voltage and inversely proportional to the square of the distance from the conductors. Therefore, the electric field strength at 2 feet from a transmission line would be only one quarter of the electric field strength at 1 foot from the line. The electric field strength at 30 feet from the line would be 1/900th of the electrical field strength at 1 foot from the line. The strength of the electric fields is measured in units of kilovolts per meter (kV/m).

Magnetic fields around transmission lines are produced by the current that flows through the line conductors. The magnetic field strength is directly proportional to the line's current and inversely proportional to the square of the distance from the conductors. Therefore, the

magnetic field strength at 2 feet from a transmission line would be only one quarter of the magnetic field strength at 1 foot from the line. The magnetic field strength at 30 feet from the line would be $1/900^{\text{th}}$ of the magnetic field strength at 1 foot from the line. Magnetic fields are expressed in units of milligauss (mG).

Power transmission line design also affects the strength of the EMF generated. Load or phase balancing for overhead transmission lines and distance between electrical conductor wires can make a very significant difference in the measurable EMF. The magnetic fields created by balanced current flow between the three conductors of a transmission line will tend to cancel each other so that very little EMF would be measurable at ground level.

Considerable research has been conducted over the last 30 years on the biological effects of the power frequency electric and magnetic fields. The majority of scientific and governmental reviews of the entire body of research and opinion on this subject have concluded that adverse effects are unlikely. Certain biological effects are well known and documented. However, additional research is ongoing with regard to human health effects. Because the health-effect studies have had contradictory results, and offer no conclusion about whether the fields are harmful or not, some states, California in particular, choose not to specify maximum levels of EMF. Instead, the State mandates a program of managing EMF exposure to the public, encouraging electric utilities to use low-cost techniques on new projects to reduce the levels of EMF when possible. This EMF reduction approach is integral to the design of the project.

EMF calculations were not performed for the 115-kV line because the existing line is not located on public property. There is considerable evidence that typical 115-kV EMF impacts have a limited geographic reach. Because the transmission line is approximately 1 mile from the nearest public access, no significant EMF exposure or impact to the public is expected.

5.5.2.2 Radio and Television Interference Evaluation

Electric corona occurs when the potential of a conductor in air is raised to a value that exceeds the dielectric strength of the surrounding air. Radio and television interference (RI-TVI) can occur when corona is present on a transmission line, though this phenomenon is usually limited to extra-high voltage lines (345 kV and above).

RI-TVI rarely occurs on 115-kV transmission lines because of their relatively low potential and the smooth surfaces of the conductors and hardware. In addition the transmission line will be located entirely within Refinery property. Nonetheless, any RI-TVI complaints will be investigated, and if the transmission lines are found to be at fault, appropriate remedies will be implemented. Therefore, RI-TVI is not expected to be an issue for the reconducted PPRP transmission line.

5.5.3 Aviation Safety

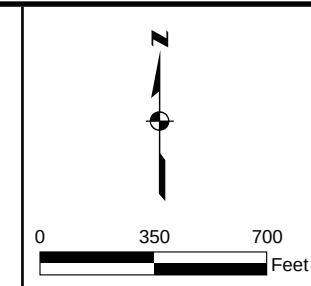
The proposed PPRP is located approximately 14 miles northwest of the nearest airport.

Federal Aviation Regulations, Part 77, establishes standards for determining obstructions in navigable air space and sets forth requirements for notification of proposed construction. These regulations require notification for any construction over 200 feet above ground level. In addition, notification is required if the obstruction is less than specified heights and falls

within restricted air space in the approach to airports. No facility components structures are required at the site that would require notification. All transmission structures are existing and will not be modified in height. Therefore, no significant aviation hazard is expected.

5.5.4 Fire Hazards

The 115-kV transmission system is designed and constructed in accordance with applicable provisions of GO-95, which establish clearances and tree trimming to mitigate fire hazards. The transmission line route is kept clear of brush and other combustible material. Chevron provides trained and qualified maintenance personnel to maintain the interconnection and immediate area in accordance with accepted industry practices.



- Existing 115 kV Transmission Lines
COGEN 1 & 2, to be reconductored
- New 12.47 kV cable run to existing
12.47 kV Transmission Lines to
tie-in hydrogen plant STG to Sub 4

FIGURE 5.3-1
LOCATION OF POWER PLANT
REPLACEMENT PROJECT
TRANSMISSION LINES
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA

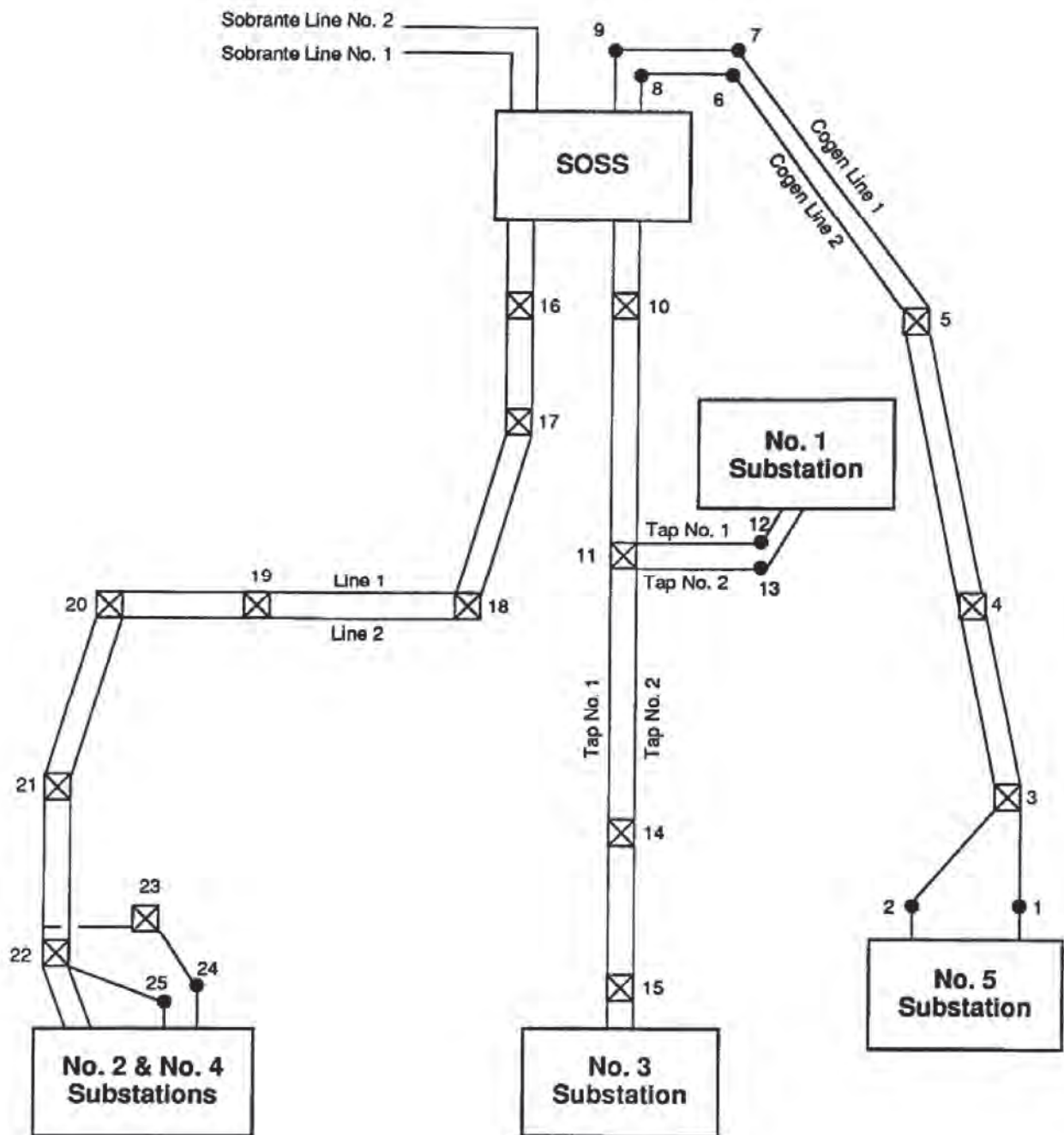


FIGURE 5.3-2
SCHEMATIC DIAGRAM OF RICHMOND
REFINERY 115 KV TOWERS AND
TRANSMISSION LINES
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA

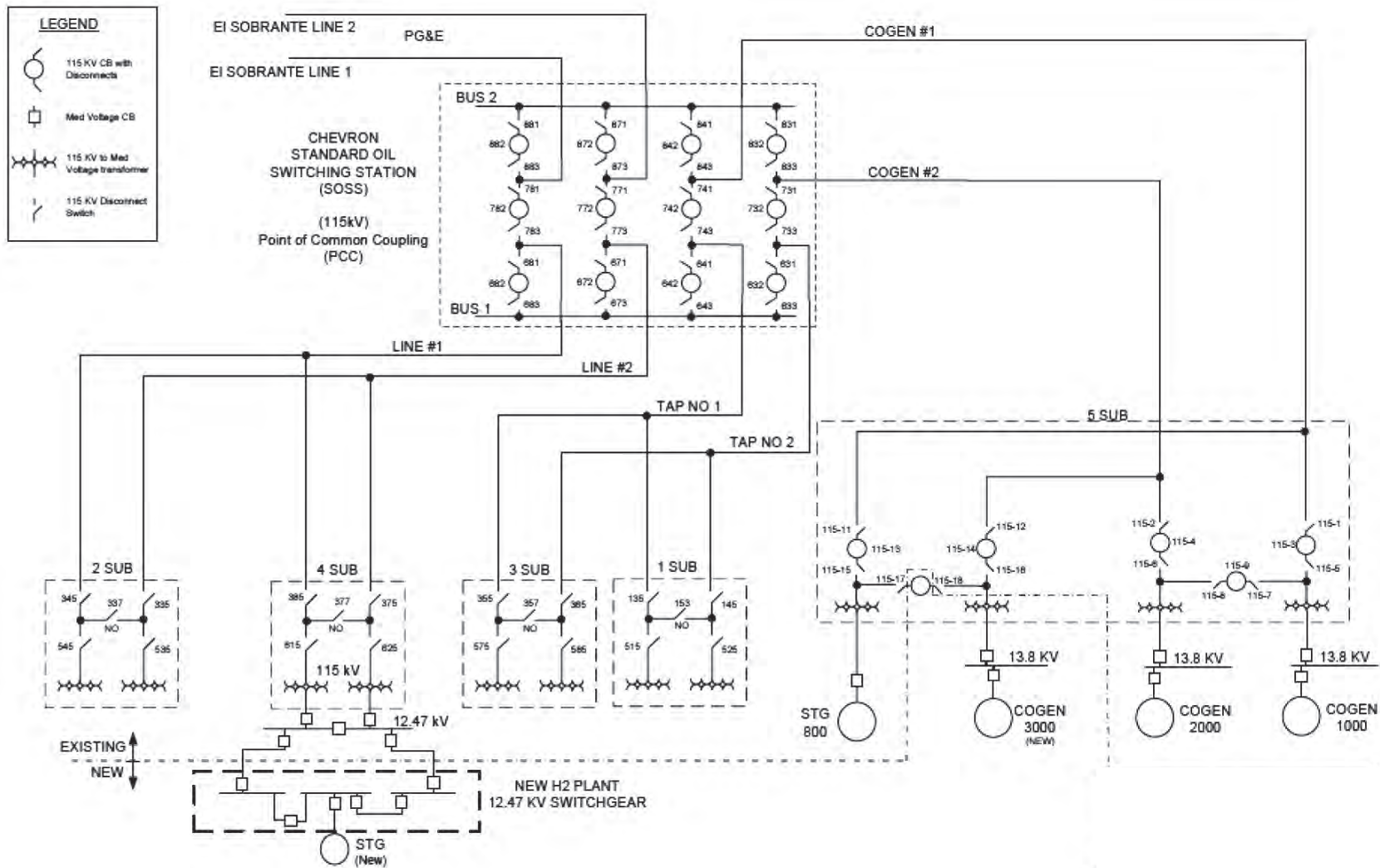


FIGURE 5.3-3
ONE-LINE DIAGRAM - 115 KV SYSTEM
INCLUDING POWER PLANT
REPLACEMENT PROJECT
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA

SECTION 6.0

Engineering and Design Criteria

6.1 Introduction

This design criteria section is intended to provide guidelines for performing detailed engineering and plant design for the Chevron Richmond Refinery Power Plant Replacement Project (PPRP, or the Project) to be located in the City of Richmond, California.

6.1.1 General Plant Description

The plant will consist of one 43-MW net General Electric (GE) Frame 6B® model combustion turbine generator (CTG) with inlet air evaporative cooling operating in combined-cycle.

6.1.2 Codes and Standards

The major design and engineering codes and standards applicable to the Project are shown in Table 6.1-1. The plant design shall be in accordance with the codes and standards in all applicable sections and subsections in the latest editions.

TABLE 6.1-1
Major Design and Engineering Codes and Standards Applicable to the Project

AASHTO	American Association of State Highway Transportation Officials	ICEA	Insulated Cable Engineers Association
ACI	American Concrete Institute	IEEE	Institute of Electrical and Electronic Engineers
AISC	American Institute of Steel Construction	IES	Illuminating Engineering Society
AISI	American Iron and Steel Institute	MSS	Manufacturers Standardization Society Practices
AMCA	Air Moving and Conditioning Association	NEC	National Electrical Code (NFPA No. 70)
ANSI	American National Standards Institute	NEMA	National Electrical Manufacturers Association
ASME	American Society of Mechanical Engineers	NFPA	National Fire Protection Association
ASTM	American Society for Testing and Materials Standards	OSHA	Occupational Safety and Health Administration
AWS	American Welding Society	SSPC	Steel Structures Painting Council
CBC	California Building Code, 2007 edition	UL	Underwriter Laboratories Incorporated
CFR	Code of Federal Regulations, Title 29, Chapter XVII, Part 1910	UPC	Uniform Plumbing Code
CTI	Cooling Tower Institute	USEPA	U.S. Environmental Protection Agency
HI	Hydraulic Institute Standards		

6.1.3 Design Data

Table 6.1-2 summarizes the Project site design elements.

TABLE 6.1-2
Site Design Elements

Element	Data
Location:	City of Richmond, California
Elevation above sea level (ft):	15
Design Temperature Range (°F):	32 to 102
Extreme Temperature Range (°F):	15 to 115
Average Annual Temperature (°F):	67
Relative Humidity Range (%):	10 to 100
Average Annual Rainfall (inches):	11.95
Maximum Rainfall 24 Hours (inches):	2.50
Design Wind Speed (mph):	70 mph Basic Wind Speed per CBC 2007
Seismic Design (CBC Zone):	4
Average Equipment Noise Level 3 feet from the outline of equipment:	85 dBA
Noise Level Outside Plant Property Line:	70 dBA (Max.)
Plant Design Life (years):	30

The following is a discussion of engineering design criteria for select subsystems.

6.1.3.1 Heating, Ventilating, and Air-Conditioning Systems

The electrical buildings will include the electrical switchgear room, electronics room, and battery room. The electrical buildings will be provided with heating, ventilating, and air-conditioning (HVAC) systems as necessary for equipment protection and personnel comfort.

6.1.3.2 Piping

Piping Codes and Standards

All process piping will be designed and constructed in accordance with the American National Standards Institute (ANSI) B31.1 Power Piping Code and ANSI B31.3 Chemical Plant and Petroleum Refinery Piping Code. Fire protection piping will be designed, constructed, and installed in accordance with applicable National Fire Protection Association (NFPA) standards.

Piping Material and Design

Piping materials will be selected on the basis of suitability with the fluids being handled and for the complete range of operating pressures and temperatures expected.

The minimum pressure rating for process piping systems will be ANSI Class 150. Joints for piping 2 inches and smaller will be socket-weld, and joints for 2.5 inches and larger will be butt-weld. Flanged joints will only be used where required to match equipment, control valves, and instrumentation, and to join piping of dissimilar materials or where required for disassembly. Threaded joints will not be used except to match equipment or in galvanized piping such as fire sprinklers.

Instrument air piping and tubing will be stainless steel. Service air piping will be carbon steel.

Non-metallic piping systems will be used where possible for underground portions of low-pressure, low-temperature systems such as plant drains, service and potable water systems, cooling water, and fire protection system. Non-metallic piping used for fire protection service will be listed by Underwriters Laboratories (UL) and/or approved by the Fire Marshal (FM). Underground metallic piping will be suitably protected from corrosion by coating and wrapping and through the use of a passive-type cathodic protection system.

Piping Insulation

Thermal insulation of piping systems for energy conservation will be provided where necessary.

Insulation for personnel protection will meet applicable Occupational Safety and Health Administration (OSHA) requirements for maximum exterior casing temperatures and will be specified for all equipment within personnel access or reach that is not insulated for energy conservation. Maximum temperature of surfaces will not exceed 140°F.

Electric heat tracing will be specified for piping systems or portions of piping systems of 2-inch nominal pipe size and smaller that are exposed to outdoor conditions and could experience loss of service due to freezing, such as:

- Non-drainable small bore water piping
- Small bore water piping that is not in service during normal plant operation
- Instrument-sensing lines

Piping containing glycol/water solution for freeze protection will not be heat traced.

Pipe Supports

Piping design and pipe supports will be designed in accordance with the requirements of ANSI B31.1. Supporting elements will be capable of carrying the sum of all concurrently acting loads such as: pipe and fluid weight, operating loads, wind, seismic, etc., and allow pipe thermal expansion and contraction without causing overstress.

6.1.3.3 Valves

Codes and Standards

Valves will meet the requirements of ANSI B31.1 Power Piping Code. Fire protection valves will be UL-listed and/or FM-approved for fire protection service.

Valve Materials and Design

Valve selection will be based on the required function, material, and pressure rating of the piping system, and the size of the pipe and the piping fluid. Valve type will be selected based on operational and maintenance considerations as well as good engineering practice.

6.2 Instrumentation and Controls

6.2.1 Control System Design

The plant instrumentation and control system will be designed to allow the operators to achieve safe and reliable operation of the power plant. Major equipment monitoring, control, and operation will be provided from the control room, requiring only the use of the existing Honeywell Total Plant Solution (TPS) global user station (GUS) consoles for the plant control system (PCS). Supplemental maintenance and local control will be through a control console and the CTG human-machine interfaces (HMIs) local to the machine. The integration of the various plant systems will be accomplished by the PCS. The PCS will be used for supervisory control and monitoring of major plant components and package systems, such as the CTG, and it will be used for direct control of selective catalytic reduction (SCR) loops and other balance-of-plant equipment and processes.

6.2.1.1 Combustion Turbine Generator/HRSG Controls

The CTG will be provided complete with a vendor-packaged and integrated control system that provides for automatic and manual start-up, synchronizing, loading and unloading, protection, and shutdown of the CTG/Heat Recovery Steam Generator (HRSG) system from the control room.

The CTG control system will accept contact inputs for start, stop, and other operating commands from the PCS to perform all normally required operating functions of the CTG. In addition, a numerical communications link will provide CTG process signals and alarms to the PCS for purposes of monitoring, trending, and archiving critical variables.

The HRSG will consist of an integrated system of control partially provided by the HRSG duct burner supplier (burner management system), and the balance of the control residing in the existing Cogen facility PCS. Remote input/output (I/O) panels will be mounted at the electrical power distribution centers to intertie field-mounted instruments and control devices to the PCS system.

6.2.1.2 Plant Control System

The PCS is an existing distributed control system (DCS)-based control system providing analog and sequential logic control, advanced control computations, data acquisition, operator interface, and numerical interface capabilities. The PCS will provide overall control and operator interface to the generating facility, and will incorporate state-of-the-art digital technology in a redundant DCS-based system. It consists of a real-time functionally distributed computer control system equipped with adequate memory, I/O hardware, termination cabinets, redundant data highway, operator interface consoles, engineering workstation, and peripherals such as printers, mass storage, etc.

Features of the PCS include redundancy of control processors, power supplies, operator stations, printers, and communications. In addition to its control capabilities, the system includes features required for historical data recording, data processing, and report generation.

The PCS includes the following additional features:

- Supervisory interface and monitoring of the combustion turbine generator with direct control of all SCR loops, HRSG, auxiliary loads, and balance of plant motor loads and process loops.
- Visual and audible alarms for abnormal events in a display hierarchy based on criticality of the event, from field instrumentation measurements or software-generated calculations of plant systems, processes, or equipment. Capability to prioritize alarms are included. Alarms will be time-stamped to the nearest second.
- All information within the control system is available on the operator video monitors. Information is transmitted between the PCS control nodes or drops via dual redundant data highways. The highways will use an appropriate medium (coaxial cable, fiber optics, etc.). Both highways are active at all times, providing for a “hot backup” in the event of single failure.
- Each of the operator control stations is capable of performing (at a minimum) the following functions:
 - Configuring and tuning all modules in the system (engineering workstation only).
 - Monitoring the value or status of system points (soft and hard).
 - Auto/manual transfer, set point adjustments, and manual operation of outputs.
 - Alarm indicators with alarm overview and alarm summary.
 - Interactive graphic displays.
 - Control processors are capable of performing both analog (basic and advanced) and digital control functions. Process controllers are configured as one-to-one redundant with automatic transfer to the backup controller in case of controller failure. Each processor is capable of being programmed and modified online. In general, all process information is available to the operator within one second of real time.

6.2.1.3 Plant Instrumentation

Plant instrumentation and control equipment will be of a proven design and chosen to ensure a high level of reliability. When redundant controls are required, completely separate devices with individual sensing taps and isolation capability will be provided.

Transmitters

Electronic “smart” transmitters will be used and have a minimum accuracy of ± 0.1 percent of calibrated span.

Pressure-sensing devices will be provided with adequate valving and test connections for in-line calibration. Manifold valves will be used where practical. These manifolds will contain instrument, test, and where required, equalizing valves. Instrument tubing will be sloped and freeze-protected as required and shown on instrument installation details. All transmitter manifolds shall include calibration taps.

Flow transmitters, in general, will be differential pressure type with square root extraction performed in the DCS.

Primary Flow Elements

Primary flow elements include the following:

- Flow nozzle meter runs will be used where highly accurate flow measurements are required.
- Orifice plates will be provided for other liquid or steam process flow measurements as appropriate.
- Vortex shedding flow meters will be provided where high levels of turn-down in measured range are required.
- Thermal mass flow sensors used for gas or air monitoring where appropriate.
- Specialty sensors/transmitters such as magnetic flow meters, turbine meters, or special stack flow sensors will be used for special application measurements as required.

Thermocouples and Resistance Temperature Detectors

All process thermocouples and resistance temperature detectors (RTDs) are of the 3-wire platinum type with normal resistance of 100 ohms at 0°C.

For high-temperature and metal-temperature measurements, thermocouples would be used. Thermocouples, in general, would be type K or E as appropriate.

Thermowells

Temperature sensors will be equipped with thermowells made of one-piece, solid-bored Type 316 stainless steel design.

Local Indicators

Thermometers will be the bimetallic adjustable angle type with minimum 4.5-inch dials and ± 1 percent accuracy. Thermowells are furnished for all thermometer bulbs.

Pressure gauges will be the bourdon tube type with solid front cases, 4.5-inch dials, stainless steel movements, and nylon bearings. Gauges will have 0.5-inch National Pipe Thread (NPT) bottom connections and will be provided with pigtail siphons for steam service, snubbers for pulsating flow, and diaphragm seals for corrosive or severe service. Liquid-filled gauges will be used where there is pipeline vibration.

Tubular gauge glasses will be used for low-pressure applications. Transparent or reflex gauges will be used for high-pressure applications. Mica shield will be used with transparent gauges on steam/condensate service. All gauge glasses will be equipped with gauge valves including a safety ball check.

Temperature, Pressure, Level, and Flow Switches

The use of process switches will be minimized, analog transmitters with signal back to the PCS are preferred.

Control Valves

Control valves used in modulating service will have normal operational range from 30 to 80 percent. Minimum control valve body size will not be less than 50 percent of the upstream pipe size. In general, control valve leakage class will be minimum ANSI B16.104 Class IV. Each control valve will be provided with accessories such as filter regulators,

solenoid valves, 4-20 milliampere (mA) position transducers and limit switches as applicable. Control valves will be provided with valve position feedback transducers (4-20 mA).

Pneumatic Operators

Pneumatic piston actuators or diaphragm operators will be provided for air-operated valves. Air operators will function properly on plant air supplied between 80 and 125 pounds per square inch gauge (psig) fluctuating pressure. Air filter-regulators will be provided for each operator.

Instrument Piping and Tubing

Instrument piping and tubing will be installed in accordance with applicable installation details and routed in an orderly manner, grouping together lines wherever practical.

Vents, drains, or traps will be provided at high or low points on impulse lines to vent air or entrained solids which may settle out.

Minimum process piping or tubing size will be 0.5-inch except for connections at instruments, which will be manufacturer's standard.

6.2.1.4 Programmable Logic Controllers

When PLCs are provided as part of the plant or packaged control systems, controller memories will be battery-protected or be of the non-volatile type. Vendors will provide ladder diagram type documentation for all programmable controller logic. A terminal unit will be provided for entering program changes, storing programs, and loading programs directly into the programmable controller memory. All PLCs supplied shall have PC interface and application software to provide data and program retrieval and manipulation. This PC interface may also be used in lieu of a separate terminal unit for programming the PLC.

6.2.1.5 Control Room

The plant control room is located in the existing Cogen control building. It contains the PCS, the plant fire alarm panel, the continuous emission monitoring system (CEMS) data acquisition system (DAS), and other communications and plant monitoring equipment.

6.3 Basis of Civil and Structural Design

These criteria cover general requirements for civil and structural design including earthwork, drainage and paving, steel and reinforced concrete structures, and miscellaneous yard structures.

6.3.1 Civil Site Work Design

6.3.1.1 General

Civil design will be in accordance with the latest City of Richmond design and specification standards and other applicable codes and standards.

6.3.1.2 Earth Work

Earth work will include clearing, grubbing, and stripping where necessary, excavation of soils for structures and foundations, development of cut and fill slopes, and trenching for a storm drainage system, as required.

Earth work will be designed in accordance with the recommendations given in the site-specific geotechnical report.

6.3.1.3 Grading Design

The area within the Project site will be graded to provide adequate positive drainage.

Finish grades will conform to the minimum drainage gradient standards indicated in Table 6.3-1.

TABLE 6.3-1
Minimum Drainage Gradient Standards

Grading/Drainage Standard	Minimum Gradient
Concrete pavement (sheet flow)	0.5 percent
Gravel covered area	1.0 percent
Lined ditches	0.35 percent
Unlined ditches	0.75 percent
Cut, Earth	1 (vert): 2 (horiz.) max
Fill, Earth	1 (vert): 2 (horiz.) max

6.3.1.4 Oily Water

Oil-contaminated stormwater resulting from equipment leakage, routine equipment maintenance, and oil-contaminated area washdown activities will be directed into an existing Chemical and Petroleum Industry (CPI)-type oil/water separator prior to discharging into holding ponds and channels in preparation for treatment in the plant bio-reactor wastewater treatment system.

6.3.1.5 Underground Utilities Protection

Installation of underground utilities shall be at least 3 feet below finish grade. Where such cover cannot be provided the pipes shall be encased in concrete or pipe sleeves, as necessary.

Underground pipes shall be checked for traffic loads using the Marston formula and with reference to AASHTO "Standard Specifications for Highway Bridges."

6.3.1.6 Road and Pavement

Plant roads shall be a minimum of 20 feet wide with turning radii of 30 feet inside and 50 feet outside and capable of sustaining a 40-ton axle load.

Road shall be crowned or crossed slope with a 2 percent minimum gradient.

Roads, maintenance, and parking area shall be paved with concrete or asphaltic concrete. Concrete thickness and base course requirements will be based on site-specific geotechnical report.

6.3.1.7 Striping and Pavement Markings

All edges of the traveled way shall be defined with painted lines. Roadways shall not have painted centerlines.

6.3.2 Structure Design

6.3.2.1 Material Specification

Table 6.3-2 summarizes the applicable material specifications.

TABLE 6.3-2
Material Specifications

Material	Specification
Anchor Bolts	Standard - ASTM A307 Grade C High-Strength – ASTM A325, Type 3 (Hot-dipped galvanized or stainless anchor bolts as required)
Anchor Bolts Sleeves	High Density Polyethylene Plastic
Bolts for Structural	ASTM A325-N or X, Bearing and Shear Type connection or A490-N or X, Bearing and Shear Type Connection High Strength Bolts
Checkered Plate	Galvanized steel with safety tread diamonds ASTM A786
Concrete	Structural Concrete: Minimum compressive strength $f'_c=4,000$ psi at 28 days Curbs, sidewalks: Minimum compressive strength $f'_c=3,000$ psi at 28 days
Embedded Steel Plates	Plates shall be A36.
Grating	ASTM A569 — 1-1/4" galvanized, ASTM A123
Grout	Master Builder Embeco 713 non-shrink grout or approved equal
Handrailing	Handrails and posts 1-1/2" diameter standard pipe posts galvanized with horizontal spacing not greater than 12" per California code.
Ladders	Galvanized steel with 3/4" rungs at 12" On Center (OC) Step off platforms provided at 12' maximum intervals. When ladder height exceeds 20' above grade, a cage shall be provided.
Masonry Unit	ASTM C90 Grade N-1
Platforms and Walkways	Minimum widths: Operating and Maintenance Platforms: 3'-6" Walkways: 3'-0" Stairs: 2'-6"
Reinforcing Steel	ASTM A615, Grade 60
Steel Pipe or Tubing	ASTM A53, type E or S, Grade B
Rain Water Leaders	Schedule 40 Polyvinyl Chloride (PVC) plastic pipe conforming to ASTM D1785 or equal

TABLE 6.3-2
Material Specifications

Material	Specification
Storm Drain Pipe	Reinforced Concrete Pipe (RCP), ASTM C76, High Density Polyethylene (HDPE), ASTM M294 or F894
Structural Steel	ASTM A36, Grade 36
Welding Electrodes	AWS D1.1, E70XX Electrodes

6.3.2.2 Design Loads

Dead Loads (D)

Dead loads include the weight of framing, roofs, floors, walls, partitions, platforms and all permanent equipment and materials. The vertical and lateral pressures of operating liquids shall also be treated as dead loads.

Floors shall be checked for the actual equipment loads. For permanently attached small equipment, piping, conduits, and cable trays, a minimum of 25 pounds per square foot (psf) shall be added to floors and roofs in the areas containing such appurtenances.

Pipe loads on areas with heavy piping concentrations shall be carefully reviewed to determine the applicable design pipe loads.

Where the piping is to be supported from platforms or walkway beams, actual loads shall be determined and used.

Lateral earth pressures and surcharges will be treated as continuously applied loads in a similar manner as for dead loads.

Live Loads (L)

Live loads include floor area, laydown and equipment handling loads, lateral earth pressure and vehicles. The floor area live load shall be omitted from areas occupied by permanently attached equipment whose weight is specifically included in dead load.

Pipe carrying transient liquids on areas with heavy piping concentrations shall be considered as live in nature and carefully reviewed to determine the applicable design conditions and loads.

Dynamic Loads (E)

Wind loads and earthquake loads shall be treated as transient loads acting along the principal axes of the Project from either direction. Such loadings will be treated in accordance with the accepted methods, design procedures and load case combinations as delineated in the appropriate code provisions.

Impact loads due to maintenance or operational procedures which were carefully determined will be appropriately applied to portions subjected to such load conditions.

Supporting elements for equipment generating vibrational loads will be designed to properly dampen and transmit these loading situations along the appropriate load paths.

Operating Loads (O)

- The operating load “O” is defined as the live load expected to be present when the plant is operating. The “O” loads shall be established in accordance with the layout and mechanical requirements.
- In the laydown areas, the actual weight of the equipment as spread out on the floor shall be considered “O.”

Minimum Design Live Loads:

Table 6.3-3 includes minimum live loads to be used in the design.

TABLE 6.3-3
Minimum Live Loads, Design

Load Category	Live Load
General	
Roofs	Per CBC 2007
Offices	50 psf
Assembly and Locker Rooms	100 psf
Laboratories	100 psf
Stairs and Walkways	Per CBC 2007
Railing	50 plf or 200 lbs applied in any direction at top of railing
Platforms and Gratings	100 psf
Grade Floors	250 psf
Surcharge adjacent to plant structures	250 psf
Truck support structures	AASHTO HS20-44
Forklift slab area	Max. wheel load as per vendor information for specific lifting requirements
Special Areas	
Control Room	100 psf
Switchgear Floor	250 psf
Battery Room	250 psf
Steel Grating	100 psf
Raceways, main cable trays	50 psf
Pipeways	Actual load but not less than 45 psf on each deck

Notes:

plf = pounds per linear foot

psf = pounds per square foot

Live Load Reduction:

- No reduction shall be allowed for warehouse storage areas.
- No reduction shall be allowed for slabs, beams, joists and girders, for loads exceeding 100 psf.
- Live load reduction shall be in accordance with the California Building Code (CBC), 2007 edition.

Earth Pressure (Pe)

Earth pressures shall be in accordance with the recommendations from the site-specific geotechnical report.

Groundwater Pressure (Pg)

For structural and buoyancy calculations, the high groundwater table shall be as specified in the geotechnical report.

Wind Loads (W)

All structures shall be designed for wind loading in accordance with CBC 2007.

Seismic Loads (E)

All structures shall be designed in accordance with the CBC 2007.

Thermal Loads (T)

All vessels and exchangers shall be investigated for thermal expansion.

Other thermal loads caused by expansion or contraction due to a change in temperature from the erection condition shall receive proper consideration. Such loads shall include:

- Forces caused by partial or complete anchorage of piping or equipment
- Forces caused by sliding or rolling friction of equipment
- Forces caused by expansion or contraction of the structure

Initial temperature for calculating expansion or contraction in structural design = 70°F.

6.3.2.3 Load Combinations

All structures and foundations shall be designed for the most critical effects resulting from the load combinations as specified in the appropriate code provisions.

Soil Bearing Capacity

All load combinations shall be considered for checking of the soil bearing capacity as determined by the geotechnical reports and investigations.

Concrete Structure

Loads shall be combined in accordance with American Concrete Institute (ACI) 318.

Steel Structure

Loads shall be combined in accordance with Section 1612, CBC 2007.

6.3.2.4 Foundations

Foundations will be designed in accordance with the recommendations contained in the Project geotechnical investigation.

Stability ratio of foundations against overturning shall be at least equal to 1.5 to 1, and sliding shall be at least equal to 1.5 to 1.

Foundations for rotating or reciprocating equipment shall satisfy all manufacturers' requirements for design loads, deflection, and vibration limits.

The bottom of all foundations will extend a minimum of 18 inches below finished grade or as recommended by the Project geotechnical report.

6.3.2.5 Design Methods

Seismic

Seismic design method shall be in accordance with CBC 2007.

Wind

Wind design method shall be in accordance with CBC 2007.

Steel

All structural steel shall be designed in accordance with the American Institute of Steel Construction (AISC) 9th edition "Specification for Design, Fabrication, and Erection Structural Steel for Buildings" using the working-stress method.

Concrete

Reinforced concrete structures, except the water-retaining structures, shall be designed in accordance with ACI Specification 318 using the Strength Design Method.

Water-retaining structures, such as the cooling tower basin and acid/caustic tank secondary containment structures, shall be designed in accordance to the Alternate Design Method (ADM) per ACI 350.

The CTG foundation shall be an independent reinforced concrete mat foundation. The foundation shall be a low-tuned reinforced concrete structure that is structurally designed in conformance with manufacturer's criteria and the following three requirements:

- **Rigidity Requirements:** The relative displacements of the bearing supports shall comply with the relative deflection criteria provided by the machine manufacturer.
- **Dynamic Requirements:** The CTG foundation shall be designed as a low-tuned concrete structure. Natural mode analysis shall be performed to assure that the fundamental vertical and horizontal frequencies of the structure do not fall within the range of the machine operating frequencies as specified by the manufacturer. In addition, the rotor unbalance forcing function, during both normal operating condition accidental condition, shall be applied to ensure that possible vibration of the structure does not result in velocities or accelerations exceeding manufacturer's specifications.
- **Strength Requirements:** The CTG foundation shall be designed to retain structural integrity during all operating and accidental condition loads that might be expected to occur during the life of the plant. The design forces related to earthquake motion or

machine accidental events shall be determined on the basis of energy dissipation in the linear (elastic) range of response.

Bonding at construction joints shall be developed by roughening the surface of the existing concrete using industry-standard methods and keeping the surface wet for at least 2 hours prior to concrete placement. Bonding mortar or other surface treatment of concrete surfaces shall not be used.

Water stops will be used at construction joints where water containment is required (i.e., sumps, cooling tower basins, etc.)

6.3.3 Seismic Design

6.3.3.1 General

Seismic design shall be based upon CBC 2007, Seismic Zone 4 and Occupancy Importance Factor $I = 1.0$. Other design parameters are specified in the geotechnical report and investigation.

6.3.3.2 Equipment Anchorage and Supporting Structures

All major equipment anchorage and supporting structures shall be designed in accordance with CBC 2007.

6.3.4 Wind Design

6.3.4.1 General

All buildings, structures, and outdoor equipment shall be designed to withstand the effect of wind from any horizontal direction.

Wind design shall be based upon the CBC 2007 with basic wind speed of 70 mph, Exposure C, and Occupancy Importance Factor $I = 1.0$.

6.4 Electrical

6.4.1 General

This section covers criteria for the design of the electrical auxiliary power systems used in conjunction with the combustion turbine generators and support equipment to be installed in the PPRP and integrated into the PPRP electrical network.

6.4.1.1 Design Considerations

The PPRP includes one natural gas- or liquid petroleum gas (butane)-fired CTG driving a 13.8-kilovolt (kV) synchronous generator and one extraction, condensing steam turbine (STG) driving a 12.47-kV synchronous generator. The output of the CTG is connected to the Refinery 115-kV distribution network through a two-winding 13.8- to 115-kV generator step-up (GSU) transformer. The output of the STG is connected directly to 12.47-kV switchgear in one of the existing Refinery substations.

Power for the cogen electrical auxiliary loads is provided through two 13.8- to 2.4-kV auxiliary transformers, and two 13.8-kV to 480-volt (V) auxiliary transformers each connected at the output of the generator. Each auxiliary transformer will be energized from the 115-kV system through the GSU transformer when the generator circuit breaker is open during start-up and periods when the CTG is not operating. Each of the auxiliary transformers is sized to accommodate all auxiliary system loads associated with the entire cogen train, including common loads. Each 2.4-kV auxiliary transformer is connected to one section of a double-ended 2.4-kV switchgear with a normally open bus-tie breaker, and each 480-V auxiliary transformer is connected to one section of a double-ended 480-V switchgear with normally open bus-tie breaker. Automatic (residual voltage activated) transfer to a live bus section is accomplished in response to loss of voltage on either bus. Synchronized, momentary parallel retransfer of a bus section to the normal source is by operator action only.

For the H₂-STG, auxiliary power will be supplied at 4,160 V by a triple-fed 4,160-V switchgear lineup and at 480 V alternating current (Vac) by a triple-fed 480-V motor control center (MCC) lineup. One feed to the 4,160-V switchgear will be from 12.47-kV Bus #3 via a 12.47-kV to 4,160-V stepdown transformer. The other two feeds will be from the two other 4,160-V busses in the hydrogen plant, each fed by its own separate 12.47-kV to 4,160-V stepdown transformer.

The Bus #3 4,160-V switchgear lineup supplies power to the various 4,160-V motors associated with the STG and cooling tower, via a 4,160-V MCC. The switchgear will have vacuum interrupter circuit breakers for the main incoming feeds.

The 480-V load center transformer will be liquid-filled and supply 480-volt, 3-phase power to one feed of the triple-fed load center and MCC. The transformer will be fed from 4,160-V bus #3. The other two feeds to 480-V bus #3 are from the two other 480-V busses in the hydrogen plant, each fed by their own separate 4,160-V to 480-V stepdown transformers from their respective 4,160-V busses (4,160-V Bus #1 and Bus #2). The Bus #3 480-V MCC lineup also supplies power to the various 480-V motors associated with the STG and cooling tower, via a 480-V MCC.

The complete electrical system is economically designed for reliability of service, safety of personnel and equipment, ease of maintenance and operation, minimum power losses, and mechanical protection. The electrical system includes provision for the addition of future loads, and maximum interchangeability of equipment.

Voltage insulation levels, interrupting and continuous current capacities, circuit protection, and mechanical strengths of all equipment shall be selected and coordinated in accordance with good practice and the requirements of the documents or organizations listed in Section 6.1.2.

Electrical system protective devices (relays, fuses, circuit breakers, etc.) shall be selected and coordinated to ensure that the circuit protective device nearest the point of fault (or high overcurrent) will open first (selective tripping) to minimize equipment damage and disturbances to the remainder of the system.

Selection of electrical equipment, and the installations for its use in hazardous areas, shall be in accordance with requirements of NEC Article 500, other applicable related industry standards, and local fire department regulations.

All electrical equipment used in the design of the PPRP shall be in accordance with the appropriate IEEE, NEMA, ICEA, ANSI, NFPA and other applicable industry standards and Chevron standards.

6.4.1.2 Major Electrical Equipment

Major electrical equipment items for the Cogen 3000 portion of the PPRP include:

- One 13.8-kV to 115-kV GSU transformer
- 15-kV bus duct from the output terminals of the CTG generator to the metal-clad 13.8-kV switchgear
- 13.8-kV metal-clad arc resistant switchgear mounted in a power house
- Two 13.8-kV to 2.4-kV auxiliary transformers
- Two 13.8-kV to 480-V auxiliary transformers
- 2.4-kV indoor metal-clad arc resistant double-ended switchgear
- 480-V indoor metal-clad double-ended switchgear
- 5-kV metal-enclosed non-segregated-phase bus duct
- 600-volt metal-enclosed non-segregated-phase bus duct
- Two 2.4-kV arc-resistant MCCs
- Three 480-volt MCCs
- 120-Vac uninterruptible power supply (UPS) system for critical loads
- 125-volt direct current (Vdc) power distribution system including batteries and battery chargers to supply DC power to the switchgear controls and the 120-Vac UPS

Major electrical equipment items for the H₂-STG portion of the PPRP include:

- 4.16-kV indoor metal-clad double-ended switchgear
- 480-V indoor metal-clad double-ended switchgear
- 12.47-kV to 4.16-kV auxiliary transformer
- 12.47-kV to 480-V auxiliary transformer
- 4.16-kV MCC
- 480-V MCC
- 120-Vac UPS system for critical loads
- 125-Vdc power distribution system including batteries and battery chargers to supply DC power to the switchgear controls and the 120-Vac UPS

6.4.1.3 Area Classification

Hazardous Areas

Hazardous area classifications will be in accordance with the National Electrical Code, Article 500. Classifications in the fuel gas area will follow the recommendations of the American Petroleum Institute (API) Standard No. RP-500A and of the local fire department.

All equipment will be suitable for the area in which it is installed. Hazardous areas will be defined on plant area classification drawings.

Non-Hazardous Locations

The switchgear room (and 125-volt battery area if sealed cell batteries are used) are classified as non-hazardous locations. The interface areas between area classifications are defined on area classification drawings.

6.4.2 Systems

6.4.2.1 Protection System

Protective equipment shall be installed to provide protection against electrical faults and abnormal system conditions. The protection schemes are designed and coordinated so that the protective device nearest to the fault operates first, with backup being provided by the next upstream protective device in the system and subsequent relay stages. Selectivity applies in phase-to-phase and three-phase, as well as to ground faults.

In the event of a fault in a generator, in which its protective zone extends from the neutral end of the windings to the load side of generator breaker, the generator breaker would trip and initiate shutdown of the affected turbine generator. The 115-kV breaker on the switchyard side of the GSU will remain closed so that the plant auxiliaries remain energized for restart.

The GSU transformer is protected from lightning and switching surges by station type, metal oxide station-class surge arresters on the high-voltage terminals. For other problems, this transformer, as well as the auxiliary transformers, are each protected by a pair of microprocessor relays for primary protection and backup protection. The protective relays provide the functions of a differential relay, phase and ground, instantaneous and time overcurrent relays, negative sequence, overtemperature, overvoltage and over- and under-frequency relays.

All motors are protected against faults and overloads. Medium-voltage motors are protected by fuses for high level faults and by microprocessor relays for low level faults and overloads. For motors fed from the 480-volt MCC, overload settings shall be in accordance with guidance of the NEC (approximately 1.15 times full load current). Certain critical motor operated valves are not provided with overload protection in the direction of travel required for safe plant shutdown.

6.4.2.2 Grounding System

The grounding system shall consist of a network of buried, bare, stranded copper cables installed around the perimeter of the station site, the generators, the GSU, auxiliary, transformers, the switchgear buildings and along piperacks to connect to the structural steel. The grounding network shall consist of the underground grounding grid, grounding electrodes, equipment-grounding conductors, crushed rock at grade level and above-grade equipment and structure-grounding connections. A separate, isolated, insulated, high-quality grounding system shall be provided at the control room for instruments and computers only. Equipment located remotely from the main grounding network shall be grounded by means of individual grounding conductors and grounding electrodes.

IEEE Standard 80 will be followed where applicable. Any equipment not directly bolted to a grounded supporting structure is connected to the grounding system. Grounding for components of the station:

- The star point (neutral) of the 115-kV wye-connected windings of the GSU transformers shall be solidly grounded.
- The generator neutral point shall be high-resistance grounded through a distribution type transformer with a resistance-loaded secondary winding. Ground fault current shall be less than 10 amperes (A).
- The star point (neutral) of the low-voltage wye-connected windings of the 13.8-kV to 2.4-kV and 12.47-kV to 4.16-kV auxiliary transformers shall each be grounded through a separate grounding resistor. Ground fault current shall be limited to 10 A.
- The 13.8-kV to 480-V and the 4.16-kV to 480-V auxiliary transformers shall be grounded at the star point (neutral) of the wye-connected secondary windings through a high resistance grounding resistor. Ground fault current shall be limited to 5 A.
- The star point (neutral) of each wye connected winding of lighting and low-voltage power transformers shall be solidly grounded.

A separate insulated, isolated instrument ground bus shall be provided and used only for connecting instrument ground terminals and instrument cable shielding. The instrument grounds of individual panels will be connected to a central point using insulated cable to form the instrument ground bus. The connections shall be made radially and looping shall not be permitted. The instrument ground bus shall be solidly connected to the main plant grounding system at one point only. The rest of the instrument ground bus is isolated from ground. The shields of instrument cables shall be grounded at one end only. Thermocouple cable shields shall be grounded at the thermocouple end. All other cable shields shall be grounded at the control room end.

6.4.2.3 Cathodic Protection

Passive type cathodic protection systems will be used where practical for underground metallic piping or equipment. Insulating flanges will be installed to electrically isolate underground pipes from above-grade grounded piping and structures. Non-metallic piping will be used where possible for the underground piping system to minimize the need for cathodic protection systems.

6.4.2.4 DC and UPS Systems

The 125-Vdc and 120-Vac UPS systems shall be sized to accommodate the requirements of all balance-of-plant systems supporting the generators. The turbine generators are equipped with a 24-volt battery system for their own control and fire protection systems. The 125-volt batteries furnished under these design criteria are sized to accommodate all other normal and emergency DC loads including the 120-Vac UPS. The battery and the batteries for the turbine generator may be installed in a separate battery room. Two battery eliminator type chargers are provided for the 125-volt batteries.

The 125-Vdc and 120-Vac UPS systems shall consist of the following items located in the air-conditioned electrical building areas: a solid state inverter, an automatic static transfer switch, two battery chargers, 125-Vdc switchboard/distribution panel, 120-Vac UPS bypass transformer (regulated type), and 120-Vac UPS distribution panel. These systems shall supply all normal power loads and emergency power necessary for orderly shutdown of the unit and shall maintain emergency power to the control system for a minimum of sixty minutes. The 125-Vdc and 120-Vac UPS systems shall also supply power for instruments and switchgear control. Emergency lighting units are not fed from the station battery.

The 125-Vdc system operates ungrounded. Two-pole circuit breakers or fuses in each pole shall be used throughout. Ground detectors and alarms shall be provided.

6.4.3 Equipment

6.4.3.1 Switchgear, MCC and Battery Locations

The 13.8-kV, 4.16-kV, 2.4-kV and 480-V switchgear and the MCCs shall be centrally located with respect to the loads served. The 13.8-kV breakers will be located in a 13.8-kV power distribution center adjacent to the CTG generator. The remaining switchgear and the MCCs will be located in a separate power distribution center. Areas allocated for switchgear and the MCCs shall be sized in excess of the initial installation requirements. Sufficient space shall be provided for future expansion and maintenance work, including the removal and transportation of circuit breakers. Battery type will be determined later.

If sealed cell battery modules are used, including those furnished with the combustion turbine generator, the battery area does not require a deluge shower. However, an eyewash station is required. The battery area will not require isolation from the switchgear room nor special ventilation.

If wet cell nickel cadmium battery modules are used, the battery area will be isolated from other electrical equipment and adequately ventilated according to equipment requirements and local conditions. Deluge shower and eyewash facilities will also be provided.

Adequate fire detection and extinguishing equipment shall be installed in all equipment areas and made easily accessible.

6.4.3.2 Maintenance Control Stations

In general, process actuation and control devices such as motors, valves, etc., associated with the combustion turbine generator unit shall be operated from the plant control room. Local bypass of turbine and generator controls shall not be permitted. Balance of plant motors and motor operated valves will have locally mounted control stations as described below to facilitate maintenance.

Each motor shall be provided with a "REMOTE-OFF-ON" manual switch lockable in the "REMOTE" and "OFF" positions. The switch shall spring return from the "ON" to the "OFF" position.

Each motor-operated valve shall be provided with a "LOCAL-REMOTE" selector switch, lockable in the "REMOTE" position, and a separate spring-loaded "JOG" switch, spring-return-to-center from the "CLOSE" and "OPEN" positions.

All switches shall be keyed the same. All control stations shall be provided with suitable nameplates showing the equipment service identification.

6.4.3.3 Motors

AC Motors

AC motors shall be sized as follows:

- Motors rated 250 horsepower (hp) and larger shall be rated 4,000 Vac, 3 phase, 60 Hz or 2,300 Vac, depending on supply voltage
- Motors rated 200 hp and smaller shall be rated 460 Vac, 3 phase, 60 Hz
- Motors rated 1/3 hp or less shall be rated 115 Vac, 1 phase, 60 Hz

Motors 250 hp and larger shall be fed from the medium-voltage motor controllers close-coupled to the 4.16-kV switchgear using fuse-protected vacuum type contactors. Motors rated 460 volts and 200 hp or less shall be supplied from combination full-voltage starters assembled in the 480-volt MCCs.

Motor service factors shall be as follows:

- Motors 200 hp and lower, 1.15
- Motors 250 hp and larger, 1.0

Motors shall be sized so that their rating at a service factor of 1.0 is not exceeded at any point on the operating curve of the driven equipment. Motor winding insulation shall be class F with class B temperature rise. Rotor bars and end rings of motors 250 hp and larger shall be copper.

Gear losses, if any, shall be added to driven equipment brake horsepower before motor driver rated horsepower is determined.

Motor winding heaters shall be provided in all motors 25 hp and larger. Motors heater power will be supplied by the motor controller or combination starter control power transformer (CPT). Motor heaters shall be operated at 120 volts, 1 phase, 60 Hz up to 1,650 watts. All heaters shall be rated at twice the operating voltage.

Motors 1,000 hp and larger shall be provided with Bently-Nevada type vibration monitors and core-balance CTs mounted in the main terminal box for motor differential protection. Motors 250 hp and larger shall be equipped with six stator winding resistive temperature detectors (RTDs) – two per phase and two motor bearing RTDs. The RTDs shall be 100 ohm platinum type and shall be wired out to a separate motor terminal box. The RTDs will be used to map and monitor the thermal characteristics of each motor.

DC Motors

120-Vdc rated motors, if required, shall have full voltage or current limit type starting as required. DC motor enclosures shall be designed for the service and area where installed.

Motor winding insulation shall be class F with class B temperature rise. DC motors will be powered from the 125-Vdc power distribution system.

6.4.3.4 Motor Controllers

General

Each motor controller shall be properly selected for short-circuit duty, continuous current, voltage level, starting current, and overload current.

Medium-voltage (4,000 volts) motors shall be fed from 4.16-kV switchgear close-coupled to fuse-protected 5-kV vacuum contactors.

Low-voltage (460 volts) motors shall be fed from 480-volt motor-control-center-mounted combination starters.

Motor Controllers—Medium-Voltage Switchgear

Medium-voltage motor controllers shall have three electronic fuses and vacuum-type NEMA E2 contactors. Each motor controller shall be equipped with a CPT for control power.

Additional contactor auxiliary contacts shall be provided for alarms, interlocks, etc.

Each medium-voltage motor controller shall be equipped with a solid-state multi-function motor-protective relay current transformer for each phase and a window-type zero sequence ground current transformer.

Motor Controllers—480-Volt Motor Control Centers

Three-phase motor starters, rated 480 volts, shall be the combination type, with magnetic contactors and molded-case magnetic trip only air circuit breakers (motor circuit protectors, MCPs) for motors up to 200 hp. Circuit breaker operating handles shall be capable of being locked in the OFF position. Each combination starter shall have an adjustable electronic overload relay with an externally operated manual reset button. The overload range shall be selected according to the motor full-load amperes.

6.4.3.5 Lighting

Lighting will be designed to provide unobstructed illumination in all buildings and along all walkways, in general plant areas, on roadways, and around building perimeters.

Lighting fixtures will be located to provide uniform illumination and ease of relamping and maintenance.

Outdoor light fixtures shall be selected, mounted, and positioned to prevent unnecessary illumination of the night sky, and to avoid light trespass, or light source visibility from adjacent properties.

High pressure sodium fixtures will be used for all outdoor areas and in the combustion turbine room. Except for the turbine room, fluorescent light fixtures will be used in indoor areas. All outdoor lighting will be controlled from a single photocell or from locally mounted switches. Outdoor lighting will be fed at 208 volts. Indoor lighting will be fed at 120 volts.

Lighting wire will be rated 600 volts, type XHHW or XHHW-2.

Lighting shall achieve the following minimum maintained illumination levels:

Outdoor Areas

- General exterior area – 0.5 to 2 foot-candles (fc)
- Roadway and perimeter – 0.5 to 2 fc
- Walkways, stairways and platforms – 5 fc

Indoor Areas

- CTG enclosure – 30 fc
- Switchgear rooms – 30 fc

Emergency lighting will be provided in the electrical building and other areas determined to be critical to the facility. This lighting will consist of wall- or ceiling-mounted dual seal beam (battery pack) fixtures and lighted exit signs, and will be suitable for 90 minutes of operation.

Convenience outlets for 120 Vac shall be located in the process areas to be reached by a 25-foot extension cord. A minimum of six 60-A, 480-volt, 4-pole outdoor outlets shall be strategically positioned around the new facility.

Lighting panel boards will be used for the control of lighting, convenience receptacles, single-phase motors, and other similar loads. Lighting panels will be provided with minimum 20-A plug-in circuit breakers. Each panel will be provided with approximately 20 percent spare breakers. Each lighting panel will be fed from a dedicated 480-208Y/120-volt transformer.

6.4.3.6 Wire and Cable

All current-carrying power and lighting conductors will be sized in accordance with NEC ampacity tables and the following criteria, except where minimum sizes are determined otherwise. Conductors should be stranded to provide flexibility (except AWG 12 and 14 conductors used for power and lighting; thermocouple extension wire; and communication wire). All insulated copper wire is to be annealed in accordance with ASTM B3 and have Class B stranding in accordance with ASTM B8. Bare copper wire is to be softdrawn in accordance with ASTM B3, with Class B stranding in accordance with ASTM B8. Medium-voltage cable conductors can be either concentric-stranded in accordance with ASTM B8 or compact-round-stranded in accordance with ASTM B496. All power, control, and instrument cables shall be flame retardant and cable tray rated:

- 15-kV power cable will be class “B” coated, stranded copper, shielded, 90° C, 133 percent EPR or XLP insulation with overall thermosetting CP or CPE jacket.
- 5-kV power cable will be class “B” coated, stranded copper, shielded, 90° C, 133 percent EPR or XLP insulation with overall thermosetting CP or CPE jacket.
- 600-volt power cable will be class “B” coated, stranded, three-conductor copper with ground, 90° C, XLP or EPR insulation with overall thermosetting XLP or CSPE jacket. Individual conductors will be identified per ICEA Method 4, Table K2, complete with bare ground wire. Cables No. 4/0 AWG and above will be single-conductor.

- 600-volt control cable will be class “B” coated, stranded copper, 90°C, XLP or EPR insulation, multi-conductor, with overall thermosetting XLP or CSPE jacket. Individual conductors will be identified per ICEA Method 1, Table K2.
- 600-volt instrumentation cable will be shielded, class “B” coated, stranded copper, 90°C XLP or EPR insulation with overall thermosetting XLP or CSPE jacket.
- 600-volt thermocouple extension cable will be similar to instrumentation except conductors will be solid alloys per ANSI MC 96.1 (standard limits of error).

Minimum Conductor Size for Mechanical Strength

The recommended minimum conductor size for mechanical strength is as follows:

- Power and lighting (600 V max) – 12 AWG
- Single conductor control (120 V) – 14 AWG
- Single pair or triad for instrument – 16 AWG
- Multi-conductor cable for instrument/control – 18 AWG
- 5 kV - 1/C nonshielded power cable – 8 AWG (min. size available)
- 5 kV - 1/C shielded power cable – 8 AWG (min. size available)
- 15 kV - 1/C shielded power cable – 2 AWG (min. size available)
- Ground loop cable – 2/0 AWG
- Cable from ground loop to MCC, switchgear, transformers, tall stacks/vessels, substation fence and pipeway columns – 2/0 AWG
- Cable from ground loop to large motors, cable trays and enclosures – 4 AWG

Minimum Conductor Size for Short-Circuit Duty

Under short-circuit conditions, the temperature of the conductor rises rapidly. Then, due to thermal characteristics of the insulation, sheath and surrounding materials, it cools slowly after the short-circuit condition is removed. Failure to check the conductor size for short-circuit heating could result in permanent damage to the cable insulation due to disintegration of insulation material. The disintegrating insulation may give off smoke and combustible vapors. These vapors may ignite if sufficiently heated. Also, the cable insulation or sheath may be expanded to produce voids, leading to subsequent failure. This is especially serious in 5-kV and higher-voltage cables.

Minimum conductor sizes for various short-circuit currents and clearing times are shown in Table 79 of IEEE Std 141. The ICEA initial and final conductor temperatures (see ICEA P-32-382) are shown for the various insulations. Table 76 of IEEE Std 141 gives conductor temperatures (maximum operating, maximum overload, and maximum short-circuit current) for various insulated cables. Vendor curves based on ICEA are also available for checking cable fault duty.

6.4.3.7 Cable Routing Criteria

In internal building spaces such as the electrical buildings, cable tray and exposed conduit will generally be used. Partial, or full, false floors below computer, communications, or control rooms may be used. Cable fill will be in accordance with NEC Article 318. Outdoor cabling will be installed in cable tray as well as, in some cases, underground concrete-encased, conduit duct banks between major equipment locations and the electrical buildings. Aboveground raceways will be used at the equipment. All raceways, including cable tray, will be installed in accordance with NEC requirements. All raceways will be separated by voltage and/or system as follows:

- DCS data highway
- Communications
- Fire detection and alarm
- Low level signal (4-20 mA)
- 120-Vac and 125-Vdc Control (less than 20A)
- 480-Vac power, motor space heater power and 125-Vdc power (20A or greater)
- 2.4-kV and 4.16-kV power
- 13.8-kV power

Cables will be identified by cable number at each end of each cable. All control wires will be uniquely identified by color at point of termination.

6.4.3.8 Cable Sizing Criteria

Voltage Drop

Voltage drop criteria are as follows:

- Two percent maximum on feeders and sub-feeders.
- Three percent maximum on 4.16-kV and 2.4-kV feeders from switchgear to motor or transformer load.
- One percent maximum on bus ducts, from transformer to MCCs or switchgear.
- Three percent maximum on 480-volt feeders, from starter to motor.
- Two percent maximum on lighting, instrumentation, and other low-voltage circuits, from 120-Vac bus to distribution panels.
- Three percent average in branch circuits, from panels to load center of circuits, with a maximum of four percent to the most distant outlet.

Ampacity

Feeder cables shall be sized based on the following multiplying factors applied to the full load current:

- All motors 1.25
- All transformers 1.15 (times max FA rating @ 65° C)

The following additional provisions shall also apply:

- The maximum ampacity for any cable shall depend upon the worst case in which the cable is routed (tray, conduit, duct, or direct buried). In addition to ampacity, special requirements such as voltage drop, fault current availability, and environment shall be taken into consideration in sizing of cable.
- Cable ampacities shall be in accordance with National Electrical Code Tables 83 – 10 and ICEA Publication P46 – 426.

Short-Circuit Current Criteria

The maximum short-circuit current protection and circuit breaker clearing times normally determines the minimum size cable used for a given load. For circuits with unusually long feeder lengths, voltage drop may be the determining factor.

The maximum allowable conductor temperature after a short circuit (assuming rated conductor temperature prior to the short-circuit) can be 250° C for copper conductors insulated with ethylene propylene rubber and cross-linked polyethylene insulation. The minimum size cable to accommodate a given short-circuit current shall be based on allowable temperature.

Cable shall be large enough to accommodate sufficient fault current to activate protective devices for an end of run fault.

6.4.3.9 Spare Raceways and Cables

Conduits

Where conduits are installed in underground duct banks, 20 percent spare conduits shall be included in each duct bank, minimum two conduits between manholes or major pullboxes.

Where overhead exposed conduits are installed in major groups or banks between two locations, 10 percent spare conduits shall be installed between junction box locations, minimum two conduits.

Cable Trays

Cable trays shall be sized to include 10 percent minimum spare capacity, based on cable fill of circuits routed. Supports for trays shall be designed to accommodate cable trays filled to 40 percent capacity.

Cables

A total of 10 percent spare conductors shall be included in routed control and instrumentation cables, in the form of either spare conductors in individual cables or spare cables, between locations where there are large numbers of terminations.

6.4.3.10 Transformers

Transformer sizing shall be based upon running loads (determined from nameplate ratings) for motors, lighting transformers, and other equipment that will be, or may be, operated under normal conditions (i.e., other than power outage). For load estimation, 1 hp shall be assumed to equal 1 kilovolt-ampere (kVA) for induction motors. Spare motor drivers will normally not be considered part of the running load for the purpose of sizing transformers, except that capacity shall be provided for starting the largest spare motor with all normal

motor drivers running. Motor drivers of installations having one motor-driven unit and one turbine-driven unit should be considered part of the running operating load for the purpose of sizing transformers. Transformer capacity, as used here, is the self-cooled rating without fans, at 55°C rise.

In general, power transformers (500 kVA and above) should be supplied with 55°C/65°C temperature rise ratings and provisions for future forced air cooling. A transformer dual-rated with a 55°C/65°C temperature rise is capable of supplying 112 percent of its 55°C kVA rating at the 65°C rise.

Single transformers with secondary ratings of 600 volts or less should be sized so that the initial running load does not exceed 80 percent of the self-cooled 55°C rating.

Individual transformers with secondaries of less than 400 volts should not exceed a rating of 125 kVA, and transformers with secondaries between 400 and 600 volts should not exceed a rating of 750 kVA, without a detailed investigation of the effects of high short-circuit currents on secondary equipment.

A single transformer at 2,400 volts or more should not have an initial running load exceeding 90 percent of its self-cooled 55°C rating.

When sizing transformers for double-ended substations, the running load on both buses shall be calculated; loads should be balanced between the buses. Each transformer should be sized to carry 75 percent of this total running load at self-cooled, 55°C rating. It is recommended that each transformer have dual ratings (55°C/65°C). Therefore, when one transformer is out of service, the remaining transformer will be able to supply 112 percent of its rated kVA, or 84 percent of the total running load, at 65°C. Sixteen percent of the load must be dropped until the other transformer is brought back into service or the transformer may be operated in an overloaded state, if ambient conditions allow overloading without exceeding its 65°C rise rating. It is normally not desirable to drop loads while one transformer is out of service, therefore 55°C/65°C rated transformers with fan cooling or larger sized transformers may be used. For example, a 2,500-kVA, 55°C/65°C, fan-cooled transformer sized to carry 75 percent of the total running load can actually carry 105 percent of the total running load with the fans on, thus giving some leeway for adding load in the future. Engineering judgment and load considerations should be used to decide if fan cooling should be provided for the transformers upon installation.

Efficiency Analysis

The Cogen 3000 component of the Chevron Richmond Refinery Power Plant Replacement Project (PPRP, or the Project) will utilize a General Electric (GE) Frame 6B combustion turbine generator (CTG) in a cogeneration configuration, with a fired heat recovery steam generator. The Cogen 3000 configuration will not include a steam turbine generator (STG), as produced steam will be used in the Chevron Richmond Refinery.

The hydrogen production process generates significant quantities of hot exhaust which will be used to generate steam for electrical production by the STG. No fuel will be combusted in the hydrogen process specifically for electricity generation. The produced steam will be directed to an extraction, condensing STG capable of producing approximately 17 net megawatts (MW). Steam not condensed by the STG will be used to satisfy the Refinery's steam demand. As no fuel is combusted specifically for electrical generation, an estimate of efficiency was not prepared for the H₂-STG.

The Frame 6B engine is a heavy-duty combustion turbine achieving a gross electrical efficiency of approximately 33 percent on a lower heating value (LHV) basis. The net electrical efficiency is approximately 31.8 percent after accounting for plant parasitic load. This level of efficiency is achieved when the CTG is operating at full load with no duct firing at International Standards Organization (ISO) ambient conditions. The combined heat and power (CHP) efficiency¹ is approximately 88.6 percent at full power and full steam production levels.

Other types of plant operations, particularly those at less than full combustion turbine output, will result in slightly lower efficiencies. The Project will be expected to normally operate at full load to support Refinery operations. However, the CTG will also be designed for flexible load following and cyclic duty capabilities, depending on Refinery steam and electrical demand. The CTG will use variable inlet guide vanes that will allow the engine to maintain high fuel efficiency at reduced loads. This includes the ability to operate within the load range of approximately 60 percent load to full-load.

¹ CHP Efficiency is the sum of the net plant electrical output plus all useful heat output divided by the total fuel LHV input.

SECTION 8.0

Environmental Information

The following sections, 8.1 through 8.14, provide the environmental information required for the proposed Chevron Richmond Refinery Power Plant Replacement Project Small Power Plant Exemption:

- 8.1 Air Quality
- 8.2 Biological Resources
- 8.3 Cultural Resources
- 8.4 Land Use
- 8.5 Noise
- 8.6 Public Health
- 8.7 Socioeconomics
- 8.8 Agriculture and Soils
- 8.9 Traffic and Transportation
- 8.10 Visual Resources
- 8.11 Hazardous Materials and Waste
- 8.12 Water Resources
- 8.13 Geologic Resources and Hazards
- 8.14 Paleontological Resources

8.1 Air Quality

This section discusses issues pertaining to air quality as applicable to the Chevron Richmond Refinery Power Plant Replacement Project (PPRP, or the Project). It contains the following sections:

- Section 8.1.1 presents a summary description of the PPRP.
- Section 8.1.2 presents the air quality setting, including geography, topography, climate, and meteorology.
- Section 8.1.3 provides an overview of the ambient air quality standards.
- Section 8.1.4 discusses existing air quality in the vicinity of the Project and describes each of the criteria pollutants.
- Section 8.1.5 identifies the laws, ordinances, regulations, and standards (LORS) that can affect the Project and Project conformance, as well as the air quality regulatory agencies relevant to the Project.
- Section 8.1.6 presents the environmental analysis of emissions from the construction and operation of the Project, as well as the procedures used in assessing facility emissions and air quality impacts, and the results of the health risk assessment.
- Section 8.1.7 discusses compliance with LORS applicable to the Project.
- Section 8.1.8 discusses mitigation for Project air quality impacts.
- Section 8.1.9 presents the cumulative impacts assessment.
- Section 8.1.10 provides a list of references used in preparing this section.
- The data used to determine the construction impacts are presented in Appendix 8.1-A; the facility emissions and operating assumptions are presented in Appendix 8.1-B; and the data for the air quality impact assessment (AQIA), including the dispersion modeling input parameters, are presented in Appendix 8.1-C.

Potential public health risks posed by emissions of toxic air contaminants, including ammonia, are also addressed in more detail in Section 8.6, Public Health.

8.1.1 Introduction

Chevron is proposing the PPRP to add an additional 60 megawatts (MW) net generation to its existing refinery electrical generation located within Chevron's Richmond Refinery in the City of Richmond (see Figure 1.2-1) in Contra Costa County, California. The proposed PPRP will be integrated into Chevron's plans to meet its growing refinery electrical load, and produce steam to replace an existing boiler plant that is approaching its end of life. The PPRP is a subset of the larger Richmond Refinery Renewal Project that is concurrently undergoing California Environmental Quality Act (CEQA) review by the City of Richmond. The California Energy Commission (CEC) has jurisdiction for only the PPRP portion of the Renewal Project which is the subject of this application.

The PPRP will consist of the following components:

- A nominal 43-MW net, natural gas- or liquid petroleum gas (butane)-fired cogeneration train consisting of one combustion turbine generator (CTG), a refinery fuel gas-fired heat recovery steam generator, 13.8-kilovolt (kV) switchgear and ancillary equipment.
- Shutdown of the existing No. 1 power plant refinery steam boilers currently providing steam to the Refinery.
- A 17-MW net extraction, condensing steam turbine generator (STG), an associated cooling tower, and 12-kV switchgear installed as part of the new hydrogen production facility (the remainder of the hydrogen plant is under CEQA review as part of the Renewal Project). The new hydrogen plant will be a net generator of steam for both the STG and the Refinery steam system.
- Reconductoring of approximately 4,000 feet of existing onsite double-circuit overhead 115-kV transmission line to upgrade its ampacity. The reconductoring will reuse existing transmission line structures.
- Adjacent onsite service connections for fuel, reclaimed water, water, wastewater, steam, and electricity to existing piperacks, with the exception of the reconductoring noted above.

The Cogen 3000 portion of the PPRP will occupy approximately 0.5 acre within an existing 5.2-acre cogeneration facility, and the STG and associated equipment (H₂-STG) will occupy approximately 0.5 acre within a new 7.9-acre hydrogen plant that will be built as part of the Richmond Refinery Renewal Project. The PPRP will be located well within the heart of the existing 2,900-acre Richmond Refinery. Temporary construction laydown and parking for the PPRP will be provided in various existing laydown areas within the Refinery that are currently used for ongoing maintenance and project laydown. A complete description of the PPRP is provided in Section 2.0.

8.1.2 Air Quality Setting

8.1.2.1 Geography and Topography

The proposed Renewal Project site is located in the western portion of the city of Richmond, at 841 Chevron Way. The new equipment associated with the PPRP will be located within the boundaries of the existing Chevron Refinery property. The Project site is relatively flat; at an elevation of approximately 15 feet (5 meters) above sea level. The hills which border the western property boundary rise to an elevation of approximately 450 feet. The hills east of the Project site are approximately 4 to 5 miles from the site and rise to a height of approximately 400 to 600 feet, gradually rising to approximately 1,500 feet southeast of the facility. The Coastal Mountain range lies approximately 5 miles to the west of the facility across the San Pablo Bay in Marin County and includes Mount Tamalpais, which has a peak height of approximately 2,600 feet above sea level.

8.1.2.2 Climate and Meteorology

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 warmest days

of the year, however, normally occur during the month of September, with an average maximum mean temperature of 74 degrees Fahrenheit (°F) while daytime winter temperatures average about 60°F (WRCC, 2007). A climate summary, including average annual rainfall, for the nearby city of Richmond, is included in Appendix 8.1-C.

The climate is influenced 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, 2007). A majority of the rainfall in the Richmond area falls between November and March as frontal storms move from the northwest to southeast. Over 80 percent of the average rainfall occurs during these months (WRCC, 2007).

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. The wind is typically the strongest in the afternoons. 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. Afternoon wind speeds of 15 to 20 miles per hour (mph) are common throughout the strait region. Annual average wind speeds are approximately 8 mph in Martinez, and approximately 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. (BAAQMD, 1999)

Inversions affect air quality conditions significantly because they influence the vertical depth in the atmosphere available for diluting air contaminants released near the ground (i.e., the “mixing depth” of the atmosphere). Temperature inversions are common in summer and fall seasons when the conditions for sea breezes are most frequent. Radiation inversions are common during the winter months when the heat quickly radiates from the earth’s surface causing the air in contact with it to rapidly cool. Mixing depths under both of these conditions can be as shallow as 50 to 100 meters. (BAAQMD, 1999)

The Bay Area Air Quality Management District (BAAQMD) maintains a meteorological station at the Chevron Refinery. Therefore, the BAAQMD’s meteorological data files for 1999 through 2003 were used in the dispersion modeling analysis to represent typical winds at the PPRP site. The annual and quarterly wind rose plots for the Chevron Refinery monitoring station are presented in Appendix 8.1-C.

8.1.3 Overview of Air Quality Standards

The U.S. Environmental Protection Agency (USEPA) has established national ambient air quality standards (NAAQS) for the following seven pollutants, termed “criteria pollutants”: ozone (O₃), nitrogen dioxide (NO₂), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter with aerodynamic diameter less than or equal to 10 microns (PM₁₀), particulate matter with aerodynamic diameter less than or equal to 2.5 microns (PM_{2.5}), and airborne lead (Pb). The federal Clean Air Act (CAA) requires the USEPA to designate areas (counties) as attainment or non-attainment with respect to each criteria pollutant, depending on whether the areas meet the NAAQS. An area that is designated non-attainment means the

area is not meeting the NAAQS and is subject to planning requirements to attain the standard.

In addition to the seven pollutants listed above, the California Air Resources Board (CARB) has also established state standards for visibility-reducing particles, sulfates, hydrogen sulfide, and vinyl chloride. Similar to the USEPA, CARB designates counties in California as attainment or non-attainment with respect to the California ambient air quality standards (CAAQS). The state standards were designed to protect the most sensitive members of the population, such as children, the elderly, and people who suffer from lung or heart diseases.

Both state and federal air quality standards were based on two variables: maximum concentration and an averaging time over which the concentration would be measured. Maximum concentrations were based on levels that may have an adverse effect to human health. The averaging times were based on whether the damage caused by the pollutant would occur during exposures to a high concentration for a short time (e.g., 1 hour), or to a relatively lower average concentration over a longer period (8 hours, 24 hours, or 1 month). For some pollutants, there is more than one air quality standard, reflecting both short-term and long-term effects. Table 8.1-1 presents the NAAQS and CAAQS.

TABLE 8.1-1
Ambient Air Quality Standards

Pollutant	Averaging Time	California	National
Ozone	1 hour	0.09 ppm (180 $\mu\text{g}/\text{m}^3$)	0.12 ppm ^a
	8 hours	0.07 ppm (137 $\mu\text{g}/\text{m}^3$)	0.08 ppm ^b (157 $\mu\text{g}/\text{m}^3$)
CO	8 hours	9.0 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)
	1 hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)
NO ₂	Annual arithmetic mean	—	0.053 ppm (100 $\mu\text{g}/\text{m}^3$)
	1 hour	0.25 ppm (470 $\mu\text{g}/\text{m}^3$) ^c	—
SO ₂	Annual arithmetic mean	—	0.03 ppm (80 $\mu\text{g}/\text{m}^3$)
	24 hours	0.04 ppm (105 $\mu\text{g}/\text{m}^3$)	0.14 ppm (365 $\mu\text{g}/\text{m}^3$)
	3 hours	—	0.5 ppm ^d (1300 $\mu\text{g}/\text{m}^3$) (Secondary standard)
	1 hour	0.25 ppm (655 $\mu\text{g}/\text{m}^3$)	—
PM ₁₀	24 hours	50 $\mu\text{g}/\text{m}^3$	150 $\mu\text{g}/\text{m}^3$
	Annual arithmetic mean	20 $\mu\text{g}/\text{m}^3$	—
PM _{2.5}	Annual arithmetic mean	12 $\mu\text{g}/\text{m}^3$	15 $\mu\text{g}/\text{m}^3$ ^e
	24 hours	—	35 $\mu\text{g}/\text{m}^3$ ^f
Sulfates	24 hours	25 $\mu\text{g}/\text{m}^3$	—
Lead	30 day average	1.5 $\mu\text{g}/\text{m}^3$	—
	Calendar quarter	—	1.5 $\mu\text{g}/\text{m}^3$
Hydrogen sulfide	1 hour	0.03 ppm (42 $\mu\text{g}/\text{m}^3$)	—

TABLE 8.1-1
Ambient Air Quality Standards

Pollutant	Averaging Time	California	National
Vinyl chloride	24 hours	0.010 ppm (26 $\mu\text{g}/\text{m}^3$)	—
Visibility-reducing particles	8 hours (10 a.m. to 6 p.m. PST)	In sufficient amount to produce an extinction coefficient of 0.23 per kilometer due to particles when the relative humidity is less than 70 percent.	—

Notes:

- ^a As of June 15, 2005 the federal 1-hour ozone standard is no longer used, except in Early Action Compact (EAC) areas.
- ^b 3-year average of 4th-highest daily maximum 8-hour concentrations.
- ^c The nitrogen dioxide ambient air quality standard was amended on February 22, 2007, to lower the 1-hr standard to 0.18 ppm and establish a new annual standard of 0.030 ppm. These changes become effective after regulatory changes are submitted and approved by the Office of Administrative Law, which is expected later in 2007.
- ^d This is a national secondary standard, which is designed to protect public welfare.
- ^e 3-year average of the weighted annual mean concentrations.
- ^f 3-year average of 98th percentile of 24-hour concentrations.

$\mu\text{g}/\text{m}^3$ = micrograms per cubic meter

mg/m^3 = milligrams per cubic meter

ppm = parts per million

8.1.4 Existing Air Quality

The federal CAA requires USEPA to classify areas in the country as attainment or non-attainment, with respect to each criteria pollutant, depending on whether they meet the national standards. In addition, CARB makes area designations within California for state ambient air quality standards (AAQS). The attainment status for both the NAAQS and CAAQS are listed in Table 8.1-2.

TABLE 8.1-2
State and Federal Air Quality Designations for the Project Area (As of May 9, 2007)

Pollutant	State Designation	Federal Designation
O ₃	Non-attainment	Non-attainment
CO	Attainment	Attainment
NO ₂	Attainment	Attainment
SO ₂	Attainment	Attainment
PM ₁₀	Non-attainment	Unclassified
PM _{2.5}	Non-attainment	Attainment
Lead, H ₂ S, and Sulfates	Attainment/Unclassified	Attainment/Unclassified

Source: BAAQMD, 2007a

The reported ambient air quality data were obtained from data published by BAAQMD (BAAQMD, 2007b), CARB (CARB, 2007), and USEPA (USEPA, 2007). 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 PM_{2.5}, the nearest monitoring station with PM_{2.5} (Concord) was used. Tables 8.1-3 through Table 8.1-8 present the monitoring data collected from the Richmond (SO₂), San Pablo (O₃, PM₁₀, CO, and NO₂), and Concord (PM_{2.5}) stations.

8.1.4.1 Ozone

Ozone is a photochemical oxidant that is formed when volatile organic compounds (VOCs) and NO_x react in the presence of ultraviolet sunlight. The principal sources of NO_x and VOC, often termed ozone precursors, are combustion processes (including motor vehicle engines) and evaporation of solvents, paints, and fuels. Motor vehicles are the single largest source of ozone precursor emissions in the Bay Area. Exposure to ozone can cause eye irritation, aggravate respiratory diseases and damage lung tissue, as well as damage vegetation and reduce visibility (BAAQMD, 1999). The Bay Area Air Basin is designated as a non-attainment area for ozone by both USEPA and CARB.

Table 8.1-3 shows the annual maximum hourly ozone levels recorded at the San Pablo monitoring station during the period 2004 through 2006, as well as the number of days in which the state and federal standards were exceeded. Data from the station shows that over the 3-year period, ozone concentrations have generally been below both state and federal standards with the exception of one day in 2004.

TABLE 8.1-3
Ozone Levels at the San Pablo Monitoring Station, 2004 through 2006

	2004	2005	2006
Highest 1-hour Average (ppm)	0.11	0.066	0.061
Highest 1-hour Average (µg/m ³)	216.0	129.6	119.8
Highest 8-hour Average (ppm)	0.070	0.057	0.050
Highest 8-hour Average (µg/m ³)	137.4	111.9	98.2
Number of Days Exceeding			
State Standard (180 µg/m ³ , 1-hour)	1	0	0
State Standard (137 µg/m ³ , 8-hour)	1	0	0
Federal Standard (157 µg/m ³ , 8-hour)	0	0	0
Federal Standard (225.8 µg/m ³ , 1-hour)	0	0	0

Source: BAAQMD, 2007b; CARB, 2007

8.1.4.2 Nitrogen Dioxide

NO₂ is a byproduct of combustion sources such as motor vehicle exhaust or stationary combustion sources. The principle form of nitrogen oxide produced by combustion is nitric oxide (NO), but NO reacts quickly to form NO₂, creating a mixture of NO and NO₂ commonly called NO_x. The Bay Area Air Basin is designated attainment status for NO₂ by both USEPA and CARB. As previously noted, CARB and Office of Environmental Health

Hazard Assessment (OEHIHA) staff recently proposed lowering the state's 1-hour NO₂ standard and establishing an annual NO₂ standard. These changes have been submitted to the Office of Administrative Law and approval of the new standards is expected in 2007.

Table 8.1-4 shows the maximum 1-hour and annual-average NO₂ levels recorded at the San Pablo monitoring station between 2004 and 2006. Ambient NO₂ concentrations measured at this monitoring station did not violate either the proposed state 1-hour standard or the annual NAAQS.

TABLE 8.1-4
Nitrogen Dioxide Levels at the San Pablo Monitoring Station, 2004 through 2006

	2004	2005	2006
Highest 1-hour Average (ppm)	0.060	0.054	0.055
Highest 1-hour Average (µg/m ³)	112.9	101.6	103.5
Annual Average (ppm)	0.013	0.012	0.013
Annual Average (µg/m ³)	24.5	22.6	24.5
Number of Days Exceeding			
State Standard (470 µg/m ³ , 1-hour)	0	0	0
Federal Standard (100 µg/m ³ , annual)	0	0	0

Source: BAAQMD, 2007b; CARB, 2007

8.1.4.3 Carbon Monoxide

CO is a colorless, odorless gas formed by incomplete combustion of fossil fuels. Motor vehicles are by far the single largest source of CO in the Bay Area (BAAQMD, 1999). The Bay Area Air Basin is designated attainment status for the state CO standards by CARB.

Table 8.1-5 shows the California and federal air quality standards for CO, and the maximum 1- and 8-hour average levels recorded at the San Pablo monitoring station during the period 2004 through 2006.

TABLE 8.1-5
Carbon Monoxide Levels at the San Pablo Station, 2004 through 2006

	2004	2005	2006
Highest 8-hour average (ppm)	1.8	1.3	1.4
Highest 8-hour average (mg/m ³)	2.1	1.5	1.6
Highest 1-hour average (ppm)	3.2	2.8	2.5
Highest 1-hour average (mg/m ³)	3.7	3.2	2.9
Number of Days Exceeding			
State/Federal Standard (10 mg/m ³ / 10 mg/m ³ , 8-hr)	0	0	0
State/Federal Standard (23 mg/m ³ / 40 mg/m ³ , 1-hr)	0	0	0

Source: BAAQMD, 2007b; CARB, 2007; USEPA, 2007

8.1.4.4 Sulfur Dioxide

Sulfur dioxide is a colorless, pungent gas formed primarily by the combustion of sulfur-containing fossil fuels. The Bay Area Air Basin is designated attainment status for SO₂ by both USEPA and CARB.

Table 8.1-6 presents the maximum SO₂ levels recorded at the Richmond Station. During the period shown, the annual average SO₂ concentrations have been well under the federal standard. The state 24-hour average standard has not been exceeded at this location in the 3-year period, 2004 through 2006.

TABLE 8.1-6
Sulfur Dioxide Levels at the Richmond Station, 2004 through 2006

	2004	2005	2006
Highest 1-hour average (ppm)	0.039	0.02	0.026
Highest 1-hour average (µg/m ³)	102.1	52.4	68.1
Highest 3-hour average (ppm)	0.019	0.011	0.014
Highest 3-hour average (µg/m ³)	49.7	28.8	36.6
Highest 24-hour average (ppm)	0.005	0.006	0.006
Highest 24-hour average (µg/m ³)	13.1	15.7	15.7
Annual Average, All Hours (ppm)	0.0016	0.0011	0.002
Annual Average, All Hours (µg/m ³)	4.2	2.9	5.2
Number of Days Exceeding			
State Standard (655 µg/m ³ , 1-hour)	0	0	0
State Standard (105 µg/m ³ , 24-hour)	0	0	0
Federal Standard (1300 µg/m ³ , 3-hour)	0	0	0
Federal Standard (365 µg/m ³ , 24-hours)	0	0	0

Source: BAAQMD, 2007b; CARB, 2007; USEPA, 2007

8.1.4.5 Fine Particulates (PM₁₀ and PM_{2.5})

Fine particulate matter (PM₁₀ and PM_{2.5}) includes a wide range of solid or liquid particles, including smoke, dust, aerosols, and metallic oxides. There are many sources of fine particulate emissions, including combustion, industrial processes, grading and construction, and motor vehicles (BAAQMD, 1999). The Bay Area Air Basin is designated attainment for both PM₁₀ and PM_{2.5} by USEPA, but non-attainment for both the state PM₁₀ and PM_{2.5} standards by CARB.

Table 8.1-7 shows the maximum 24-hour and annual concentration of PM₁₀ recorded at the San Pablo monitoring station during 2004 through 2006.

TABLE 8.1-7
PM₁₀ Levels at the San Pablo Station, 2004 through 2006

	2004	2005	2006
Highest 24-hour average ($\mu\text{g}/\text{m}^3$)	64	42	58
Annual Arithmetic Mean ($\mu\text{g}/\text{m}^3$) (State Standard = 20 $\mu\text{g}/\text{m}^3$)	21.2	19	21
Number of Days Exceeding			
State Standard (50 $\mu\text{g}/\text{m}^3$, 24-hour)	1	0	NA
Federal Standard (150 $\mu\text{g}/\text{m}^3$, 24-hour)	0	0	0

NA – Not Available: Data for 2006 was only available from USEPA at the time of report preparation.
Source: BAAQMD, 2007b; USEPA, 2007

The reported PM_{2.5} data were obtained from the Concord monitoring station for 2004 through 2006. Table 8.1-8 presents the 3-year average 24-hour PM_{2.5} concentration and annual arithmetic mean concentrations.

TABLE 8.1-8
PM_{2.5} Levels at the Concord Station, 2004 through 2006

	2004	2005	2006
Maximum 24-hour Average Concentration ($\mu\text{g}/\text{m}^3$) ^a	74	49	62
Annual Arithmetic Mean ($\mu\text{g}/\text{m}^3$)	11	9	10
Number of Days Exceeding			
State Standard (12 $\mu\text{g}/\text{m}^3$, Annual)	0	0	0
Federal Standard (65 $\mu\text{g}/\text{m}^3$, 24-Hour ^b)	1	0	0
Federal Standard (15 $\mu\text{g}/\text{m}^3$, Annual)	0	0	0

Notes:

^a For PM_{2.5}, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard (CARB, 2007).

^b The Federal 24-hour standard was modified by the USEPA from 65 to 35 $\mu\text{g}/\text{m}^3$ on December 17, 2006. Therefore, exceedances for the 24-hour federal standard were compared to the previous 65 $\mu\text{g}/\text{m}^3$ standard through 2006.

Source: BAAQMD, 2007b; USEPA, 2007

8.1.5 Laws, Ordinances, Regulations, and Standards

The CAA, implemented by the USEPA, requires major new and modified stationary sources of air pollution to obtain a construction permit prior to commencing construction through a program known as the Federal New Source Review (NSR) program. The requirements of the NSR program are dependent on whether the air quality in the area where the new source (or modified source) is being located attains the NAAQS. The program that applies in areas that are in attainment of the NAAQS is the Prevention of Significant Deterioration (PSD). The program that applies to areas where the air does not meet the NAAQS (termed non-attainment areas) is the non-attainment NSR.

USEPA implements the NSR program through regional offices. Arizona, California, Hawaii, Nevada, and specific Pacific trust territories are administrated out of the USEPA Region IX

office located in San Francisco. USEPA typically delegates its NSR, Title V, and Title IV authority to local air quality agencies that have sufficient regulatory structure to implement these programs consistent with requirements of the CAA and implementing regulations. BAAQMD has been delegated several of these programs. However, USEPA currently retains authority for administering the PSD program in BAAQMD.

CARB was established by the state legislature in 1967 with the purpose of attaining and maintaining healthy air quality, conducting research into causes and solutions to air pollution, and addressing the impacts that motor vehicles have on air quality. To this end, CARB implements the following programs:

- Establish and enforce motor vehicle emission standards, including fuel standards.
- Monitor, evaluate, and set health-based air quality standards.
- Conduct research to solve air pollution problems.
- Establish toxic air contaminant (TAC) control measures.
- Oversee and assist local air quality districts.

Air pollution control districts were established shortly after the CARB, based on meteorological and topographical factors. The districts were established to enforce air pollution regulations for the purpose of attaining and maintaining all state and federal AAQS. The districts regulate air emissions by issuing air permits to stationary sources of air pollution in compliance with approved regulatory programs. Each district promulgates rules and regulations specific to air quality issues within its jurisdiction. The air emissions sources regulated by each district vary. The types of air pollution sources that might be regulated include manufacturers, power plants, refineries, gasoline service stations, and auto body shops.

Each level of government has adopted specific regulations that limit emissions from stationary combustion sources, several of which are applicable to the PPRP. The agencies having permitting authority for the proposed Project are shown in Table 8.1-9.

TABLE 8.1-9
Air Quality Agencies

Agency	Authority	Contact
USEPA Region IX	Regulatory oversight	Gerardo Rios USEPA Region IX 75 Hawthorne Street San Francisco, CA 94105 (415) 947-3974
CARB	Regulatory oversight	Michael Tollstrup Project Assessment Branch California Air Resources Board 2020 L Street Sacramento, CA 95814 (916) 322-6026
BAAQMD	Permit issuance, enforcement	Brian Bateman Bay Area Air Quality Management District 939 Ellis Street San Francisco, CA 94109 (415) 771-6000

The applicable LORS and compliance with these requirements are discussed in more detail in the following sections. An application for an Authority to Construct (ATC) was also filed with BAAQMD in June 2005.

Federal and state agencies and BAAQMD have specific regulations applicable to stationary combustion sources. These applicable regulations are presented in this section. Section 8.1.7 presents a detailed discussion of the Project's conformance with the applicable regulations. An ATC permit has been filed with the BAAQMD for the entire Renewal Project.

8.1.5.1 Federal

USEPA promulgates and enforces federal air quality laws, with Region IX administering the federal air programs in California. The federal CAA provides the legal authority to regulate air pollution from stationary sources. The applicable federal regulations are summarized in Table 8.1-10 (on page 8.1-12), along with the agency responsible for administration of the regulation.

8.1.5.2 State

CARB's primary responsibilities are to develop, adopt, implement, and enforce the state's motor vehicle pollution control program; to administer and coordinate the state's air pollution research program; to adopt and update, as necessary, the state's AAQS; to review the operations of the local air pollution control districts; and to review and coordinate preparation of the State Implementation Plan for achievement of the federal AAQS.

The California Health and Safety Code, Section 41700 prohibits the discharge from a facility of air pollutants that cause injury, detriment, nuisance, or annoyance to the public, or which endanger the comfort, repose, health, or safety of the public, or that damage business or property.

The state has promulgated numerous laws and regulations at the state level (i.e., Toxic Air Contaminants and Air Toxic Hot Spots) which are effectuated at the local level by the air districts. A discussion of these state and local LORS is presented in Tables 8.1-11 (see page 8.1-14) and 8.1-12 (see page 8.1-15), respectively.

In August 2006, the California legislature passed Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006. AB 32 requires California resource agencies to establish a comprehensive program of regulatory and market mechanisms to achieve reductions in greenhouse gas (GHG) emissions (CARB, 2006). The Richmond Refinery, including the PPRP, will be subject to AB 32, and will be required to comply with all final rules, regulations, emissions limitations, emission reduction measures or market-based compliance mechanisms adopted under AB 32. However, there are currently no applicable facility-specific GHG emission limits or caps. Therefore, GHG emissions have been estimated for the PPRP for information purposes at this time.

TABLE 8.1-10
Applicable Federal Laws, Ordinances, Regulations, and Standards for Protection of Air Quality

LORS	Purpose	Regulating Agency	Applicability/Compliance Strategy
Title 40 CFR Part 50	Establishes AAQS for criteria pollutants.	USEPA Region IX	The Applicant will conduct a dispersion modeling analysis to determine if the Project will exceed the state or federal AAQS.
Title 40 CFR Parts 51 and 52, NSR/PSD (BAAQMD Reg 2, Rule 2)	Requires NSR facility permitting for construction or modification of specified stationary sources. NSR applies to pollutants for which ambient concentration levels are higher than NAAQS. PSD review applies to pollutants for which the area is in attainment with the NAAQS.	USEPA Region IX	The PSD requirements apply on a pollutant-specific basis to any project that is a new major stationary source or a major modification to an existing major stationary source. BAAQMD classifies an unlisted source (which is not in the specified 28 source categories) that emits or has the potential to emit 250 tons per year (tpy) of any pollutant regulated by the Act as a major stationary source. For listed sources, the threshold is 100 tpy. NO _x or SO _x emissions from a modified major source are subject to PSD if the cumulative emission increases for either pollutant exceeds 40 tpy. In addition, a modification at a non-major source is subject to PSD if the modification itself would be considered a major source.
Title 40 CFR, Part 60	Establishes national standards of performance for new or modified facilities in specific source categories.	BAAQMD, with USEPA Region IX oversight	Proposed 40 CFR Part 60 Subpart KKKK – NO _x Emission Limits for New Stationary Combustion Turbines, was proposed on February 18, 2005, and is expected to be promulgated shortly. It would apply to all new combustion turbines that commence construction, modification, or reconstruction after February 18, 2005. The proposed rule would require natural-gas-fired turbines greater than or equal to 30 MW to meet a NO _x emission limit of 50 nanograms per Joule (ng/J) (0.39 pounds per megawatt-hour [lb/MW-hr]), and an SO ₂ limit of 73 ng/J (0.58 lb/MW-hr). Alternatively, a fuel sulfur limit of 500 parts per million by weight (ppmw) could be met. Stationary combustion turbines regulated under this subpart would be exempt from the requirements of Subpart GG.
Title 40 CFR, Part 63	Establishes national emission standards to limit emissions of hazardous air pollutants (HAPs, or air pollutants identified by USEPA as causing or contributing to the adverse health effects of air pollution but for which NAAQS have not been established) from facilities in specific categories.	BAAQMD, with USEPA Region IX oversight	Title 40, Code of Federal Regulations, Part 63—National Emission Standards for Hazardous Air Pollutants for Source Categories, establishes emission standards to limit emissions of hazardous air pollutants from specific source categories for Major HAP sources. Sources subject to Part 63 requirements must either use the maximum achievable control technology (MACT), be exempted under Part 63, or comply with published emission limitations. The applicable MACT standard to the Project is Subpart YYYY, which sets a formaldehyde emission limit or an operational limit of 91 parts per billion by volume (ppbv) for subject sources.

TABLE 8.1-10

Applicable Federal Laws, Ordinances, Regulations, and Standards for Protection of Air Quality

LORS	Purpose	Regulating Agency	Applicability/Compliance Strategy
Title 40 CFR Part 64 (CAM Rule)	Establishes onsite monitoring requirements for emission control systems.	BAAQMD, with USEPA Region IX oversight	Title 40, Code of Federal Regulations, Part 64—Compliance Assurance Monitoring (CAM), requires facilities to monitor the operation and maintenance of emissions control systems and report any control system malfunctions to the appropriate regulatory agency. If an emission control system is not working properly, the CAM rule also requires a facility to take action to correct the control system malfunction. The CAM rule applies to emissions units with uncontrolled potential to emit levels greater than applicable major source thresholds. Emission control systems governed by Title V operating permits requiring continuous compliance determination methods are generally compliant with the CAM rule. Exemptions from CAM are presented in 40 CFR 64.2(b).
Title 40 CRF part 70 (BAAQMD Reg 2, Rule 6)	CAA Title V Operating Permit Program	BAAQMD, with USEPA Region IX oversight	Title 40, Code of Federal Regulations, Part 70—Operating Permits Program, requires the issuance of operating permits that identify all applicable federal performance, operating, monitoring, recordkeeping, and reporting requirements. These requirements are implemented at the local level through BAAQMD Regulation 2, Rule 6. The Title V permit is tied to the BAAQMD NSR regulations.
Title 40 CRF part 72 (BAAQMD Reg 2 Rule 7)	CAA Acid Rain Program	BAAQMD, with USEPA Region IX oversight	Title 40, Code of Federal Regulations, Part 72—Acid Rain Program, establishes emission standards for SO₂ and NO_x emissions from electric generating units through the use of market incentives, requires sources to monitor and report acid gas emissions, and requires the acquisition of SO₂ allowances sufficient to offset SO₂ emissions on an annual basis. This program is implemented through BAAQMD's Regulation 2, Rule 7. However, units which commence construction after November 15, 1990, and supply equal to or less than one-third of its potential electrical output capacity or equal to or less than 219,000 MWe-hours actual electric output on an annual basis to any utility power distribution for sale (on a gross basis), are exempt from this regulation.

TABLE 8.1-11

Applicable State Laws, Ordinances, Regulations, and Standards for the Protection of Air Quality

LORS	Purpose	Regulating Agency	Applicability/Compliance Strategy
California Code of Regulations, Section 41700	Prohibits emissions in quantities that adversely affect public health, other businesses, or property.	BAAQMD with CARB oversight	The CEC conditions of exemption and the air quality management district (AQMD) ATC processes are developed to ensure no adverse public health affects or public nuisances result from operation of the Project.
California Code of Regulations Sections 93300-93347 (Toxic "Hot Spots" Act)	Requires preparation and biennial updating of facility emission inventory of hazardous substances; risk assessments.	BAAQMD with CARB oversight	An estimate of TAC emissions and associated risk will be evaluated as part of this subsection and Section 8.6, Public Health.

8.1.5.3 Local

When the state's air pollution statutes were reorganized in the mid-1960s, local districts were required to be established in each county of the state. There are three different types of districts: county, regional, and unified. In addition, special AQMDs, with more comprehensive authority over non-vehicular sources as well as transportation and other regional planning responsibilities, have been established by the Legislature for several regions in California, including the BAAQMD. AQMDs have principal responsibility for developing plans for meeting the NAAQS and CAAQS; for developing control measures for non-vehicular sources of air pollution necessary to achieve and maintain both state and federal air quality standards; for implementing permit programs established for the construction, modification, and operation of sources of air pollution; and for enforcing air pollution statutes and regulations governing non-vehicular sources.

The BAAQMD plans define the proposed strategies, including stationary source control measures and NSR rules, whose implementation will attain the state AAQS. The relevant stationary source control measures and NSR requirements are presented in Table 8.1-12.

8.1.6 Environmental Analysis

An analysis of the Project's ambient air quality impact was conducted to demonstrate compliance with the local, state, and federal air quality requirements for criteria pollutants (e.g., NO₂, CO, SO₂, PM₁₀ and PM_{2.5}), and noncriteria pollutants (e.g., ammonia) during operations. The following subsections describe the Project, the Project phases for which emissions have been evaluated (including construction), the ambient impact analyses results, and the evaluation of facility compliance with the applicable local, state, and federal air quality regulations.

TABLE 8.1-12

Applicable Local Laws, Ordinances, Regulation, Standards, and Permits for Protection of Air Quality

LORS	Purpose	Regulating Agency	Applicability/Compliance Strategy
BAAQMD Reg 1, Section 301 (Public Nuisance)	Prohibits the emissions of air contaminants or other material which create a public nuisance.	BAAQMD	The CEC conditions of exemption and the BAAQMD ATC process is designed to ensure that the operation of the Project will not cause a public nuisance.
BAAQMD Regulation 2, Rule 2 (Permits – NSR)	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 may be granted.	BAAQMD	As part of the NSR permit approval process, an air quality dispersion analysis must be conducted, using a mass emissions-based analysis contained in the rule or an approved dispersion model, to evaluate impacts of increased criteria pollutant emissions from any new or modified facility on ambient air quality. The PSD requirements apply on a pollutant-specific basis to any project that is a new major stationary source or a major modification to an existing major stationary source. BAAQMD classifies an unlisted source (which is not in the specified 28 source categories) that emits or has the potential to emit 250 tpy of any pollutant regulated by the Act as a major stationary source. For listed sources, the threshold is 100 tpy. NO_x or SO_x emissions from a modified major source are subject to PSD if the cumulative emission increases for either pollutant exceeds 40 tpy of NO_x, SO_x, or VOC emissions. (Note: for this application, it is assumed VOCs are equivalent to POCs.) In addition, a modification at a non-major source is subject to PSD if the modification itself would be considered a major source. BACT shall be applied to all new and modified sources with a potential to emit 10 pounds or more of any of the following: POC, NPOC, NO_x, SO₂, PM₁₀ or CO. (BAAQMD 2-2-301) A source shall be exempt from MACT requirements if the combined potential to emit from all related sources in a proposed modification is less than 10 tpy of any HAP and less than 25 tpy of any combination of HAPs. (BAAQMD 2-2-114) Offsets for NO_x are required at a 1.0 to 1.0 ratio if a modification to the permit causes a cumulative increase of 10 to 35 tpy. Offsets for PM₁₀ and SO_x are required at a 1.0 to 1.0 ratio if a modification to the permit causes a cumulative increase of 1.0 tpy. (BAAQMD 2-2-302 and 2-2-303) A visibility, soils, and vegetation analysis is required if the proposed project is subject to PSD requirements and is within 10 kilometers of a Class I Area. (BAAQMD 2-2-417).

TABLE 8.1-12

Applicable Local Laws, Ordinances, Regulation, Standards, and Permits for Protection of Air Quality

LORS	Purpose	Regulating Agency	Applicability/Compliance Strategy
BAAQMD Regulation 2, Rule 3 (Permits – ATC and Permit to Operate [PTO] for Power Plants)	The purpose of this rule is to outline the special permitting provisions for the construction of power plants within the District.	BAAQMD	In conjunction with the submittal of the SPPE Application to the CEC, the Applicant will work with the BAAQMD to provide the information needed for the issuance of an ATC. As stated in this rule, the review will be conducted as outlined in Reg 2, Rule 2.
BAAQMD Regulation 2, Rule 5 (Permits – Toxics NSR)	The purpose of this rule is to provide for the review of new and modified sources of TAC emissions in order to evaluate potential public exposure and health risk, to mitigate potentially significant health risks resulting from these exposures, and to provide net health risk benefits by improving the level of control when existing sources are modified or replaced.	BAAQMD	TBACT shall be applied to any new or modified source of TACs where the source risk is a cancer risk greater than 1.0 in a million (10^{-6}), and/or a chronic hazard index greater than 0.20. An ATC or PTO will be denied if the cancer risk exceeds 10 in a million, or the chronic hazard index exceeds 1.0, or the acute hazard index exceeds 1.0.
BAAQMD Regulation 2, Rule 6 (Permits – Title V)	The purpose of this rule is to implement the operating permit requirements of Title V of the CAA as amended in 1990.	BAAQMD	An application must be submitted to BAAQMD that presents all information necessary to evaluate the subject facility and determine the applicability of all regulatory requirements.
BAAQMD Regulation 2, Rule 7 (Permits – Acid Rain)	The purpose of this rule is to incorporate by reference the provisions of 40 CFR Part 72 for purposes of implementing an acid rain program that meets the requirements of Title IV of the CAA.	BAAQMD	If a facility is subject to 40CFR Part 72, an application must be presented to BAAQMD with all relevant sources at the facility, a compliance plan for each unit, applicable standards, and estimated commencement date of operation.
BAAQMD Regulation 6 (Particulate Matter and Visible Emissions)	Purpose of this Regulation is to limit the quantity of particulate matter in the atmosphere through the establishment of limitations on emission rates, concentration, visible emissions, and opacity.	BAAQMD	Exhaust emissions shall not be darker than No. 1 when compared to the Ringleman Chart for any period(s) aggregating 3 minutes in any hour, exceed the opacity standard of not greater than 20 percent for a period or periods aggregating 3 minutes in any hour, or exceed the 0.15 grains per dry standard cubic feet of exhaust gas volume.
BAAQMD Regulation 7 (Odorous Substances)	The purpose of this regulation is to place general limitations on odorous substances and specific emission limitations on certain odorous compounds.	BAAQMD	Emissions of odorous substances shall not remain odorous after dilution with odor-free air at a rate of 1,000 volumes of odor-free air per volume of source sample. The maximum emissions of ammonia shall not exceed 5,000 ppm.
BAAQMD Regulation 9, Rule 1	Establishes emission limits for sulfur dioxide from all sources and limits ground-level concentrations of SO ₂	BAAQMD	Dispersion modeling will be conducted to determine if off-property SO ₂ ground level concentrations are less than 0.5 ppm for 3 consecutive minutes, 0.25 ppm averaged over 60 consecutive minutes, or 0.05 ppm averaged over 24 hours. Sulfur contents in the fuel will be less than 0.5% and gas stream concentrations will be less than 300 ppm (dry).

TABLE 8.1-12

Applicable Local Laws, Ordinances, Regulation, Standards, and Permits for Protection of Air Quality

LORS	Purpose	Regulating Agency	Applicability/Compliance Strategy
BAAQMD Regulation 9, Rule 3	The purpose of this rule is to limit the emissions of NO _x from new or modified heat transfer operations.	BAAQMD	For new or modified heat transfer operation designed for a maximum heat input of 264 gigajoules (GJ) (250 MMBtu) per hour or more, NO _x shall not exceed 125 ppm when gaseous fuel is burned or 225 ppm when liquid fuel is burned.
BAAQMD Regulation 9, Rule 9	Purpose of this rule is to limit emissions of NO _x from stationary gas turbines.	BAAQMD	For turbines with a heat input rating greater than 500 million British thermal units per hour (MMBtu/hr) (40+ MW), NO _x emission levels shall not exceed 0.72 lb/MW-hr or 25 ppmv.
BAAQMD Regulation 10 (40 CFR Part 60)	Establishes national standards of performance for new or modified facilities in specific source categories.	BAAQMD	Subpart GG (Standards of Performance for Stationary Gas Turbines) applies to gas turbines with a heat input at peak load equal to or greater than 10.7 gigajoules per hour (GJ/hr), or 10 million MMBtu/hr, at the lower heating value. The New Source Performance Standards (NSPS) limits the sulfur content of fuel to 0.8 percent. USEPA promulgated new standards for new, modified, or reconstructed stationary combustion turbines constructed/modified after February 18, 2005. The proposed rule would require natural-gas-fired turbines greater than or equal to 30 MW to meet a NO_x emission limit of 50 ng/J (0.39 lb/MW-hr), and an SO₂ limit of 73 ng/J (0.58 lb/MW-hr). Alternatively, a fuel sulfur limit of 500 ppmw could be met. Stationary combustion turbines regulated under this subpart would be exempt from the requirements of Subpart GG.
BAAQMD Regulation 11, Rule 10	The purpose of this rule is to reduce emissions of hexavalent chromium from cooling towers by eliminating chromium-based circulating water treatment programs.	BAAQMD	Hexavalent chromium levels in the circulating water must be less than 0.15 milligrams per liter (mg/L).

8.1.6.1 Methodology for Estimating Facility Impacts

The new cogeneration equipment will consist of a GE Frame 6B gas-fired CTG, rated at 43 MW net output (nominal at site design conditions), and a heat recovery steam generator (HRSG) equipped with duct burners with a maximum combined cogeneration (turbine and duct burner) heat input rating of 840 MMBtu/hr higher heating value (HHV). The cooling tower associated with the STG will have a maximum recirculation rate of 36,000 gallons per minute (gpm), which includes a higher recirculation rate than is needed for process cooling for the STG.

The operating profile for the Cogen 3000 has not been finalized. Therefore, for this SPPE application, the maximum hourly and annual emissions from the Cogen 3000 were conservatively estimated using the combined maximum heat input rating for the turbine and duct burner. The hourly and annual emission rates for the STG cooling tower were estimated assuming the maximum design water circulation rate for the complete hydrogen plant cooling load (STG portion is approximately 44 percent of this rate) and the maximum total dissolved solids (TDS) concentration permissible in the water supply.

The emissions of NO_x and CO during the commissioning, turbine startup, and shutdown phases may be higher than the steady-state operation because the emission control systems will not be operating at their design efficiencies during these events. However, the commissioning emissions would only occur during the initial installation of the equipment, and because the PPRP and hydrogen plant will be operated on a continuous basis, the Cogen 3000 and STG cooling tower would only be shut down a minimal number of times for scheduled and unscheduled maintenance. Based on the expectation that the Cogen 3000 and STG cooling tower will operate on a continuous basis, emissions from startup were estimated for this analysis but were not included in the comparison to the NAAQS and CAAQS.

8.1.6.1.1 Emission Estimates

Natural gas combustion results in the formation of NO_x, SO₂, VOCs, PM₁₀, PM_{2.5}, and CO. (Note: for this application it is assumed VOCs are equivalent to the BAAQMD's POCs.) Because natural gas is a clean-burning fuel, there will be minimal formation of combustion PM₁₀ and SO₂. The CTG will be equipped with steam-injected combustors that minimize the formation of NO_x. To further reduce NO_x emissions, selective catalytic reduction (SCR) will be used, and oxidation control systems will be used to reduce CO and VOC emissions. In addition to criteria pollutants, noncriteria pollutants will also be emitted by the PPRP, including ammonia, which will be used as a reactant by the SCR systems to control NO_x emissions.

Emissions of the criteria and noncriteria pollutants have been characterized and quantified in this application.

Emission Profile

There will be three discrete phases of the Project, which are addressed in this air quality assessment. The first phase is the construction of the new facility, the second phase is the new facility commissioning, and the final phase is the new facility operation.

Construction Phase. Short-term emissions would be generated from construction equipment exhaust, motor vehicle exhaust, re-entrained road dust, and fugitive dust emissions from soil disturbance. As described in Section 8.1.1, the PPRP is a subset of the larger Renewal

Project, specifically the PPRP is a subset of the Hydrogen Plant and the Power Plant Replacement Projects.

Based on engineering estimates, the construction of the Hydrogen Plant Replacement and the Power Plant Replacement Projects would occur over a period of approximately 28 to 30 months. For the purpose of estimating short-term construction impacts, it was assumed the magnitude, duration, and construction activities associated with the entire Hydrogen Plant Replacement Project (i.e., the H₂ facility, the STG, and the H₂-STG cooling tower) would be greater than the magnitude, duration, and activities associated with construction of the Cogen 3000, the STG, and the H₂-STG cooling tower alone. Therefore, it is expected that the construction emissions from the entire Hydrogen Plant Replacement Project would be greater than the construction emissions from the Cogen 3000, the STG, and the H₂-STG cooling tower portions of the Hydrogen Plant Replacement Project. The maximum short-term daily construction emissions are conservatively represented by the construction emissions related to the entire Hydrogen Plant Replacement Project and are presented in Table 8.1-13. The methodology used to estimate the construction emissions is provided in Appendix 8.1-A.

TABLE 8.1-13
Maximum Daily Construction Emissions

Construction Emission Source	Emissions (lb/day)					
	VOC ^a	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}
Fugitive Dust ^b	-	-	-	-	40	8
Construction Equipment Exhaust ^b	14	109	96	0.08	4	3
Onroad Emissions – Workers ^c	2	52	6	0.05	44	5
Onroad Emissions – Trucks ^c	1	10	23	0.03	6	1
Maximum Total (lb/day)	17	171	125	0.16	94	17

Notes:

^a Emission factors in URBEMIS and EMFAC are listed as reactive organic gases (ROG). For this analysis it is assumed ROG are equivalent to VOCs

^b Fugitive dust and construction equipment exhaust emissions were estimated using URBEMIS2002 v. 8.7.0 emission factors. It was assumed that a maximum of 4 acres per day would be graded and that construction equipment would operate 4 hours per day, except for cranes, which would operate 2 hours per day.

^c Onroad exhaust emissions were estimated using EMFAC2007 v. 2.3 emission factors. It was assumed that workers would travel 5 miles per trip, delivery and dump trucks would travel 10 miles per trip, and water trucks would travel 5 miles per trip. Onroad emissions included emissions from re-entrained road dust. Re-entrained road dust emissions were estimated using AP-42, Ch. 13.2.1 (USEPA, 2006).

lb/day = pounds per day

The short-term construction emissions were not compared to thresholds because the BAAQMD has not published quantitative thresholds of significance for construction emissions. The BAAQMD *CEQA Guidelines* (BAAQMD, 1999) emphasize implementation of effective control measures rather than detailed quantification of construction emissions. According to the BAAQMD *CEQA Guidelines*, implementation of all the basic control measures would reduce fugitive PM₁₀ emissions during construction to less than significant levels (BAAQMD, 1999). The BAAQMD's basic control measures will be implemented as part of the Project construction (ESA, 2007). However, these control measures would not address exhaust

emissions generated during construction. According to the BAAQMD *CEQA Guidelines*, construction equipment exhaust emissions (CO, NO_x, and VOC) are included in the emissions inventory that is the basis for the regional air quality plans and are not expected to impede attainment or maintenance of the ozone standards in the Bay Area (BAAQMD, 1999). Therefore, construction emissions from the PPRP would be less than significant.

Commissioning Phase. During the commissioning phase, the turbine and duct burner will be initially operated at various load rates without the benefit of the emission control systems to ensure proper operation of the equipment. The commissioning phase for this Project is expected to be approximately 21 days of unit operation. During this period, the Applicant will ensure that emissions are reduced to the extent feasible by limiting equipment operation consistent with the equipment manufacturers recommended intervals. Table 8.1-14 presents an estimate of the maximum hourly emissions during commissioning for NO_x and CO. Emission rates for other criteria pollutants are expected to be equal to or lower than normal operating rates due to reduced loads during commissioning. Similarly, the commissioning of the H₂-STG cooling tower will not result in emissions greater than normal operating rates.

TABLE 8.1-14
Turbine and Duct Burner Commissioning Emission Rate

	NO _x	CO	VOC	SO ₂	PM ₁₀
Maximum Hourly, lb/hr	588.5	47.8	*	*	*
Maximum Daily, lb/day	3,581	334.3	*	*	*
Maximum Annual, ton/yr	37.6	3.51	*	*	*

Note:

* Not emitted in amounts greater than normal operating rates.

Reference: Information prepared for the BAAQMD permitting process.

Operational Phase. Operational emission estimates were prepared for the two expected operating modes. The first operating mode is the startup and shutdown mode and the second is the steady-state operating mode. Emission estimates for these two operating modes are based on vendor data and engineering estimates.

Startup and Shutdown Emissions. During a startup and shutdown, the emission control systems (steam-injected combustors, SCR, and oxidation catalyst) are not operating at design efficiencies, resulting in higher emission rates for NO_x and CO emissions. As stated previously, the Cogen 3000 equipment is expected to operate as a baseload unit, with shutdowns only for scheduled and unscheduled maintenance activities. Shutdown emission rates are not expected to be greater than normal operating rates. Therefore, the number of startups and shutdowns will not significantly contribute to the daily and annual emission estimates. Table 8.1-15 presents the Cogen 3000 startup emissions on a pounds per hour basis.

TABLE 8.1-15
Cogen 3000 Startup Emission Rates*

	NO _x	CO	VOC	SO ₂	PM ₁₀
Startup (lb/hr)	143.2	33.5	*	*	*

Note:

* Not emitted in amounts greater than normal operating rates.

Reference: Information prepared for the BAAQMD permitting process.

Steady-state Operating Emissions. Table 8.1-16 presents the maximum fuel usage expected for the CTG. The maximum fuel usage was estimated based on the combined maximum turbine and duct burner firing rate. The daily and annual fuel usage was based on the maximum hourly fuel usage rate multiplied by 24 and 8,760 hours, respectively.

TABLE 8.1-16
Maximum Cogen 3000 Fuel Use

Period	Cogen 3000 Maximum Fuel Use (MMBtu HHV)*
Per Hour	840
Per Day	20,160
Per Year	7,358,400

Note:

* Hourly, daily and annual fuel use are based on the assumption that the Cogen 3000 unit would be operated at the maximum heat input rating for each hour times 24 hours per day, 365 days per year.

The Cogen 3000 operational emission rates for steady-state operations have been estimated based on the combined maximum heat input rating and conservative estimates of annual operation. Emission estimates are provided in Appendix 8.1-B. The emission rates for the Cogen 3000 unit are shown in Table 8.1-17.

TABLE 8.1-17
Maximum Pollutant Emission Rates for the Cogen 3000 Unit ^a

Pollutant	ppmvd @ 15% O ₂	Emission Rate (lb/hr) ^b
NO _x	2.5	7.7
CO	4.0	7.5
VOC	2.0	2.2
PM ₁₀ ^c	NA ^d	6.3
SO ₂ ^e	<1	0.38
Ammonia	10.0	3.8

Notes:

^a Maximum values exclude startups and shutdowns.

^b Assumes a maximum heat input value of 840 MMBtu/hr (HHV) for the CTG and duct burner.

^c 100 percent of particulate matter emissions assumed to be emitted as PM₁₀ and PM_{2.5}; PM₁₀/PM_{2.5} emissions include both front and back half as those terms are used in USEPA Method 5.

^d Not available.

^e Assessed using 0.164 grains of sulfur per 100 cubic feet of natural gas.

See Appendix 8.1-B, Table 8.1-B3.

ppmvd = parts per million by volume-dry

Operational emissions from the STG cooling tower have been estimated based on a recirculation rate in gallons per minute for the complete cooling tower (both STG portion and hydrogen plant portion), a maximum expected TDS concentration in the water supply,

and established emission calculation procedures. The annual emissions reflect 24 hours per day, 365 days per year of operation. It was conservatively assumed that all particulate matter less than 10 microns is also less than 2.5 microns. Emission estimates are provided in Appendix 8.1-B. The PM₁₀ and PM_{2.5} emission rates for the cooling towers are shown in Table 8.1-18.

TABLE 8.1-18
Maximum PM₁₀/PM_{2.5} Cooling Tower Emissions

	Recirculation Rate (gpm)	Maximum TDS Concentration (mg/L)	Hourly PM ₁₀ /PM _{2.5} (lb/hr)	Annual PM ₁₀ /PM _{2.5} (lb/yr)
STG Cooling Tower	36,000	5000	4.5	39,460

Note: Annual emissions are based on 8,760 hours per year of operation.

lb/hr = pounds per hour

lb/yr = pounds per year

8.1.6.1.2 Facility Emissions

The facility emission estimates were based on the turbine and duct burner emission rates shown in Table 8.1-17, the cooling tower emissions in Table 8.1-18, and the maximum design capacities of the equipment. The maximum annual, daily, and hourly emissions for the Project during normal operation are shown in Table 8.1-19. Detailed emission estimates are provided in Appendix 8.1-B.

TABLE 8.1-19
Maximum Annual, Daily, and Hourly Emissions for PPRP during Normal Operation (Excludes Startup Emissions)

	NO _x	SO ₂	VOC	CO	PM ₁₀
Maximum Hourly Turbine and Duct Burner Emissions, lb/hr	7.7	0.4	2.2	7.5	6.3
STG Cooling Tower Emissions, lb/hr	—	—	—	—	4.5
Maximum Daily Turbine and Duct Burner Emissions, lb/day ^a	184.4	9.6	51.8	180	151.2
STG Cooling Tower Emissions, lb/day	—	—	—	—	108.0
Total Emissions (lb/day)	184.4	9.6	51.8	180	259.2
Turbine and Duct Burner Emissions, lb/yr ^b	67,452	3,329	18,921	65,700	55,188
STG Cooling Tower Emissions, lb/yr	—	—	—	—	39,460
Total Emissions (lb/yr)	67,452	3,329	18,921	65,700	94,648
Total Emissions (tpy)	33.7	1.7	9.5	32.9	47.3

Notes:

^a Daily emissions includes 24-hours per day of operation at the maximum fuel firing rate of 840 MMBtu/Hr HHV.

^b Annual emissions are based on 8,760 hours per year of operation for the CTG and STG cooling tower.

In response to State's call for greenhouse gas (GHG) reductions in Assembly Bill 32, Chevron has incorporated into the Renewal project a more efficient cogeneration technology. The Cogen plant will reduce the Refinery's GHG emissions by using a single

natural gas fuel stream to produce both electric and thermal energy to serve the Refinery, thereby avoiding the higher GHG emissions that would result from the separate production of these commodities. Furthermore, Chevron's Hydrogen Plant design recovers waste heat from the process in a heat recovery steam generator that will drive a condensing steam turbine generator, creating 17 megawatts of electrical energy for use in the hydrogen plant, in lieu of several less efficient non-condensing steam turbine drivers.

An analysis of the overall GHG emissions from the Renewal Project was also conducted as a part of the administrative draft Environmental Impact Report (EIR) (ESA, 2007). Based on the administrative draft EIR, when considering the change in CO₂ for the PPRP, the change in CO₂ emission from baseline to the expected utilization would be an increase of approximately 77,000 metric tons (ESA, 2007). However, when considering the net change in CO₂ emissions for the entire Renewal Project, the proposed Renewal Project shows a net reduction in CO₂ emissions of approximately 219,000 metric tons/year (emissions of CO₂ equivalent were not included in this analysis). At the time of this analysis, state (CARB) and/or local (BAAQMD) guidelines did not exist to assess the significance of the GHG emissions. Therefore, emissions are presented for informational purposes and no conclusions regarding significance are made at this time.

8.1.6.1.3 Toxic Air Contaminants and Noncriteria Pollutant Emissions

Emissions associated with the Project will consist primarily of combustion by-products produced by the natural-gas-fired combustion turbines, and particulate emissions from the cooling towers. However, the Project is also expected to emit small quantities of TACs and noncriteria pollutants (e.g., ammonia). The TACs are compounds that have been identified by CARB as pollutants that may pose a significant health hazard. Some of these pollutants are also regulated under the federal NSR program. These federally regulated pollutants include lead, asbestos, beryllium, mercury, fluorides, sulfuric acid mist, hydrogen sulfide, total reduced sulfur, and reduced sulfur compounds, but since they are expected to be emitted in quantities less than their federal thresholds, they are being analyzed as TACs.

Noncriteria pollutant emission factors for the analysis of emissions from the gas turbine were obtained from the Energy & Environmental Research Corporation (EERC) August 1998 publication entitled *Air Toxic Emission Factors for Combustion Sources Using Petroleum Based Fuels, Final Report, Volume II* (EERC, 1998). Emission factors for the cooling water were based on information provided by the Applicant as part of the BAAQMD permit application (Chevron, 2006).

The health risk analysis was conducted assuming that the combustion turbines and cooling towers would be operated 8,760 hours per year, at the maximum heat input rating and maximum circulation rate, respectively. This would be a conservative estimate of emissions because the planned operating rates will likely be less than operating each hour of the year at the maximum capacity of the equipment.

Appendix 8.1-B provides the detailed emission calculations for noncriteria pollutants. A summary of the potential public health impacts related to the TAC emissions from the Cogen 3000 unit and the STG cooling towers are presented in Section 8.1.6.3. A complete discussion of the TAC emissions and the potential public health impacts are presented in Section 8.6.

8.1.6.2 Air Quality Impact Analysis

An ambient air quality impact analysis was conducted to compare worst-case ground-level impacts resulting from the operation of the proposed PPRP with established state and federal AAQS and applicable BAAQMD significance criteria. The analysis was conducted in accordance with the air quality impact analysis guidelines presented in the USEPA's 40 CFR Part 51, Appendix W: *Guideline on Air Quality Models* (USEPA, 2005) and the BAAQMD's *Permit Modeling Guidance* (BAAQMD, 2005a).

The analysis includes an evaluation of the possible effects of simple, intermediate, and complex terrain, and aerodynamic effects (downwash) due to nearby building(s) and structures on plume dispersion and ground-level concentrations. A basic Gaussian plume model was used in this analysis. The model assumes that the concentrations of emissions within a plume can be characterized by a Gaussian distribution of gaseous concentrations about the plume centerline. Gaussian dispersion models are approved by the USEPA and BAAQMD for regulatory use and are based on conservative assumptions (i.e., the models tend to over predict actual impacts by assuming steady-state conditions, no pollutant loss through conservation of mass, no chemical reactions, etc.).

The following subsections present:

- Modeling methodology for evaluating the impacts on ambient air quality
- Modeling scenarios and source data used to evaluate the impacts on ambient air quality
- Modeling results compared to the ambient air quality standards

8.1.6.2.1 Modeling Methodology for Evaluating Impacts on Ambient Air Quality

This section outlines the air dispersion modeling techniques used to assess the impacts from the operation of the proposed Project. The modeling methodology follows the modeling guidance provided in the USEPA's *Guideline on Air Quality Models* (USEPA, 2005) as well as the BAAQMD's modeling guidance (BAAQMD, 2005a). The Applicant's preliminary BAAQMD permitting input files were also used as the initial setup files for the analysis, including stack height, site layout, building parameters, and facility boundary.

Model Selection

The operational air quality impact analysis was performed using the Industrial Source Complex, Short-Term Model (ISCST3, Version 02035). ISCST3 was selected in consultation with CEC and BAAQMD staff during a meeting on December 12, 2006. ISCST3 is a Gaussian dispersion model capable of assessing impacts from a variety of source types in areas of simple, intermediate, and complex terrain. The model can account for area, line, and volume source types; downwash effects; and gradual plume rise as a function of downwind distance. The model is capable of estimating concentrations for averaging periods from one hour to one year. The required emission source data inputs to ISCST3 include source locations, source elevations, stack heights, stack diameters, stack exit temperatures, stack exit velocities, and pollutant emission rates. The source locations are specified for a Cartesian (x,y) coordinate system where x and y are distances east and north in meters, respectively. The Cartesian coordinate system used for these analyses is the Universal Transverse Mercator Projection (UTM), 1927 North American Datum (NAD 27).

Model Options

ISCST3 model options include use of site-specific vertical profiles of wind speed and temperature, consideration of stack and building wake effects, and time-dependent exponential decay of pollutants. USEPA-recommended default values were used for the modeling analyses. A number of these default values are required for approval and are listed below.

- Rural dispersion coefficients
- Final plume rise
- Stack tip downwash
- Buoyancy-induced dispersion
- Calm processing
- No missing data processing
- Default wind profile exponents
- Default vertical potential temperature gradients
- 10-meter anemometer height

Previous modeling of the facility for BAAQMD permitting used rural dispersion coefficients. Therefore, for consistency, this modeling analysis also utilizes rural dispersion mixing coefficients.

Meteorological Data

The CEC requires five consecutive years of meteorological data approved by CARB or the local air pollution control district to be used in the air modeling. BAAQMD has recommended the use of BAAQMD's onsite meteorological data collected at the Chevron Refinery between 1999 and 2003. The BAAQMD meteorological data files have been pre-formatted by the BAAQMD for use with the Industrial Source Complex – Short-term (ISCST3) model, including the use of a predetermined mixing height of 600 meters.

Background Data

The background data need not be collected onsite, as long as the data are representative of the air quality in the subject area (40 CFR 51, Appendix W, Section 9.2). The following three criteria were used for determining whether the background data would be representative: (1) location, (2) data quality, and (3) data currentness. These criteria are defined as follows:

- **Location:** The measured data must be representative of the areas where the maximum concentration occurs for the proposed stationary source, existing sources, and a combination of the proposed and existing sources.
- **Data quality:** Data must be collected and equipment must be operated in accordance with the requirements of 40 CFR Part 58, Appendices A and B, and PSD monitoring guidance.
- **Data Currentness:** The data are current if they have been collected within the preceding three years and are representative of existing conditions.

Based on the criteria above, background concentrations for the PPRP were taken from the Richmond (7th Street, approximately 1.75 miles northeast of Proposed Project site), San Pablo (Rumrill Boulevard, approximately 2.75 miles northeast of Proposed Project site), and

Concord¹ (approximately 20 miles east of Project site) monitoring stations. Table 8.1-20 presents the maximum concentrations of NO_x, SO₂, CO, PM₁₀, and PM_{2.5}, recorded for the most recent years (2004 through 2006) from the above stations.

TABLE 8.1-20
Background Air Concentrations Near the Chevron Facility ^{a, b} 2004 through 2006

Pollutant	Averaging Time	2004		2005		2006		Average	Maximum
		ppm	µg/m ³	ppm	µg/m ³	ppm	µg/m ³	µg/m ³	µg/m ³
NO ₂	1-hour	0.06	113	0.05	102	0.06	104	106	113
	Annual	0.013	24.5	0.012	22.6	0.013	24.5	23.8	24.5
SO ₂	1-hour	0.039	102.1	0.020	52.4	0.026	68.1	74.2	102.1
	3-hour	0.019	49.7	0.011	28.8	0.014	36.6	38.4	49.7
	24-hour	0.005	13.1	0.006	15.7	0.006	15.7	14.8	15.7
	Annual	0.0016	4.2	0.0011	2.9	0.002	5.2	4.1	5.2
CO	1-hour ^c	3.2	3665	2.8	3207	2.5	2863	3245	3665
	8-hour ^c	1.8	2061	1.3	1489	1.4	1603	1718	2061
PM ₁₀	24-hour	-	64	-	42	-	58	55	64
	Annual	-	21.2	-	19.0	-	21.0	20.4	21.2
PM _{2.5}	24-hour	-	74	-	49	-	62	62	74
	Annual	-	10.7	-	9.0	-	10.0	9.9	10.7

Notes:

^a Data reported are for the San Pablo (Ozone, PM₁₀, CO and NO₂), Richmond (SO₂), and Concord (PM_{2.5}) monitoring stations. The annual BAAQMD ambient air quality data summaries were used as the primary reference. The USEPA AIRS database and the CARB database were used when BAAQMD data were not available.

^b Conversion from ppm to µg/m³ at 25° Celsius and 760 torr.

^c Ambient CO data was converted from mg/m³ to µg/m³ by multiplying by 1,000.

In evaluating the impacts of operation on ambient air quality, modeling of the ambient impacts for the Project were added to the representative background concentrations in Table 8.1-20, and the results were compared to the state and federal ambient air quality standards for SO₂, NO₂, PM₁₀, PM_{2.5}, and CO.

Receptor Data

Cartesian coordinate receptor grids were used to assess the ground-level pollution concentrations surrounding the Project area, identify the extent of significant impacts, and identify the maximum impact locations.

For the operational air quality impact analyses, a fine receptor grid (30-meter resolution) was used around the fenceline with an initial coarse grid of receptors with 100-meter spacing extended 10 kilometers from the fenceline. A second refined receptor grid out to a radius of 1,500 meters with 30-meter grid receptor spacing was centered on the coarse grid receptor with the maximum predicted ground level concentrations. Concentrations within the facility fenceline were not calculated.

¹ 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 PM_{2.5}, the nearest monitoring station with PM_{2.5} (Concord) was used.

Receptor elevations, including those around the fenceline, were determined using the 7.5-minute U.S. Geological Survey (USGS) Digital Elevation Model (DEM) data (30-meter spacing between grid nodes). All coordinates were referenced to the UTM Zone 10, NAD27. Source base elevations, which are used in part to determine the height of the plume relative to the receptors, were based on information provided by the Applicant.

Building Downwash and Good Engineering Practice Assessment

For the analysis of the potential turbine impacts during operation, the USEPA's Building Profile Input Program (BPIP) (Dated 04112) was used to calculate the projected building dimensions required for ISCST3 evaluation of impacts from building downwash. The cooling towers were represented as volume sources; therefore, an evaluation of the good engineering practice (GEP) stack height or building downwash was not applicable.

GEP as used in the modeling analyses is the maximum allowed stack height to ensure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddies, or wakes that may be created by the source itself, nearby structures, or nearby terrain obstacles. In addition, the GEP modeling restriction ensures that any required regulatory control measure is not compromised by the effect of that portion of the stack that exceeds the GEP.

USEPA's guidance for determining GEP stack height (H_g) (USEPA, 1985) is based on the height of a nearby structure(s) measured from the ground-level elevation at the base of the stack (H) and the lesser dimension, height or projected width, of the nearby structure(s) (L) as follows:

$$H_g = H + 1.5L$$

The GEP modeling restriction is the greater of the calculated GEP stack height or 65 meters. Therefore, based on the onsite and offsite building dimensions as input into BPIP, the GEP height for the facility stack is the greater of 65 meters or the calculated height of 39.9 meters. A stack height of 50.6 meters (from the Applicant's preliminary BAAQMD permitting files) was used to model the Cogen 3000 unit. The difference between the modeled stack height and the expected stack height will be resolved through the permitting process.

8.1.6.2.2 Modeling Scenarios and Source Data Used to Evaluate Impacts on Ambient Air Quality

In evaluating the impacts of the proposed Project on ambient air quality, modeling of the worst case ambient impacts for the Project were added to representative background concentrations, and the results were compared to the state and federal AAQS.

Operation Impacts Analysis

The maximum short-term emission rates used for modeling the worst-case impacts were based on unit capacity and maximum heat input or circulation rate. Because the units are expected to run continuously with the exception of scheduled maintenance or unscheduled breakdown, the startup and shutdown cycles were not considered part of the "normal" operations for comparison to the AAQS. Therefore, the maximum 1-hour, 3-hour, 8-hour, and 24-hour emission rates for normal operations were based on the maximum heat input and the Cogen 3000 design capacity. For the annual worst-case impacts, the Cogen 3000 was assumed to operate 24 hours per day for 365 days per year. The STG cooling tower was assumed to operate at the maximum water recirculation rate for 8,760 hours.

A 2-tiered approach was used to determine the maximum ground-level concentrations for each pollutant and averaging period. The first tier used a receptor grid with 30-meter spacing along the facility fenceline and 100-meter spacing extending 10 kilometers outside the facility fenceline. The second tier used a receptor grid spacing of 30 meters, centered on the maximum first tier modeling location with a 1,500-meter radius. The coarse and fine receptor grids are presented in Figure 8.1-C3 of Appendix 8.1-C. Each year of meteorological data (1999–2003) was modeled separately to determine the maximum annual and short-term concentrations from the proposed Project.

For the proposed Project, the turbine and duct burner would be the only source of NO_x, SO_x, and CO. Therefore, the modeling results from the unit emission rate-based analysis were multiplied by the actual NO_x, SO_x, and CO emission rates for each operating scenario and averaging period to obtain projected maximum concentrations. These maximum concentrations were added to the background concentration and compared to the respective AAQS.

A detailed modeling analysis was conducted to predict the total PM₁₀ and PM_{2.5} impacts from the turbine operating scenario and the cooling tower emissions. The detailed analysis was conducted using the actual turbine emission rates combined with the cooling tower emissions for PM₁₀. The maximum concentrations were then added to the PM₁₀ and PM_{2.5} background concentrations and compared to the respective AAQS.

Source emission rates for the dispersion modeling are presented in Table 8.1-21. A summary of the source parameters and the UTM locations of each source are shown in Appendix 8.1-C. The results of the modeling analysis are presented in Section 8.1.6.2.3 and Appendix 8.1-C.

TABLE 8.1-21
ISCST3 Model Input for the PPRP

Averaging Period	Source	Emission Rates*							
		NO _x		CO		SO ₂		PM ₁₀	
		lb/hr	g/s	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s
Annual	Cogen 3000	7.74	0.975	7.54	0.950	0.378	0.048	6.26	0.789
	STG Cooling Tower	–	–	–	–	–	–	4.5	0.567
1-, 3-, 8-, and 24-hour	Cogen 3000	7.74	0.975	7.54	0.950	0.378	0.048	6.26	0.789
	STG Cooling Tower	–	–	–	–	–	–	4.5	0.567

Note:

* See Appendices 8.1-B and 8.1-C

g/s = grams per second

8.1.6.2.3 Modeling Results Compared to the Ambient Air Quality Standards

Operation Impacts Analysis

The highest modeled concentrations were used to demonstrate compliance with the AAQS. Table 8.1-22 presents a comparison of the maximum PPRP operational impacts to the AAQS. For those pollutants and averaging periods where the background concentrations do not exceed the AAQS, the Project will not cause or contribute to the violation of a standard. For those pollutants where the background data is already in excess of the standards, the Project's impact plus background is above the standard, and would further contribute to an

existing violation of the standard absent mitigation. The Applicant will be providing such mitigation in the form of emission reduction credits (ERCs). The complete list of off-property impacts for the five years of meteorological data (1999–2003) are presented in Appendix 8.1-C, Tables 8.1-C5 and 8.1-C6. (Note: the results in Table 8.1-C6 do not include background concentrations).

TABLE 8.1-22
PPRP Operation Impacts Analysis—Maximum Modeled Impacts Compared to the Ambient Air Quality Standards

Pollutant	Averaging Time	Maximum Facility Impact ($\mu\text{g}/\text{m}^3$)	Background ($\mu\text{g}/\text{m}^3$) ^a	Total Impact ($\mu\text{g}/\text{m}^3$)	State Standard ($\mu\text{g}/\text{m}^3$)	Federal Standard ($\mu\text{g}/\text{m}^3$)
NO ₂	1-hour ^b	25	113	138	338 ^c	—
	annual ^b	0.3	24.5	24.8	56 ^c	100
SO ₂	1-hour	1.2	102.1	103.3	655	—
	3-hour	1.1	49.7	50.8	—	1,300
	24-hour	0.3	15.7	16.0	105	365
	annual	0.02	5.2	5.22	—	80
CO	1-hour	24	3665	3,689	23,000	40,000
	8-hour	14	2061	2,075	10,000	10,000
PM ₁₀	24-hour	18	64	82	50	150
	annual	1.4	21.2	22.6	20	—
PM _{2.5}	24-hour	18	74	92	—	35
	annual	1.4	10.7	12.1	12	15

Notes:

^a Background concentrations were the highest concentrations monitored during 2004 through 2006.

^b 1-hour and annual NO₂ predictions are conservatively based on 100 percent conversion to NO₂. In reality, NO to NO₂ conversion is limited by the amount of ambient ozone that is available to complete the conversion.

^c The NO₂ ambient air quality state standard was amended on February 22, 2007, to lower the 1-hour standard to 0.18 ppm and establish a new annual standard of 0.030 ppm. These changes will become effective after regulatory changes are submitted and approved by the Office of Administrative Law, which is expected later in 2007.

Fumigation Impacts Analysis

A meteorological condition that can produce high concentrations of ground-level pollutants in coastal environments is referred to as shoreline fumigation. The condition occurs when the air flows from a large water body toward land. At the land-sea interface, a new internal boundary layer begins to develop due to mechanical and thermal effects. When the land is much warmer than the water surface, thermal effects will dominate and a thermal internal boundary layer (TIBL) will develop. Below the TIBL, the atmosphere is typically unstably stratified, while above the TIBL, a temperature lapse rate is usually assumed. The fumigation condition occurs when a plume initially released into the stable flow above the TIBL, intersects the TIBL. As the plume enters the TIBL, the plume is mixed toward the ground which can result in higher ground level concentrations of pollutants.

Inversion breakup fumigation occurs when a plume is emitted into a stable layer of air and that layer is then mixed to the ground in a short period of time through convective heating and microscale turbulence. Under these conditions, an exhaust plume may be drawn to the ground with little diffusion, causing high ground-level pollutant concentrations, although typically for periods less than 1 hour.

The effects of fumigation on the maximum modeled impacts were evaluated using the USEPA SCREEN3 model (Version 96043). For this evaluation, only impacts from the turbine stack were evaluated. The same operating scenario identified in the operational impact analysis was considered for fumigation. The nearest shoreline to the combustion turbine is approximately 1,400 meters. Additional model inputs were derived from BAAQMD's *Permit Modeling Guidance* (BAAQMD, 2005a), and are summarized below:

- A 2.5 meters per second wind speed,
- Stability class F, and
- A 50.6-meter anemometer height (turbine stack height).

The fumigation calculations in SCREEN3 demonstrate that the plume height is below the TIBL. Therefore, shoreline fumigation impacts would not affect the worse-case impacts. The maximum inversion breakup fumigation concentration predicted by SCREEN3 occurs over 10 kilometers downwind of the combustion turbine location. This result was conservatively compared to the maximum 1-hour concentration predicted by ISCST3 (Table 8.1-23). As presented in Table 8.1-23, the fumigation concentrations are less than 9 percent of the maximum predicted impacts predicted by ISCST3. Based on this evaluation, it is concluded that fumigation will not result in the worst-case impacts.

TABLE 8.1-23
Fumigation Impacts Analysis Results

Pollutant	Scenario	SCREEN3 Fumigation Result ($\mu\text{g}/\text{m}^3$)	Maximum ISCST3 Facility Impact ($\mu\text{g}/\text{m}^3$)	Percent of ISCST3 Concentration (%)
NO _x	Maximum HHV	2.2	25	8.8
CO	Maximum HHV	2.2	24	9.2
SO _x	Maximum HHV	0.1	1.2	8.3

8.1.6.3 Health Risk Assessment

Health risks potentially associated with the TACs emissions were evaluated for the Project operation. The health risk assessment (HRA) was performed following the latest guidance outlined in the *Air Toxics Hot Spots Program Risk Assessment Guidelines* (OEHHA, 2003), USEPA's *Guideline on Air Quality Models* (USEPA, 2005), CARB's *Recommended Interim Risk Management Policy for Inhalation-based Residential Cancer Risk* (CARB, 2003), and the BAAQMD's *Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines*. (BAAQMD, 2005b). The CARB Hotspots Analysis Reporting Program (HARP, version 1.3, October 2006) was used to conduct the HRA analysis.

Table 8.1-24 presents a summary of the potential health risk impacts related to the PPRP. The derived adjusted cancer risk at the point of maximum impact (PMI) is approximately 1.2 in a million. The PMI is located along the western boundary of the Chevron facility. The derived adjusted maximum exposed individual resident (MEIR) cancer value is predicted to be approximately 0.2 in a million. The receptor location for MEIR is about 460 meters south of the facility boundary. The maximum exposed individual worker (MEIW) cancer risk is predicted to be approximately 0.4 in a million, located along the western boundary of the

Chevron facility. Both the MEIR and MEIW for the proposed Project are below the BAAQMD significance threshold of one in one million.

The potential chronic and acute hazard indices are also presented in Table 8.1-24. The chronic and hazard PMI values are approximately 0.009 and 0.01, respectively. The chronic PMI is less than the 0.2 TBACT threshold values (BAAQMD Regulation 2, Rule 5) and the authority to construct/permit to operate threshold of 1.0.

A complete discussion of the TAC emissions and the potential public health impacts are presented in Section 8.6.

TABLE 8.1-24
Summary of the Potential Health Risk Impacts for the PPRP

Risk	Receptor	Value	UTM (NAD 27)
70-year Cancer Derived PMI	3344	1.3 per million	552588, 4199070
70-year Cancer Derived Adjusted PMI	1180	1.2 per million	552556, 4199102
Chronic Hazard Index PMI	1180	0.00869	552556, 4199102
Acute Hazard Index PMI	3360	0.0114	552601, 4199228
70-year Cancer Derived MEIR	31548	0.19 per million	553756, 4197622
70-year Cancer Derived Adjusted MEIR	31548	0.18 per million	553756, 4197622
Cancer MEIW	1180	0.39 per million	552556, 4199102
Resident Chronic Hazard Index	31548	0.00125	553756, 4197622
Worker Chronic Hazard Index	1180	0.00869	552556, 4199102
Resident Acute Hazard Index	31345	0.00149	553786, 4197652
Work Acute Hazard Index	3360	0.0114	552601, 4199228

8.1.6.4 Class I Area Visibility Impacts Analysis

BAAQMD Regulation 2, Rule 2 requires any project to conduct a modeling analysis for plume visibility if the net emission increase from the new or modified source exceeds the PSD significance thresholds and the location of the source, relative to the closest boundary of a specified Federal Class I area (Point Reyes National Seashore), is within the 10 kilometers.

Although the PPRP alone would exceed the PSD significant emission rate (SER) thresholds for a major modification, the overall net increase of the Renewal Project is below the PSD SER criteria for regulated pollutants. Therefore, because the overall Renewal Project is not subject to the PSD analysis requirements and the Point Reyes National Seashore is greater than 10 kilometers from the Project site, a visibility analysis was not conducted.

8.1.7 Compliance with Laws, Ordinances, Regulations, and Standards

Table 8.1-25 presents the compliance evaluation for the applicable LORS and permits for protection of air quality.

TABLE 8.1-25

Compliance Evaluation for the Applicable Laws, Ordinances, Regulations, Standards, and Permits for Protection of Air Quality

LORS	Compliance Assessment
Federal	
Title 40 CFR Part 50	The Applicant will comply with all BAAQMD permit conditions limiting emissions and operations. Dispersion modeling indicates the Project will not exceed the state or federal AAQS for the attainment pollutants.
Title 40 CFR Part 51 NSR/PSD (BAAQMD Reg 2, Rule 2)	Because the PPRP will exceed the 10 lb/day trigger for at least one of the regulated pollutants, an ATC and PTO application will be obtained from the BAAQMD prior to construction of the Project. As a result, the compliance requirements of 40 CFR, Part 51 will be met. Although the PPRP would individually exceed the PSD significant emission rate (SER) for a major modification for PM₁₀, the overall Renewal Project net increase is below the PSD SER criteria for regulated pollutants. Therefore, the PPRP is not subject to PSD analysis requirements.
Title 40 CFR, Part 60	The proposed turbine will utilize steam-injected NO _x reduction technology along with an SCR system, and will utilize pipeline-quality natural gas, and will comply with both the NO _x and SO ₂ limits. The NO _x and SO ₂ emissions from the turbines will be 0.17 lb/MW-hr and 0.0084 lb/MW-hr, respectively. The certified NO _x Continuous Emission Monitoring System (CEMS) will ensure compliance with the standard. Records of natural gas usage will ensure compliance with the SO ₂ limit.
Title 40 CFR, Part 63	The Chevron Richmond Refinery exceeds the major source thresholds for HAPs (10 tpy for any one pollutant or 25 tpy for all HAPs combined). Therefore, National Emissions Standards for Hazardous Air Pollutants (NESHAP) regulations apply. The Cogen 3000 HRSG incorporates an oxidation catalyst and the expected formaldehyde emissions associated with the PPRP will be 63 ppbv. Therefore, the Project is expected to comply with Subpart YYYY control technology and formaldehyde emission limit requirement of 91 ppbv.
Title 40 CFR Part 64 (CAM Rule)	The Project will have emission control systems for NO _x and CO (SCR and oxidation catalyst). Emissions of NO _x and CO will be directly measured by a continuous monitoring system. Therefore, the CAM Rule provisions do not apply.
Title 40 CRF part 70 (BAAQMD Reg 2, Rule 6)	Title 40, Code of Federal Regulations, Part 70 applies to facilities that emit greater than 100 tpy on a pollutant-specific basis. The Chevron facility will be an affected facility under the Title V rules (BAAQMD Regulation 2, Rule 6). Accordingly, a parallel application to modify the existing Title V permit has been made to the BAAQMD in addition to the CEC SPPE application.
Title 40 CRF part 72 (BAAQMD Reg 2 Rule 7)	The facility will not supply equal to or less than one-third of its potential electrical output capacity or equal to or less than 219,000 MWe-hours actual electric output on an annual basis to any utility power distribution for sale (on a gross basis), therefore, the Project is exempt from CFR Part 72.

TABLE 8.1-25

Compliance Evaluation for the Applicable Laws, Ordinances, Regulations, Standards, and Permits for Protection of Air Quality

LORS	Compliance Assessment
State	
California Code of Regulations, Section 41700	The CEC conditions of exemption and the BAAQMD ATC process is designed to ensure that the operation of the Project will not cause a public nuisance.
California Code of Regulations Sections 93300-93347 (Toxic "Hot Spots" Act)	The MEIR and MEIW cancer risks are 0.18 and 0.39 in a million, respectively. The maximum chronic and acute hazard indices are 0.00869 and 0.0114, respectively. The levels are also below the BAAQMD ATC or PTO thresholds for cancer risk of 10 in a million, or the chronic and acute hazard index of 1.0.
Local	
BAAQMD Reg 1, Section 301 (Public Nuisance)	The CEC conditions of exemption and the BAAQMD ATC process is designed to ensure that the operation of the Project will not cause a public nuisance.
BAAQMD Regulation 2, Rule 2 (Permits – NSR)	An air quality dispersion analysis was conducted, using a mass emissions-based analysis contained in the rule and the ISCST3 dispersion model. The overall Renewal Project net increase is below the PSD SER criteria for regulated pollutants. Therefore, the PPRP is not subject to the PSD analysis requirements. Based on the BACT thresholds, a BACT analysis was conducted for the following: POC, NO_x, PM₁₀ and CO. (BAAQMD 2-2-301) The PPRP does not exceed the major source thresholds for HAPs (10 tpy for any one pollutant or 25 tpy for all HAPs combined). Therefore, NESHAP regulations are not expected to apply. (BAAQMD 2-2-114) Offsets for PM₁₀ will be provided at a 1.0 to 1.0 ratio for the PPRP application. (BAAQMD 2-2-303) Per BAAQMD 2-2-417, the PPRP is not subject to PSD requirements and is greater than 10 kilometers from the nearest Class I area (Point Reyes National Seashore), therefore, a visibility, soils, and vegetation analysis is not required.
BAAQMD Regulation 2, Rule 3 (Permits – ATC and PTO for Power Plants)	In conjunction with the submittal of the SPPE Application to the CEC, the Applicant will work with the BAAQMD to provide the information needed for the issuance of a ATC. As stated in this rule, the review will be conducted as outlined in Regulation 2, Rule 2.
BAAQMD Regulation 2, Rule 5 (Permits – Toxics NSR)	The MEIR and MEIW cancer risks are 0.18 and 0.39 in a million, respectively. The maximum chronic and acute hazard indices are 0.00869 and 0.0114, respectively. The values are less than the TBACT thresholds of 1.0 in a million (10 ⁻⁶), and/or a chronic hazard index greater than 0.20. The levels are also below the ATC or PTO thresholds for cancer risk of 10 in a million, or the chronic and acute hazard index of 1.0.
BAAQMD Regulation 2, Rule 6 (Permits – Title V)	An application has been submitted to the BAAQMD that presents all information necessary to evaluate the subject facility and determine the applicability of all regulatory requirements.

TABLE 8.1-25

Compliance Evaluation for the Applicable Laws, Ordinances, Regulations, Standards, and Permits for Protection of Air Quality

LORS	Compliance Assessment
BAAQMD Regulation 2, Rule 7 (Permits – Acid Rain)	The facility will not supply equal to or less than one-third of its potential electrical output capacity or equal to or less than 219,000 MWe-hours actual electric output on an annual basis to any utility power distribution for sale (on a gross basis), therefore, the Project is exempt from CFR Part 72 and BAAQMD Regulation 2, Rule 7.
BAAQMD Regulation 6 (Particulate Matter and Visible Emissions)	The Cogen 3000 will emit PM at 0.006 grains per dry standard cubic feet (DSCF) of exhaust gas volume, less than the 0.15 grains per DSCF limit.
BAAQMD Regulation 7 (Odorous Substances)	Ammonia emissions from the SCR catalyst will be less than 10 ppmv. Therefore, maximum emissions will be below the 5,000 ppm limit, and odors from the PPRP are expected to be less than significant.
BAAQMD Regulation 9, Rule 1	Results of the dispersion modeling indicate off-property SO ₂ ground-level concentrations will be below the 0.5 ppm level for 3 consecutive minutes, 0.25 ppm level averaged over 60 consecutive minutes, or the 0.05 ppm level averaged over 24 hours. The proposed turbine will burn pipeline-quality natural gas with less than 4 ppm sulfur. Therefore, sulfur contents in the fuel will be less than 0.5% and gas stream concentrations will be less than 300 ppm (dry).
BAAQMD Regulation 9, Rule 3	BACT levels of 2.5 ppmv for NO _x will be applied to the Project; therefore, the NO _x emission levels for the Project will not exceed the 125 ppmv level or 225 ppm level for liquid fuels.
BAAQMD Regulation 9, Rule 9	BACT levels of 2.5 ppmv for NO _x will be applied to the Project; therefore, the NO _x emission levels for the Project will not exceed the 25 ppmv level.
BAAQMD Regulation 10 (40 CFR Part 60)	The proposed turbine will utilize steam-injected NO _x reduction technology along with an SCR system and will utilize pipeline-quality natural gas, and will comply with both the NO _x and SO ₂ limits. The NO _x and SO ₂ emissions from the turbines will be 0.17 lb/MW-hr and 0.0084 lb/MW-hr, respectively. The certified NO _x CEMS will ensure compliance with the standard. Records of natural gas usage will ensure compliance with the SO ₂ limit.
BAAQMD Regulation 11, Rule 10	The Applicant will obtain recycled water from the East Bay Municipal Utility District; therefore, hexavalent chromium levels are expected to be below the 0.15 mg/L limit. Furthermore, the Chevron Richmond Refinery has not used chromium-based water treatment chemicals for over a decade.

8.1.8 Mitigation

Mitigation will be provided for NO_x, CO, PM₁₀, and VOC/POC emission increases from the Project in the form of offsets and the installation of BACT, as required under BAAQMD regulations.

8.1.8.1 BACT Discussion

Applicable BAAQMD BACT levels are presented in Table 8.1-26. BAAQMD Rule 2-2-301 requires the Project to apply BACT for emission increases of POC, NO_x, SO₂, PM₁₀, and CO that are greater than 10 lb/day. As presented in the table, BACT is required for POC, NO_x, PM₁₀, CO, and ammonia. The calculation of facility emissions is discussed in Section 8.1.6.1.

TABLE 8.1-26
Best Available Control Technology Requirements (Ref. BAAQMD Rule 2-2-301)

Pollutant	Applicability Level	Permit Units Exceeding this Level	BACT Required?
POC*	10 lb/day/source	Turbine and Duct Burner	Yes
NO _x	10 lb/day/source	Turbine and Duct Burner	Yes
SO ₂	10 lb/day/source	–	No
PM ₁₀	10 lb/day/source	Turbine and Duct Burner STG Cooling Tower	Yes Yes
CO	10 lb/day/source	Turbine and Duct Burner	Yes
Ammonia	–	Turbine and Duct Burner	Yes

Note:

* For this analysis, it is assumed that VOC emissions are the same as POC emissions. Therefore, VOCs have been compared to the POC threshold.

BACT for NO_x emissions from the turbine and duct burner will be achieved by the use of low NO_x emitting combustion equipment and post-combustion controls. The Applicant has selected a turbine equipped with steam-injected NO_x combustors. The gas turbine will be designed to generate less than 25 parts per million by volume-dry (ppmvd) NO_x, corrected to 15 percent O₂, at the outlet of the engine. In addition, the turbine will be equipped with a post-combustion SCR system to further reduce NO_x emissions to 2.5 ppmvd NO_x, corrected to 15 percent O₂ on a three-hour average basis (excluding startups and shutdowns). The current BAAQMD BACT requirement for natural-gas-fired combined-cycle gas turbines is 2.5 ppmvd, corrected to 15 percent O₂ over a three-hour averaging period. Therefore, the PPRP will meet the BACT requirements for NO_x.

BACT for CO emissions from the turbine will be achieved by good combustor design and an oxidation catalyst. Good combustor design will result in low levels of combustion CO while maintaining very low NO_x formation. In addition, the Project will use an oxidation catalyst system to further reduce CO emissions to 4.0 ppmvd, corrected to 15 percent O₂. The current BAAQMD CO BACT requirement for natural-gas-fired combined-cycle gas turbines is 4.0 ppmvd, corrected to 15 percent O₂ over a three-hour averaging period. Therefore, the PPRP will meet the BACT requirements for CO.

BACT for VOC emissions will be achieved by good combustor design and an oxidation catalyst. BACT for VOC emissions from combustion devices has historically been the use of good combustor design. With the use of the good combustor design and the oxidation catalyst, the VOC emissions leaving the stacks will not exceed 2 ppmvd, corrected to 15 percent O₂ for turbine operation at full load. The current BAAQMD VOC BACT requirement for natural-gas-fired combined-cycle gas turbines is 2.0 ppmvd, corrected to 15 percent O₂ over a three-hour averaging period. Therefore, the PPRP will meet the BACT requirements for VOC.

For the turbines, BACT for PM₁₀ is best combustion practices and the use of gaseous fuels. The use of clean-burning gaseous fuel will result in minimal particulate emissions. Based on the preliminary BAAQMD draft permit conditions, BACT for cooling tower PM₁₀ is achieved by limiting the cooling tower drift to 0.0005 percent. Therefore, the PPRP will meet the BACT requirements for PM₁₀.

8.1.8.2 Emission Reduction Credits Assessment

As described in Section 8.1.1, the PPRP is a subset of the larger Renewal Project, specifically the PPRP is a subset of the Hydrogen Plant and the Power Plant Replacement Projects. For comparison to the ERC thresholds, the net emissions for the Hydrogen Plant, the Power Plant replacement, and the overall Renewal Projects (ESA, 2006) are presented in Table 8.1-27. Based on the net emissions presented in Table 8.1-27, only PM₁₀ exceeds the ERC thresholds. Therefore, according to BAAQMD Regulation 2-2-303, the Applicant will be required to provide emission offsets for PM₁₀ at a ratio of 1.0 to 1.0.

TABLE 8.1-27
"Renewal Project" Net Emissions^a

	Pollutant (tons per year)			
	NO _x	SO ₂	PM ₁₀	VOC
Hydrogen Plant Replacement	-10.4	-52.4	-12.7	-2.1
Power Plant Replacement	-13.5	1.7	14.8	0.9
Total Project Net Emissions ^b	-74.0	-21.8	12.0	10.1
BACT Threshold ^c	35.0	1.0	1.0	35.0
Exceed BACT Threshold	No	No	Yes	No

Notes:

^a Data from Volume 1 of the *Chevron Energy and Hydrogen Renewal Project, Draft Environmental Impact Report*, (ESA, 2007).

^b Total Project net emissions also include the net emission from the Catalytic Reformer Replacement, Hydrogen Purity Improvements, Storage Tanks, Central Control Room, and Maintenance Facilities.

^c Reference: BAAQMD Rule 2-2-302, Rule 2-2-303

The Applicant currently holds various emission reduction certificates for emissions of criteria pollutants. The certificates for PM₁₀ are presented in Table 8.1-28. The Applicant will work with the BAAQMD to assign the certificates needed to offset the 11.0 tpy. Through the use of BACT to control air pollutant emissions, the use of available ERCs as presented in Table 8.1-27, combined with the results of the air quality impact analysis, the Project will not

result in significant air quality impacts. Therefore, no additional operational mitigation is necessary beyond the offsets that will be provided in accordance with BAAQMD requirements.

TABLE 8.1-28
Applicant's Available Emission Reduction Credits

Certificate	Origination Date	Emission Reduction Credit Bank (Tons/Year)
765	March 18, 1992	0.5
904	April 24, 1992	0.3
917	July 14, 1992	31.1
223	January 7, 1993	5.4
617	September 15, 1993	1.5
900	April 1, 1996	0.3
Total		39.1

8.1.9 Cumulative Air Quality Impacts

Section 5.2 of the DEIR for the Chevron Renewal Project (ESA, 2007) presents an analysis of the cumulative air quality impacts of the Renewal Project, including the PPRP, and other planned development projects. The DEIR's cumulative impact analysis considered following documents to determine the effects of projects that may not be well defined:

- Richmond General Plan
- North Richmond Specific Plan
- Contra Costa County General Plan
- Contra Costa County Transportation Authority Transportation Plan
- Bay Conservation Development Commission Plans
- Regional Planning Documents from the Associations of Bay Area Governments, Metropolitan Transportation Commission, and the Regional Water Quality Control Board
- Bay Area Air Quality Management District's 2005 Ozone Strategy Plan

Through this process, a total of 17 pending projects were identified. Of these 17 projects, nine of them included projects planned by the Chevron Richmond Refinery. The remaining eight were the following non-Chevron projects:

- East Bay Municipal Utility District's Richmond Advanced Recycling Expansion (RARE) Water Project
- Valero Benicia Refinery Improvement Project

- PG&E's Richmond Fuel Oil Pipeline Divestiture Project
- ConocoPhillips Clean Fuels Expansion Project
- Praxair Contra Costa Pipeline Project
- Praxair Contra Costa Hydrogen Pipeline Project
- Praxair Natural Gas Pipeline Project
- Point Molate Reuse Project

The results of this analysis, presented in Section 5.2.5.12 of the DEIR, indicate that most of the cumulative air quality construction or operational impacts will be less than insignificant, or mitigated to levels less than significant.

8.1.10 References

Bay Area Air Quality Management District (BAAQMD). 1999. BAAQMD CEQA Guidelines, Assessing the Air Quality Impacts of Projects and Plans. December.

_____. 2005a. Permit Modeling Guidance. May.

_____. 2005b. Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines. June.

_____. 2007a. Air Quality Area Designations
http://www.baaqmd.gov/pln/air_quality/ambient_air_quality.htm

_____. 2007b. Air Quality Data Summaries.
http://www.baaqmd.gov/pio/aq_summaries/index.htm

California Air Resources Board (CARB). 2003. Recommended Interim Risk Management Policy for Inhalation-based Residential Cancer Risk.

_____. 2006. *AB 32 Fact Sheet*. September 25

_____. 2007. Air Quality Data Summaries <http://www.arb.ca.gov/adam/welcome.html>

_____. EMFAC2007, Version 2.3.
http://www.arb.ca.gov/msei/onroad/latest_version.htm

Chevron Products Company (Chevron). 2006. EIR Health Risk Screening Analysis – Energy Plant and Hydrogen Plant Renewal Project. June 27.

Energy & Environmental Research Corporation (EERC). 1998. Air Toxic Emission Factors for Combustion Sources Using Petroleum Based Fuels, Final Report, Volume II. August.

ESA Associates, Inc. (ESA). 2007. *Chevron Energy and Hydrogen Renewal Project Administrative Draft EIR* (State Clearinghouse No. 2005072117). Prepared for City of Richmond, CA. May.

Office of Environmental Health Hazard Assessment (OEHHA). 2003. Air Toxics Hotspots Program Guidance Manual for Preparation of Health Risk Assessments.

U.S. Environmental Protection Agency (USEPA). 1985. Guideline for Determination of Good Engineering Practice Stack Height. USEPA-450/4-80-023R. June.

_____. 2005. Guideline on Air Quality Models, 40 CFR, Part 51, Appendix W.

_____. 2006. Compilation of Air Pollutant Emission Factors, AP-42. November.

_____. 2007. AIRS Air Quality Data Summaries.
<http://www.epa.gov/air/data/monvals.html>

Western Regional Climatic Center (WRCC). 2007. Historical Climate Data Summary for the City of Richmond.

8.2 Biological Resources

The objectives of this section are to describe the biological resources that occur in the general Project area, including threatened and endangered species and their habitats, and to describe the potential impacts that could occur to those species as a result of construction and operation of the proposed Project. The following section includes a description of the laws, ordinances, regulations, and standards (LORS) that apply to biological resources protection, the setting and conditions of the affected site, the methods that were used to evaluate the potential presence of special-status species, and the potential adverse impacts that could occur to biological resources as a result of Project implementation. This section also discusses the feasibility of potential protection and mitigation measures that would avoid, minimize, or compensate for unavoidable adverse impacts.

8.2.1 Introduction

Chevron is proposing the Power Plant Replacement Project (PPRP) to add an additional 60 megawatts (MW) net generation to its existing refinery electrical generation located within Chevron's Richmond Refinery (the Refinery) in the City of Richmond (see Figure 1.2-1) in Contra Costa County, California. The proposed PPRP will be integrated into Chevron's plans to meet its growing refinery electrical load, and produce steam to replace an existing boiler plant that is approaching its end of life. The PPRP is a subset of the larger Richmond Refinery Renewal Project that is concurrently undergoing California Environmental Quality Act (CEQA) review by the City of Richmond. The California Energy Commission (CEC) has jurisdiction for only the PPRP portion of the Renewal Project that is the subject of this application.

The PPRP will consist of the following components:

- A nominal 43-MW net, natural gas- or liquid petroleum gas (butane)-fired cogeneration train consisting of one combustion turbine generator (CTG), a refinery fuel gas-fired heat recovery steam generator, 13.8-kV switchgear and ancillary equipment.
- Shutdown of the existing No. 1 power plant refinery steam boilers currently providing steam to the Refinery.
- A 17-MW net extraction, condensing steam turbine generator (STG), an associated cooling tower, and 12-kV switchgear installed as part of the new hydrogen production facility (the remainder of the hydrogen plant is under CEQA review as part of the Renewal Project). The new hydrogen plant will be a net generator of steam for both the STG and the Refinery steam system.
- Reconductoring of approximately 4,000 feet of existing onsite double-circuit overhead 115-kV transmission line to upgrade its ampacity. The reconductoring will reuse existing transmission line structures.
- Adjacent onsite service connections for fuel, reclaimed water, water, wastewater, steam, and electricity to existing piperacks, with the exception of the reconductoring noted above.

The cogeneration portion of the PPRP will occupy approximately 0.5 acre within an existing 5.2-acre cogeneration facility, and the STG and associated equipment will occupy approximately 0.5 acre within a new 7.9-acre hydrogen plant that will be built as part of the Richmond Refinery Renewal Project. The PPRP will be located well within the heart of the existing 2,900-acre Richmond Refinery. Temporary construction laydown and parking for the PPRP will be provided in various existing laydown areas within the Refinery that are currently used for ongoing maintenance and project laydown. A complete description of the PPRP is provided in Section 2.

The additional surface water runoff from the PPRP within the Refinery site will be directed via catchment basins and underground culverts to the Refinery's existing stormwater system. The stormwater would be discharged under the existing Refinery National Pollutant Discharge Elimination System (NPDES) permit.

8.2.2 Applicable Laws, Ordinances, Regulations and Standards

The following describes the primary LORS associated with potential impacts to biological resources in the Project area, and the agencies responsible for enforcing regulations.

8.2.2.1 Federal

Federal Endangered Species Act (FESA, 16 USC 153 et seq.)

Applicants for projects that could result in adverse effects to any federally listed species are required to mitigate potential impacts in consultation with the U.S. Fish and Wildlife Service (USFWS). Adverse effects are defined as "take," which is prohibited except under authorization through Section 7 or Section 10 consultation and Incidental Take Authorization. The objective of consultation is to determine whether the proposed project would result in take of an individual listed plant or animal or jeopardize the continued existence of a listed species, and what avoidance and/or compensation measures would be necessary to avoid take and jeopardy.

In general, compensation is typically required for adverse effects to listed species. Take, under federal definition, also includes actions that could result in "significant habitat modification or degradation" (50 CFR Section 17.3). Candidate species do not have the full protection of FESA; however, the USFWS advises project applicants that Candidate species could be elevated to listed status at any time, and should be regarded as species with special consideration.

Migratory Bird Treaty Act (16 USC 703 to 711): Protects all migratory birds, including nests and eggs.

Bald and Golden Eagle Protection Act (16 USC 668): Specifically protects bald and golden eagles from harm or trade.

Clean Water Act (33 USC 1251 et seq.). The objective of this act is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters [Section 10(a)]. Section 404 of the Clean Water Act (CWA) establishes a program to regulate and permit the discharge of dredged or fill material into waters of the United States, including wetlands.

Section 401 of the CWA requires that federal agencies issuing licenses or permits for construction or other activities get a written certification that the activity will not cause or contribute to a violation of the state's or tribe's water quality standards. After receiving the

certification, the federal agency issuing the permit must include conditions in the permit to prevent the project from degrading water quality of a downstream state or tribe.

The U.S. Army Corps of Engineers (USACE) and U.S. Environmental Protection Agency (USEPA) 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 USACE. Section 401 compliance has been delegated by USEPA in California and is administered by the Regional Water Quality Control Boards.

8.2.2.2 State

California Endangered Species Act (CESA) (Fish and Game Code Section 2050 et seq.)

Species listed under the CESA cannot be “taken” or harmed, except under specific permit. Take is defined in Fish and Game Code Section 86 as to hunt, pursue, catch, capture, or kill, or to attempt to do so.

Fish and Game Code Section 3511, 4700, 5050, and 5515: Protects bird, mammal, reptile, amphibian, and fish species, which are “fully protected.” California Department of Fish and Game (CDFG) is unable to authorize take of “fully protected” species when activities are proposed in areas inhabited by those species.

Fish and Game Code Section 3503: It is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto.

Fish and Game Code Section 3503.5: Protects all birds of prey and their eggs and nests.

Fish and Game Code Section 3513: Makes it unlawful to take or possess any migratory non-game bird as designated in the Migratory Bird Treaty Act.

Fish and Game Code Sections 1900 et seq., or Native Plant Protection Act: Lists threatened, endangered, and rare plants listed by the state.

Title 14, California Code of Regulations, Sections 670.2 and 670.5: Lists animals designated as threatened or endangered in California. California Species of Concern (CSC) is a category designated by CDFG for species considered to be indicators of regional habitat changes, or candidate species for future state listing. CSC do not have special legal status, but are used by CDFG as a management tool when considering the future use of any land parcel.

California Fish and Game Code (Sections 1600 through 1616): Prohibits alteration of any stream, including intermittent and seasonal channels and many artificial channels, without a permit from CDFG. This applies to any channel modifications that would be required to meet drainage, transportation or flood control objectives of the project. CDFG jurisdiction is limited to the 100-year flood level. 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 sediment release into a jurisdictional area.

California Environmental Quality Act (CEQA): Requires that a project's effects on environmental resources must be analyzed and assessed using criteria determined by the lead agency. Under CEQA, rare species are defined in a broader sense than threatened, endangered, or CSC. Under this definition, CDFG can request additional consideration of species not otherwise protected.

Warren Alquist Act: A CEQA-equivalent process implemented by the CEC. Preparation of this SPPE Application will result in an Initial Study prepared by CEC Staff to fulfill CEQA requirements.

State Lands Commission (SLC) Land Use Leases/Land Use Permits: The 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.

Regional Water Quality Control Board Section 401: 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 that apply for Section 404 or Section 10 permits from the USACE must also obtain a 401 water quality certification from the state. The Refinery is under the jurisdiction of the San Francisco Bay 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 RWQCB'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 8.13 (Water Resources).

8.2.2.3 Local

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. The Project site and linear features are located outside the BCDC jurisdictional area along the San Pablo Bay.

City of Richmond General Plan Goals, Guidelines, and Policies: The City of Richmond has a general plan (City of Richmond, 1994) with goals, guidelines, and policies that represent the City's overall philosophy on public and private development and provide a foundation for public and private decision-making on related issues. This plan has a number of guiding principles that may be pertinent to the activities in the proposed Project vicinity. General Plan goals and policies that may apply to PPRP include the following:

General Goal VI: Ensure a proper balance between economic and physical development in Richmond, and protection and enhancement of the natural environment.

Goals of the Land Use Element, LU-G: Achieve residential, commercial, industrial, and mixed-use developments which are compatible with environmental constraints and which protect and enhance the area's natural resources.

Shoreline Area Guideline #1: Allow for an appropriate level of development in shoreline areas while establishing a pleasing setting and protecting natural resources that are irreplaceable.

Open Space and Conservation Element Goal OSC-A: Preserve environmental conditions that, if disturbed, would destroy important wildlife habitats and valued natural features.

Open Space and Conservation Element Goal OSC- F: Preserve the natural topographical form of the Berkeley Hills, San Pablo Ridge, El Sobrante Ridge, Point Potrero and San Pablo Peninsula.

Open Space and Conservation Element Goal OSC- J: Reduce the need to import water and the environmental damage caused by water importation.

Open Space and Conservation Element Goal OSC-M: Develop and implement a new stormwater pollution control program that will protect water quality in the City's waterways and the San Francisco Bay from stormwater discharges.

Open Space and Conservation Element Policy OSC-A.3: Minimize removal of vegetation in all new developments. In particular, the cutting of mature native woodland trees, especially on unstable slopes and in creek beds, should be controlled.

Open Space and Conservation Element Policy 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.

Open Space and Conservation Element Policy 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.

Open Space and Conservation Element Policy OSC-C.2: Require all new waterfront development, and encourage existing waterfront development, to provide a reasonable degree of buffering between such development and adjacent marsh and mudflat areas. (Buffering size should be determined in consultation with CDFG and other relevant agencies).

Open Space and Conservation Element Policy OSC-J.1: Greatly expand reclamation of waste water. Such water should be utilized by all appropriate users, in particular by industry (e.g., Chevron Refinery and Richmond Rod and Gun Club).

Open Space and Conservation Element Policy OSC-J.3: Encourage new development in areas already served by water tanks or reservoirs and discourage new development in areas not served by water tanks and reservoirs to minimize costs of public services, increase water conservation and preserve open space.

Open Space and Conservation Element Policy OSC-K.3: Prohibit underground disposal of liquid wastes.

Open Space and Conservation Element Policy OSC-K.5: Provide for the monitoring and protection of groundwater through environmental reviews.

Open Space and Conservation Element Policy 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.

West Shoreline Area Guideline #1: Evaluate any proposals for the use of San Pablo Peninsula, Point Pinole, and the waters around Castro Rocks with attention to their effects on the deer population, the monarch butterfly and the harbor seal, respectively.

8.2.3 General Location and Setting

The San Francisco Bay and the San Pablo Bay are a breach in the Coast Range that extends for much of the length of the state. The bays are an important geologic break in the range, providing an influential climatic and hydrological connection between the Pacific Ocean and the Central Valley. The San Francisco area abounds with environmental diversity as land meets water and salt water meets fresh water. The result is a collection of communities such as deep open water, sandy shore lines, dunes, oak woodlands, grasslands, scrub, salt flats, salt marshes, estuaries, brackish marshes, freshwater marshes, and riparian corridors. The range of habitats and transition zones result in a diverse assemblage of plant and wildlife species.

The land mass surrounding the coastal bay is largely urban with dense industrial, commercial, and residential development. However, it is not without undeveloped or abandoned lots, park land, and other patches of designated open space providing important habitat for common and special-status plant and wildlife species. Even in the urban and industrial landscape, many species have adapted and continue to persist in the presence of human disturbance and significant habitat modification.

The ocean influence and varied topography surrounding the San Francisco Bay Area result in a variety of microclimates. The geographical break in the Coastal Range channels wind through the bay and influences the climate east through the Central Valley and up the Sierra Nevada Range. The Bay Area experiences a typical Californian Mediterranean climate, modified by its ocean proximity. True to the Mediterranean climate, winters are characteristically mild (typically 45 to 60 degrees Fahrenheit [°F]) and moist. However, wind patterns and cold ocean water combine to produce fog and moderate summer temperatures (typically 50 to 70°F).

The proposed PPRP is located in a heavily industrialized area of the City of Richmond. The Project would occupy previously developed land within the existing Refinery which occupies approximately 2,900 acres of the San Pablo Peninsula (Figure 8.2-1). The Refinery is surrounded by a diverse group of natural habitats and intense development.

The Refinery has been in operation since the early 1900s and has drastically altered the natural habitat within its bounds, which occupy much of the San Pablo Peninsula. The PPRP construction sites have been used in the past as part of the Refinery operations and are devoid of vegetation. Both the proposed Project sites and laydown areas are graded flat and covered by either gravel, hardpack soil, or pavement. There are no remaining features that provide natural habitat for plant and wildlife species within the Project footprint. However, the Refinery is also within close proximity to significant biological resources including the San Francisco Bay, San Pablo Bay, and nearby estuaries and treatment wetlands (see Figures 8.2-1 and 8.2-2 located at the end of this section).

The San Francisco Bay and the San Pablo Bay are inlets where inland waters from various rivers meet the Pacific Ocean. The bays provide important habitat for fishes, migratory birds, and marine mammals. The San Pablo peninsula, on which the Refinery is located, divides the San Francisco and San Pablo Bays. Although the bay coast has been highly modified, salt water marshes or estuaries remain in some areas. A portion of the San Pablo River and Wildcat Creek marshes are located in the northeastern corner of the Refinery property. This tidal marsh and mudflat is identified in the Contra Costa General Plan as a Significant Ecological Area and provides important habitat for a variety of species including state and federal listed animals. Chevron has completed a project to restore tidal flow to approximately 250 acres of Wildcat Creek Marsh within the Refinery property.

Chevron has created its own treatment wetlands immediately south of the Wildcat Creek Marsh. Also referred to as the Water Enhancement Wetland project, Chevron's created wetlands are an experimental natural treatment and polishing system primarily for removal of solids and metals. Water is delivered to the first stage of the wetlands from the Refinery's bioreactor settling area and then goes through three stages before being pumped out of the wetlands to a final treatment. The treated water is then discharged into San Pablo Bay, approximately 2,000 feet offshore to the north of Point San Pablo. The treatment wetlands have been in use since 1988 and were created with the conversion of 90 acres of former effluent treatment ponds.

Although the proposed PPRP sites are previously disturbed and devoid of features that would provide habitat or other attraction for special-status and other local plant and wildlife species, the following subsections are provided to describe the types of habitat found adjacent to the Project areas. Special-status species that are known to have occurred or to have the potential to occur in those areas are listed in Table 8.2-1 (located at the end of Section 8.2) and described in Subsection 8.2.4.2.1. A comprehensive list of special-status species obtained from USFWS and CDFG that was used to evaluate Project impacts to sensitive biological resources is included in Appendix 8.2-A.

A more detailed description of the Project setting and current activities within the Refinery are included in Section 8.4 (Land Use).

8.2.4 Biological Setting

The following describes the biological conditions in the Project area, including vegetation and habitat types, local wildlife species, and special-status species known, or with a potential, to occur in the general Project vicinity.

8.2.4.1 Methods

The biological setting characterization is based on information gathered during a review of existing references, aerial photographs, an environmental impact report (EIR) prepared for the Chevron Richmond Refinery (ESA, 2006), and a November 16, 2006, site reconnaissance visit. Figure 8.2-1 exhibits the Project features on an aerial photograph background.

A list of federal and state special-status plant and wildlife species was developed for the Project based on database and literature searches, including agency consultation and site surveys. References searched included the California Natural Diversity Database (CNDDDB), the USFWS species list, and the California Native Plant Society (CNPS) Electronic Inventory. The CNDDDB and CNPS searches were performed for the San Quentin, Richmond, Mare Island, and Oakland 7.5-minute United States Geological Survey (USGS) quadrangles. The searches resulted in a list of special-status plant and wildlife species previously identified and/or potentially occurring in the vicinity of the proposed Project. The special-status species list is summarized in Table 8.2-1 (at the end of this section) and also includes suitable habitat typically associated with each species, critical seasonal periods associated with the species' natural history, and general comments. A Project vicinity map, including CNDDDB search results, is presented on Figure 8.2-2.

A reconnaissance-level survey of the site was conducted on November 16, 2006, with a CEC biologist and other representatives to review the Project and address probable concerns. The visit was also intended to verify characterizations made in the EIR that were used to determine the types of habitat present and the potential for supporting special-status species on the Project site and general vicinity. Based on the disturbed condition of the proposed Project site, review of the biological resources information previously gathered, consultation with the CEC staff biologist and the Project description, no protocol surveys were performed.

8.2.4.2 General Vegetation and Habitat

The PPRP sites, utility linears, access routes, and laydown areas are uniformly flat, gravel, dirt, and paved lots devoid of vegetation and situated within a large active refinery with a long history of operation and soil contamination. There are no remaining features that provide natural habitat for plant and wildlife species within the PPRP footprint.

Other areas of the Refinery are not without vegetation and habitat for local wildlife (Figure 8.2-1). The ridge line that runs down the center of the San Pablo Peninsula is characterized by large storage tanks surrounded by wooded, scrub, and non-native grassland vegetation. Capped landfill areas within the Refinery have been planted with a variety of tree species. Chevron has also constructed treatment wetlands that are within the Refinery and adjacent to the existing switchyard. Given their location immediately adjacent to San Pablo Bay, these treatment wetlands are unique in that they are entirely freshwater. Therefore they are characterized by wetland vegetation associated with freshwater marshes

in contrast with the salt marsh estuary habitat (known as Wildcat Creek and San Pablo Creek Marsh) located immediately north of the treatment ponds. The bio-reactor ponds within the Refinery and under the existing 115-kV transmission line are not an attractant to birds and other wildlife due to their caustic nature. Bird species using the bays or the surrounding wetlands, including the Chevron treatment wetlands, likely fly over the proposed site and heavy industrial areas of the Refinery. Other than the tank farm areas, the industrial areas of the Refinery do not provide likely shelter, forage, breeding, or movement corridor habitat for common or special-status wildlife. The habitat types within and adjacent to the Refinery are described below and are further considered in the effects determinations regarding special-status species.

Vegetation Types and Wildlife Habitats Identified Within and in the Vicinity of the Project Area
The Draft EIR for the Richmond Renewal Project (ESA, 2006) (hereinafter referred to as “The Draft EIR”) describes the habitats within the Refinery as Barren, Urban, Eucalyptus/Monterey Pine Groves, Coastal Scrub, and Annual Grassland/Ruderal. Given the history of the Refinery, all habitats identified within the Refinery property are described in the EIR as either degraded or, in the case of the tree groves, the results of former landscaping and naturalization of tree grove plantings. The reconnaissance survey verified the degraded and manipulated condition of the habitats in the Refinery property.

Beyond the Refinery and towards the northern extremity of the peninsula are small areas of Coast Live Oak Woodland, Willow Scrub, Fresh/Brackish Water Marsh, Northern Coastal Salt Marsh and remnant patches of Coastal Terrace Prairie (City of Richmond, 1994). These areas were not further considered in the Draft EIR because they are at a sufficient distance from the proposed PPRP and will not be affected by the associated construction activities or operation.

1. *Barren.* The Draft EIR described the majority of the Refinery as Barren using the Wildlife Habitat Relationships (WHR) system, a community-level matrix model for predicting wildlife habitat relationships. This includes areas with buildings or pavement with less than 2 percent total herbaceous vegetative cover or less than 10 percent tree or shrub cover. 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 raphanistrum*) are weedy species found occasionally in gravel road shoulders and similar areas.

The Barren areas occupied by 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.

2. *Urban.* The Draft EIR considered landscaped strips along Castro Street and Channel Street as Urban habitat. Urban habitat is defined as planted vegetation that includes tree groves, street strips, and other landscaped features in an urban setting. Landscaped areas around the Chevron offices within the Refinery can also be considered Urban.

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*). These areas are probably too limited and isolated to be expected to support wildlife typically found in this setting, although they may provide habitat for occasional use.

3. *Eucalyptus/Monterey Pine Groves*. Round storage tanks are situated on the northeast hillside within the Refinery. This area is referred to as Tank Farm Hill. Growing amongst the tanks are gum trees (eucalyptus) and Monterey pine. The eucalyptus and pine are not native to the area and were planted. These trees are found throughout other areas along the hillsides of the San Pablo Peninsula. There is little understory vegetation in these areas but there are patches of scrub and non-native grassland that will be discussed later. The tank farms are not subject to the intensive activity that takes place in the low-land areas of the Refinery; therefore these trees serve as potential roost, perch, and nest sites for various bird species, including raptors. They also provide cover for other species such as raccoon (*Procyon lotor*) and Virginia opossum (*Didelphis virginiana*).
4. *Coastal Scrub*. The Coastal Scrub vegetation within the Refinery is also confined to the less-disturbed hillsides of the tank farm, amongst the eucalyptus and pine trees. The scrub is primarily composed of coyote brush (*Baccharis pilularis*) and California sagebrush (*Artemisia californica*). The scrub cover is dense in some areas. The scrub species also include poison oak (*Toxicodendron diversilobum*), toyon (*Heteromeles arbutifolia*), and sticky monkeyflower (*Mimulus aurantiacus*). Invasive shrub species include French broom (*Genista monspessulana*) and pampas grass (*Cortaderia selloana*).
5. 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*).
6. *Non-native Grassland/Ruderal Vegetation*. Areas of Non-native Grassland and Ruderal Vegetation are also found within the tank farm area of the Refinery. This vegetation type is found primarily in disturbed areas amongst the tanks and along roadsides and other cleared areas within the Refinery and includes wild oats, ripgut brome, Italian ryegrass (*Lolium multiflorum*), and a large assortment of weedy non-native species including mustard (*Brassica* spp.), wild radish (*Raphanus raphanistrum*), fennel (*Foeniculum vulgare*) and many others.

Grasslands can provide refuge for reptiles and amphibians such as western fence lizard, southern alligator lizard (*Elgaria multicarinata*), and Pacific tree frog (*Pseudacris regilla*), as well as 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, including red-tailed hawk (*Buteo jamaicensis*) and American kestrel (*Falco sparverius*).

Contra Costa General Plan Significant Ecological Areas

The Contra Costa General Plan (Contra Costa County, 1996) designated 41 Significant Ecological Areas throughout the County, selected based on three criteria: (1) areas containing rare, threatened, and endangered species; (2) unique natural areas; and (3) wetlands and marshes. The following are Significant Ecological Areas that occur within 10 miles of PPRP, followed by the short description included in the general plan and the approximate distance from PPRP.

1. *Point Pinole*. Tidal and freshwater marshes, mudflat, grassland, eucalyptus plantation, and a fishing pier which extends ¼ mile into San Pablo Bay. Valuable for migrating waterfowl and shorebirds. Habitat for soft-haired bird's beak (*Cordylanthus mollis* ssp. *Mollis*), California clapper rail (*Rallus longirostris obsoletus*) and salt marsh harvest mouse (*Reithrodontomys raviventris*), possibly for California black rail (*Laterallus jamaicensis coturniculus*), San Pablo song sparrow (*Melospiza melodia samuelis*) and white-tailed kite (*Elanus Leucurus*). The eucalyptus plantation serves as a resting place for migrating monarch butterflies (*Danaus plexippus*). Point Pinole is located approximately 4 miles north of PPRP.
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 including the salt marsh harvest mouse and the California clapper rail. Portions of these marshes are located within the Refinery property and are approximately 3,000 feet north from the closest PPRP site and 2,000 feet north from the associated switchyard.
3. *Brooks Island*. Tidal marsh, scrub/brushland and coastal prairie grassland. Important stop for migrating waterfowl including Canada goose (*Branta canadensis*). Supports a population of California vole (*Microtus californicus*) with apparent unique genetic features. Brooks Island is approximately 4 miles southeast of PPRP.
4. *Hoffman Marsh*. Tidal marsh habitat for migrating waterfowl and shorebirds, possibly for California clapper rail and salt marsh harvest mouse. Hoffman Marsh is approximately 5 miles southeast of PPRP.
5. *San Pablo Ridge*. The grassland areas on clay and clay loam soils on San Pablo Ridge support a population of Santa Cruz tarweed (*Holocarpha macradenia*) which was transplanted from a hillside in Pinole. The general plan identifies two locations along San Pablo Ridge and the closest of the two is approximately 4.5 miles northeast of PPRP.
6. *Wildcat Creek Canyon*. Grassy hillside with riparian woodland along Wildcat Creek. Habitat for ornate shrew (*Sorex ornatus*), western pond turtle (*Clemmys marmorata*), northern brown skink (*Eumeces gilberti placerensis*) and possibly for Alameda whipsnake (*Masticophis lateralis euryxanthus*). Wildcat Creek Canyon is in the East Bay Regional Parks and is approximately 6 miles southeast of PPRP.
7. *Lone Tree Point*. Stratified cliff face demonstrates the underlying trend of coastal uplift. Fossiliferous strata contain many marine-life fossils such as clams and oysters. Lone Tree Point is approximately 9 miles northeast of PPRP.

8. *Sobrante Ridge Manzanita Grove*. A unique “island” stand of chaparral that supports two and possibly three species of manzanita, including the Alameda manzanita (*Arctostaphylos pallida*). The Sobrante Ridge Manzanita Grove is approximately 6.5 miles east of PPRP.
9. *Mouth of Pinole Creek*. This coastal salt marsh area supports California black rail (*Laterallus jamaicensis coturniculus*). The mouth of Pinole Creek is approximately 6 miles northeast of PPRP.

8.2.4.3 Special-Status Species

Due to the lack of biological resources and associated habitat, it is unlikely that activities within the proposed PPRP construction sites, laydown areas, and access roads would result in significant impacts to special-status plant and wildlife species. The proposed PPRP site has been a part of the active Refinery operations for so long that the lack of historical records of special-status species in or immediately adjacent to these proposed work, laydown, and access areas is no surprise. Seasonal botanical and wildlife surveys were not performed due to the condition of the Project area. Occupied and potential habitat for special-status species is found nearby and within the other areas of the Refinery property. Therefore much of the remainder of this section will focus on those nearby habitats.

Special-Status Plant Species

Given the site condition, none of the special-status plant species included in Table 8.2-1 are likely to be found within the PPRP area. Database searches did indicate various special-status plants within 10 miles of the proposed PPRP. Of note, the Suisun Marsh aster (*Aster lentus*), a CNPS 1B plant, has been recorded on the San Pablo Peninsula, approximately 2 miles east of PPRP at Point Molate. This plant would not be affected by the PPRP as no marsh habitat is within the Project area.

Wildlife

The habitat quality and species diversity of the San Pablo Peninsula has been greatly reduced by the habitat loss resulting from the Refinery construction and operation. The proposed construction area, laydown area, and access routes for the PPRP are currently devoid of forage, shelter, or breeding habitat for wildlife. However, as discussed in Section 8.2.4.2, San Pablo Peninsula and less developed and frequented areas within the Refinery property still support suitable habitat for a variety of local wildlife species. Various migratory and resident wildlife species likely use the less disturbed and vegetated areas of the tank farms, treatment wetlands, and San Pablo and Wildcat Creeks marshes for roosting, shelter, foraging, and breeding. Due to current development and daily activities adjacent to the PPRP, it is unlikely that wildlife species would travel through the site. Therefore, the site does not likely function as part of a wildlife movement corridor.

Special-Status Wildlife Species

No federal or state-listed wildlife species have been reported to the CNDDDB for the San Pablo Peninsula. However, special-status species have been found in habitats nearby the Refinery, or have the potential to occur nearby or within the Refinery. As described in the 2006 EIR, this is especially true for the San Pablo and Wildcat Creek Marshes, the Chevron Treatment Wetlands, vegetated portions of the San Pablo Peninsula, and aquatic

habitat of the San Pablo and San Francisco Bays. Those species will be discussed relative to those habitat areas.

1. *San Pablo Creek and Wildcat Creek Marsh and Chevron Treatment Marsh Areas.* According to the Draft EIR, the final stretch of Wildcat Creek and its confluence with San Pablo Bay largely separates Chevron Treatment Wetlands from the northern coastal salt marsh habitat of Wildcat Creek Marsh. The marsh provides potential habitat for a relatively large number of special-status species typically restricted to this habitat type. Species that have been observed in the marsh (CDFG, 2006) include the federal and state endangered salt-marsh harvest mouse and California clapper rail, the state endangered and federal species of concern California black rail, the federal species of concern San Pablo song sparrow (*Melospiza melodia samuelis*) and white-tailed kite, 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, 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 this plant species.

The snowy egret (*Egretta thula*) and the great blue heron (*Ardea herodias*) are local residents found throughout California. They typically nest communally in dense marshes and trees near water. These species likely forage in the surrounding wetlands but no potential rookery (nesting locations) sites were recorded or observed in the PPRP vicinity.

Portions of the marshes are located within the Refinery property and are approximately 3,000 feet north from the closest PPRP plant site and 2,000 feet north from the associated switchyard. The Chevron Treatment Wetlands are located between the operational Refinery and this estuary. The treatment wetlands have the potential to be occasionally used by some of the species, such as the clapper rail, that are more closely associated with saltwater marsh habitat and pickleweed; however, none were observed during relatively intensive bird surveys in the treatment marsh areas between 1994-2004 (ESA, 2006). This may be partially due to the treatment wetlands being non-tidal and freshwater, which is different than the estuaries associated with Bay wetland habitats.

2. *San Pablo Peninsula (Northern and Western Portions).* According to the Draft EIR, certain vegetated areas of San Pablo Peninsula immediately northwest of the Project area contain 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 tree and foraging habitat occurs in the vicinity of the PPRP, 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 PPRP in less disturbed portions of the peninsula. The western 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.

Groves of blue gum and eucalyptus adjacent and extending into some of the tank field areas may provide potential wintering sites for monarch butterfly (*Danaus plexippus*) although no wintering sites have been reported or observed on the peninsula.

According to the Draft EIR, a nesting colony of double-crested cormorant (*Phalacrocorax auritus*), a state species of concern, occurs on the eastern portion of the Richmond-San Rafael Bridge. Individual birds may make occasional use of trees within the Refinery 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 foraging habitat.

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. Trees in the vicinity of tank field areas may provide potential roosting sites.

According to the Draft EIR, fragrant fritillary (*Fritillaria lilacae*) is known in the Refinery vicinity by a historical record from Point Richmond, approximately one mile to the south. Potential coastal scrub or grassland habitat may occur in undisturbed areas further north on the San Pablo Peninsula but none is found within the Refinery.

3. *San Pablo Bay and San Francisco Bay.* According to the Draft EIR, 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 use portions of Wildcat Creek for foraging 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 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.

8.2.5 Impacts

8.2.5.1 CEQA Environmental Checklist

Table 8.2-2 provides the CEQA Checklist questions that are used in this Small Power Plant Exemption (SPPE) Application to assess the potential significance of an impact.

8.2.5.2 Discussion of Impacts

As stated in the Section 8.4, Land Use, the proposed PPRP would include the replacement and upgrade of the power generating facilities within the Refinery and would not expand the Refinery boundary or the existing buffer between existing areas of operation and the Refinery boundaries. The PPRP would be constructed on disturbed soils within current and previously used process areas within the Refinery and all activities, including the

management and disposal of the wastes from the various construction activities, would be conducted in accordance with established procedures and the applicable regulatory requirements that the Refinery already follows.

TABLE 8.2-2
Biological Resources CEQA Checklist

	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant	No Impact
Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFG or USFWS?				X
b) Have a substantial adverse effect on any riparian habitat, or other sensitive natural community identified in local or regional plans, policies, or regulations or by the CDFG USFWS?				X
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, and coastal) through direct removal, filling, hydrological interruption, or other means?				X
d) Interfere substantially with the movement of any native resident, or migratory fish, or wildlife species, with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?				X
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?				X
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?				X

Wetlands and Waters of the U.S.

Wetlands and waters of the United States are defined by the USACE by the presence of hydric soils, hydrophytic vegetation, and wetland hydrology (Environmental Laboratory, 1987). No jurisdictional wetlands or waters are present on the PPRP site, laydown, or access areas. Project construction would not cause loss or fill of any wetlands.

Water Supplies and Discharges

Process water for the PPRP will be supplied through the existing Refinery system. This system is further discussed in Section 8.12, Water Resources. Water will be discharged to the Refinery wastewater treatment system. The Project will not involve any mechanism related

to securing or discharging water during operations that will affect fish or other aquatic biota.

Stormwater discharge from the PPRP will be directed into the Refinery's existing containment system and discharged under the Refinery's National Pollutant Discharge Elimination System (NPDES) permit. According to Chevron's current RWQCB NPDES permit, the Refinery's stormwater can be discharged directly to the San Francisco and San Pablo Bays or be directed through the Effluent Treatment System, depending on water quality.

Water will be applied to the site for dust control during construction. Eroded soils and sediment washed into surface waters would be potentially harmful to San Francisco Bay and San Pablo Bay water quality. As discussed further in Sections 8.9 (Agriculture and Soils) and 8.14 (Water Resources), the Applicant would be required to have a Stormwater Pollution Prevention Plan (SWPPP) as part of compliance with an NPDES construction permit. The permit specifies best management practices (BMPs) to avoid sediment runoff and erosion that would cause water quality degradation.

Cooling Tower Drift

Impacts to soils and vegetation associated with cooling tower drift are presented in Section 8.1, Air Quality.

Combustion Turbine Emissions

Impacts to soils and vegetation associated with combustion turbine air emissions are presented in Section 8.1, Air Quality.

Noise and Lights from Plant Operations

The PPRP site is zoned heavy industrial (see Section 8.4, Land Use) and is surrounded by industrial facilities within the Refinery. These facilities typically operate 24 hours per day, 7 days per week and have standard industrial lighting and noise emissions. Operation of the plant would produce some noise, as described in Section 8.5. Noise and construction activities would not adversely impact wildlife, due to existing noise levels and the lack of local wildlife attractants in the immediate vicinity.

Bright night lighting could disturb wildlife (e.g., nesting birds, foraging mammals, and flying insects). Night lighting is also suspected to attract migratory birds to some areas and, if the lights are on tall buildings or the combustion turbine exhaust stacks, collisions could occur. However, the exhaust stack height is currently estimated at 138.5 feet, which is lower in profile than much of the surrounding development.

Due to the existing level of lighting from the Refinery, the minimal increase in nighttime lighting from the PPRP facilities is not expected to be significant.

Potential for Collision and Electrocution Hazard to Birds

The Project would construct one exhaust stack, as high as 138.5 feet, and reconductor an existing electric transmission line that could potentially result in bird collisions. Most collisions involve nocturnal migrants flying at night in inclement weather and low-visibility conditions, colliding with tall guyed television or radio transmission towers (CEC, 1995; Kerlinger, 2000 in *Final Staff Assessment for Contra Costa Power Plant*). Migratory birds generally fly at an altitude that would avoid ground structures, except when crossing over

topographic features (e.g., ridge tops) or when inclement weather forces them down closer to the ground. A large number of birds migrate along the Pacific Coast, passing through the San Francisco Bay Area. The Refinery is within a known path for nocturnally migrating birds. However, there are no topographic or ecological features that would attract birds to this location or “funnel” them into the vicinity of the elevated features of the Project. Birds may collide with the approximately 4,000-foot-long 115-kV electrical transmission connections but risk of collision is not expected to be greater than the existing line.

Large raptors, herons, and egrets can be electrocuted by transmission lines when a bird’s wings simultaneously contact two conductors of different phases, or a conductor and a ground. The existing 115-kV line that will be reconducted as part of the PPRP spans the Refinery’s 165 million gallon bioreactor pond. Due to the effluent levels, birds and other wildlife are not known to use these ponds and they are not considered an attractant to wildlife. However, given the height of the lines and the location adjacent to the San Francisco and San Pablo Bays as well as productive wetland habitats, there is a potential for birds to strike the transmission line. The 115-kV electrical transmission lines for the Project will be constructed with at least a 5.5-foot span between conductor wires. The reconducted line is not expected to increase avian electrocutions in the area.

8.2.5.3 Conflict With Regional Habitat Conservation Plans

There are no countywide or regional Habitat Conservation Plans that would affect development in this industrial area of Richmond.

8.2.5.4 Cumulative Impacts

The proposed PPRP is part of a larger Energy and Hydrogen Renewal Project that would intensify the use of land on site that is developed for Refinery-related operations. However, the scope of the larger project will remain within the bounds of the existing operating Refinery boundaries, and the cumulative impacts of the proposed PPRP in relationship to existing land uses on site and in the Project vicinity would be considered less than significant.

The RWQCB has imposed limits on the Refinery that are intended to maintain resulting pollution discharge to receiving waters at a level that would be considered to have a less than significant affect on biological resources. The Refinery will be required to maintain these limits even with the addition of discharge associated with the PPRP.

A proposed future project at the Refinery in conjunction with the East Bay Municipal Utility District, the Richmond Advanced Recycling Expansion (RARE) project, would increase the amount of recycled water used at the Refinery, potentially increasing the amount of pollutant loading in the effluent discharge. Although exempt from the NPDES permit (see Section 8.13, Water Resources, the water from the RARE project would consist of water that is otherwise discharged to the bay, thus mass loading would remain the same.

Although potential increases in pollutants from the cumulative discharges could occur, compliance with the discharge requirements of the Refinery’s NPDES permit would reduce the Refinery’s contribution to these impacts to a level that is less than cumulatively considerable. The NPDES permitting process provides discharge standards that, when followed, limit this impact to less than significant. The Refinery’s contribution is controlled

by discharge limits in the NPDES permit and eventually will be considered by the RWQCB under the regional Total Maximum Daily Load (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 PPRP impact would be substantially mitigated by discharge requirements established by the RWQCB for this and other projects considered under cumulative analysis. Accordingly, the potential contribution of pollutants as a result of the PPRP, together with other industrial development projects, is not considered a cumulatively significant biological impact. The NPDES permit limits are set by the San Francisco Bay Regional Water Quality Control Board (RWQCB) for protection of aquatic life and other beneficial uses in the San Francisco Bay, including San Pablo Bay. The PPRP will discharge water under the Refinery's NPDES permit limits, which are not expected to adversely affect beneficial uses in the bays. See also discussion in Section 8.13, Water Resources, and Section 8.11, Hazardous Materials and Waste.

8.2.6 Proposed Mitigation and Monitoring

As described in the Section 8.8, Agriculture and Soils, erosion control measures would be required during construction to help maintain water quality, protect property from erosion damage, and prevent accelerated soil erosion or dust generation that destroys soil productivity and soil capacity. Temporary erosion control measures would be installed before construction begins, would be maintained and evaluated during construction, and would be removed from the site after the completion of construction. These measures would also likely benefit surrounding natural habitats. More details of the temporary and permanent erosion control measures can be found in Section 8.8, Agriculture and Soils.

Similar measures will be implemented during the construction and operation of the PPRP to minimize the risks associated with the handling of and inadvertent spills or leaks of hazardous materials that could affect biological resources. Refer to Section 8.11, Hazardous Materials and Waste, for an outline of these measures, including a risk management plan and a spill prevention control and countermeasure plan.

8.2.7 Biological Resources of Commercial and Recreational Value

The proposed PPRP will be contained within the Refinery property, which is off-limits to the public. Construction of the Project and indirect effects associated with its construction and operation are not expected to adversely affect any commercial activities such as fishing or recreational activities.

8.2.8 Involved Agencies and Agency Contacts

The Project has no federal nexus, and will not impact any state or federal listed species or state species of concern and will not cross any jurisdictional streams or wetlands. The agency contacts to confirm the foregoing information for this Project are summarized in Table 8.2-3.

TABLE 8.2-3
Biological Resources Agency Contacts

Biological Resource Agency	Contact	Title	Telephone/Email
U.S. Fish and Wildlife Service Federal Building 2800 Cottage Way, Room W-2605 Sacramento, California 95825	Ryan Olah	Sacramento Field Office Environmental Service Delta Branch Chief	(916) 414-6625 Ryan_Olah@fws.gov
California Department of Fish and Game 7329 Silverado Trail Napa, California 94558 Mail: P.O. Box 47, Yountville, California 94599	Scott Wilson	Conservation Planning Supervisor	(707) 944-5584 SWilson@dfg.ca.gov

8.2.9 Required Permits and Permit Schedule

Because no streams will be crossed and no special-status species would be affected, no federal, state or local permits are required for Biological Resources. The only related permit would be an NPDES construction permit that is addressed in Section 8.12, Water Resources.

8.2.10 References

- Avian Power Line Interaction Committee (APLIC). 1996. *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996*. Edison Electric Institute/Raptor Research Foundation. Washington, DC.
- California Department of Fish and Game (CDFG). 2006. *California Natural Diversity Database*. Search of the San Quentin, Richmond, Mare Island, and Oakland 7.5-minute U.S. Geological Survey quadrangles.
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TABLE 8.2-1
Special-Status Species Potentially Occurring in Project Vicinity

Common Name	Scientific Name	Status Federal/State/CNPS	Primary Habitat and Critical Seasonal Periods	Likelihood for Occurrence in Project Area and Comments
Plants				
Soft bird's beak	<i>Cordylanthus mollis</i> ssp. <i>Mollis</i>	FE/CR/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. There is no marsh habitat within the Project Area and the Project is not expected to result in direct or indirect affects to marsh habitat.
Fragrant fritillary	<i>Fritillaria liliacea</i>	--/--/1B	This species is associated with coastal scrub, grassland, and coastal prairie communities, often associated with serpentine substrate.	Low. There is no appropriate habitat for this species within the Project Area and the Project is not expected to result in direct or indirect affects to its appropriate habitat outside the Project footprint.
California seablite	<i>Suaeda californica</i>	FE/--/1B	This species is an evergreen shrub found in coastal saltwater marshes and swamps. Formerly known from San Francisco Bay area, where it is thought to have been extirpated by development; now extant only in Morro Bay and near Cayucos Pt.	Low. Slight potential habitat in Wildcat Marsh, but species occurs mostly east of Carquinez Straits. There is no marsh habitat within the Project Area and the Project is not expected to result in direct or indirect affects to marsh habitat.
Alkali milk-vetch	<i>Astragalus tener</i> var. <i>tener</i>	--/--/1B	This species is an annual herb that is associated with playas, valley and foothill grasslands, and alkaline vernal pool communities.	Low. There is no appropriate habitat for this species within the Project Area and the Project is not expected to result in direct or indirect affects to its appropriate habitat outside the Project footprint.
Suisun Marsh aster	<i>Aster lentus</i>	--/--/1B.2	This species is a rhizomatous herb associated with brackish and freshwater marshes and swamp communities.	Low. Slight potential habitat in Wildcat Marsh, but species occurs mostly east of Carquinez Straits. There is no marsh habitat within the Project Area and the Project is not expected to result in direct or indirect affects to marsh habitat.
Coastal bluff morning-glory	<i>Calystegia purpurata</i> ssp. <i>saxicola</i>	--/--/1B.2	This species is a perennial herb associated with coastal dune, coastal scrub, and North Coast coniferous forest communities.	Low. There is no appropriate habitat for this species within the Project Area and the Project is not expected to result in direct or indirect affects to its appropriate habitat outside the Project footprint.
Fishes				
Tidewater goby	<i>Eucyclogobius newberryi</i>	FE/CSC/NA	This species is associated with shallow waters of bays and estuaries, in lower stream reaches, in coastal stream lagoons	Low. There is no aquatic habitat within the Project Area and the Project is not expected to result in direct or indirect affects to aquatic habitat.

TABLE 8.2-1
Special-Status Species Potentially Occurring in Project Vicinity

Common Name	Scientific Name	Status Federal/State/CNPS	Primary Habitat and Critical Seasonal Periods	Likelihood for Occurrence in Project Area and Comments
Delta smelt	<i>Hypomesus transpacificus</i>	FT/CT/NA	This species is associated with shallow, open waters of estuaries where salinities range from 2-7 ppt. They spawn and rear in sloughs and shallow edge waters of channels in upper Delta and Sacramento River, Suisun Marsh and Bay.	Low. There is no aquatic habitat within the Project Area and the Project is not expected to result in direct or indirect affects to aquatic habitat.
Coho salmon – Central California coast ESU	<i>Oncorhynchus kisutch</i>	FE/CE/NA	This species spends its early years in the freshwater stream system in which it was born and then migrates out to the Pacific Ocean before returning to spawn in the same river systems. This species is associated with accessible Bay Area and coastal rivers and streams with cover, cool water and sufficient dissolved oxygen. They require beds of loose, silt-free gravel for spawning.	Low. There is no aquatic habitat within the Project Area and the Project is not expected to result in direct or indirect affects to aquatic habitat.
Steelhead – Central California Coast ESU	<i>Oncorhynchus mykiss irideus</i>	FT/CSC/NA	This species spends its early years in the freshwater stream system in which it was born and then migrates out to the Pacific Ocean before returning to in the same river system. This species is associated with accessible Bay Area and coastal rivers and streams with cover, cool water and sufficient dissolved oxygen. They require beds of loose, silt-free gravel for spawning.	Low. Although this fish is known to spawn in tributaries to San Francisco and San Pablo Bays, there is no aquatic habitat within the Project Area and the Project is not expected to result in direct or indirect affects to aquatic habitat.
Steelhead – Central Valley ESU	<i>Oncorhynchus mykiss</i>	FT/--/NA	This species spends its early years in the freshwater stream system in which it was born and then migrates out to the Pacific Ocean before returning to spawn in the Sacramento and San Joaquin Rivers and their tributaries.	Low. Although this fish is known to migrate through San Francisco, San Pablo, and Suisun Bays, as well as the Delta region to spawning grounds, there is no aquatic habitat within the Project Area and the Project is not expected to result in direct or indirect affects to aquatic habitat.
Chinook salmon – Central Valley spring-run	<i>Oncorhynchus tshawytscha</i>	FT/CT/NA	This species spends its early years in the freshwater stream system in which it was born and then migrates out to the Pacific Ocean before returning to spawn in a few tributaries to the Sacramento River basin.	Low. Although this fish is known to migrate through San Francisco Bay and Sacramento-San Joaquin Delta to spawning streams, there is no aquatic habitat within the Project Area and the Project is not expected to result in direct or indirect affects to aquatic habitat.

TABLE 8.2-1
Special-Status Species Potentially Occurring in Project Vicinity

Common Name	Scientific Name	Status Federal/State/CNPS	Primary Habitat and Critical Seasonal Periods	Likelihood for Occurrence in Project Area and Comments
Chinook salmon – Central Valley fall/late fall-run	<i>Oncorhynchus tshawytscha</i>	FC/CSC/NA	This species spends its early years in the freshwater stream system in which it was born and then migrates out to the Pacific Ocean before returning to spawn in lowland reaches and tributaries to the Sacramento River basin.	Low. Although this fish is known to migrate through San Francisco Bay and Sacramento-San Joaquin Delta to spawning streams, there is no aquatic habitat within the Project Area and the Project is not expected to result in direct or indirect affects to aquatic habitat.
Chinook salmon – winter run	<i>Oncorhynchus tshawytscha</i>	FE/CE/NA	This species spends its early years in the freshwater stream system in which it was born and then migrates out to the Pacific Ocean before returning to spawn in the Sacramento River basin.	Low. Although this fish is known to migrate through San Francisco Bay and Sacramento-San Joaquin Delta to spawning streams, there is no aquatic habitat within the Project Area and the Project is not expected to result in direct or indirect affects to aquatic habitat.
Green sturgeon	<i>Acipenser medirostris</i>	FP/--/NA	This species is associated with estuaries, lower reaches of large rivers, and salt or brackish water off river mouths. They spawn in deep, fast water of fresh water streams.	Low. Although this fish is known to migrate through the San Francisco Bay estuaries and spawn in the Sacramento River, there is no aquatic habitat within the Project Area and the Project is not expected to result in direct or indirect affects to aquatic habitat.
Sacramento splittail	<i>Pogonichthys macrolepidotus</i>	FSC/--/NA	This species is found in slow moving rivers and dead end sloughs. They require flooded vegetation for spawning and rearing. They spawn in freshwater in the lower Delta. Once common in San Pablo Bay and Carquinez Strait following high winter flows, they are now largely confined to the Delta, Suisun Bay, Suisun Marsh, Napa River, Petaluma River, and other parts of the Sacramento-San Joaquin Estuary.	Low. Although this fish was once common in San Pablo Bay and the Carquinez Strait following high winter flows, there is no aquatic habitat within the Project Area and the Project is not expected to result in direct or indirect affects to aquatic habitat.
Longfin smelt	<i>Spirinchus thaleichthys</i>	FSC/--/NA	This species is found in open waters of estuaries. They spawn in freshwater streams from February to April. Larval rearing habitat consists of brackish estuarine waters.	Low. Although this fish is known to use the estuaries of the Suisun and San Pablo bays, there is no aquatic habitat within the Project Area and the Project is not expected to result in direct or indirect affects to aquatic habitat.

TABLE 8.2-1
Special-Status Species Potentially Occurring in Project Vicinity

Common Name	Scientific Name	Status Federal/State/CNPS	Primary Habitat and Critical Seasonal Periods	Likelihood for Occurrence in Project Area and Comments
Insects and Crustacea				
Monarch butterfly	<i>Danaus plexippus</i>	Wintering sites protected by CDFG	In California this species is associated with over-wintering roost sites that are typically located within eucalyptus groves.	Low. Although wintering roosts are known to occur at Point Pinole, approximately 5 miles north of the Refinery, the species has not been observed on the San Pablo Peninsula. The eucalyptus and other trees within the adjacent tank farm may provide potential roosts for this butterfly. There is no appropriate habitat for this species, however the Project is not expected to result in direct or indirect affects to this potential habitat.
Reptiles and Amphibians				
California red-legged frog	<i>Rana aurora draytonii</i>	FT/CSC/NA	This species is associated with aquatic habitat such as stock ponds, pools, and slow moving streams with emergent vegetation for breeding, foraging, and cover. It also uses adjacent upland habitats for foraging, movement, and cover.	Low. There is no appropriate fresh water habitat or associated upland habitat within the Project Area and the Project is not expected to result in direct or indirect affects to any suitable habitat for this species outside the Project footprint.
Western pond turtle	<i>Emys (=Clemmys) marmorata</i>	--/CSC/NA	This species is typically associated with freshwater slack- or slow-water aquatic habitat with adequate deep water cover and basking sites. They use surrounding uplands for foraging, aestivation, and nesting.	Low. There is no appropriate fresh water habitat or associated upland habitat within the Project Area and the Project is not expected to result in direct or indirect affects to any suitable habitat for this species outside the Project footprint.
Birds				
California black rail	<i>Laterallus jamaicensis coturniculus</i>	FSC/CT/NA	This species nests and forages in tidal emergent wetland with pickleweed.	Low. This species has been recorded in the nearby Wildcat Marsh. There is no appropriate marsh habitat within the Project Area and the Project is not expected to result in direct or indirect affects to this marsh habitat.
California clapper rail	<i>Rallus longirostris obsoletus</i>	FE/CE/NA	This species nests and forages in emergent wetlands with pickleweed, cordgrass, and bulrush.	Low. This species has been recorded in the nearby Wildcat Marsh. There is no appropriate marsh habitat within the Project Area and the Project is not expected to result in direct or indirect affects to this marsh habitat.

TABLE 8.2-1
Special-Status Species Potentially Occurring in Project Vicinity

Common Name	Scientific Name	Status Federal/State/CNPS	Primary Habitat and Critical Seasonal Periods	Likelihood for Occurrence in Project Area and Comments
Caspian tern	<i>Sterna caspia</i>	MB/--/NA	This bird is the largest tern species. It is associated with large lakes and coastal areas where it forages on fish, aquatic invertebrates, and the occasional small or young bird or egg. They breed by themselves or in small colonies where they make their nests on the ground or on floating material.	Low. This species has the potential to nest and forage along the nearby coastline. However, there is no appropriate foraging or nesting habitat within the Project Area and the Project is not expected to result in direct or indirect affects to their habitat.
Double-crested cormorant	<i>Phalacrocorax auritus</i>	MB/CSC/NA (Rookery sites)	This species nests along coast on isolated islands or in trees along lake margins or on bridges. They often forage inland on lakes, ponds, and estuaries	Low. Nesting colony occurs on Richmond-San Rafael Bridge and this bird may roost in nearby trees. The Project is not expected to result in direct or indirect affects to any suitable habitat for this species outside the Project footprint.
Snowy egret (rookery)	<i>Egretta thula</i>	FP, MB/--/NA	This species is found throughout California where it is associated with estuaries, wetlands, ponds, rivers, irrigation ditches, and flooded agricultural fields. They nest communally in dense marshes and trees. Breeding season typically is from March-May.	Low. Although this species may forage in nearby marshes and open areas, the Project site is heavily industrial and does not support forage habitat for this bird. The Project is not expected to result in direct or indirect affects to any suitable habitat for this species outside the Project footprint.
Great blue heron (rookery)	<i>Ardea herodias</i>	MB/--/NA	This species is primarily associated with marshes, lagoons, streams, lakes, and pond habitat and is also found in fields and meadows. They typically nest communally in tall trees near water. Breeding typically begins in March.	Low. Although this species may forage in nearby marshes and open areas, the Project site is heavily industrial and does not support forage habitat for this bird. The Project is not expected to result in direct or indirect affects to any suitable habitat for this species outside the Project footprint.
Black-crowned night heron	<i>Nycticorax nycticorax</i>	MB/--/NA	This species is associated with wetland and large aquatic habitat throughout much of North America. They typically nest colonial in trees. They are opportunistic feeders.	Low. Although this species may forage in nearby marshes and open areas, the Project site is heavily industrial and does not support forage habitat for this bird. The Project is not expected to result in direct or indirect affects to any suitable habitat for this species outside the Project footprint.

TABLE 8.2-1
Special-Status Species Potentially Occurring in Project Vicinity

Common Name	Scientific Name	Status Federal/State/CNPS	Primary Habitat and Critical Seasonal Periods	Likelihood for Occurrence in Project Area and Comments
White tailed kite	<i>Elanus leucurus</i>	FSC, MB/FP/NA	This raptor species is typically associated with California's Central Valley but can also be found in appropriate habitat within the Bay Area. It is commonly associated with riparian and open habitats. They typically breed between January and August. Their platform nests are located in trees or shrubs. This species is primarily a local resident and is known to form communal roosts in the fall and winter.	Low. Although this species may forage in nearby marshes and open areas and may even nest in trees within the Refinery, the Project site is heavily industrial and does not support forage habitat for this bird. The Project is not expected to result in direct or indirect affects to any suitable habitat for this species outside the Project footprint.
Northern harrier	<i>Circus cyaneus</i>	MB/CSC/NA	This raptor species is a ground nester that is associated with fresh water and salt marshes and swamps, lowland meadows, and irrigated fields.	Low. Although this species may forage in nearby marshes and open areas and possibly nest in nearby marshes, the Project site is heavily industrial and does not support forage habitat for this bird. The Project is not expected to result in direct or indirect affects to any suitable habitat for this species outside the Project footprint.
Cooper's hawk	<i>Accipiter cooperi</i>	MB/*/NA (nest sites)	This raptor species forages in a variety of habitats but is most often associated with wooded areas.	Low. Although this species may forage in nearby marshes and open areas and may even nest in trees within the Refinery, the Project site is heavily industrial and does not support forage habitat for this bird. The Project is not expected to result in direct or indirect affects to any suitable habitat for this species outside the Project footprint.
Short-eared owl	<i>Asio flammeus</i>	MB/CSC/NA	This raptor species is a ground nester that is associated with fresh water and salt marshes and swamps, lowland meadows, and irrigated fields.	Low. Although this species may forage in nearby marshes and open areas and possibly nest in nearby marshes, the Project site is heavily industrial and does not support forage habitat for this bird. The Project is not expected to result in direct or indirect affects to any suitable habitat for this species outside the Project footprint.
Western burrowing owl	<i>Athene cunicularia</i>	MB, FSC/CSC/NA	This raptor species is associated with open grassland habitat with mammal burrows, typically ground squirrels. They use these burrows for cover and natal dens. Breeding season is typically from February through August.	Low. Although this species may forage in nearby marshes and open areas and may even nest on the hillsides or other areas on the Peninsula, the Project site is heavily industrial and does not support forage habitat for this bird. The Project is not expected to result in direct or indirect affects to any suitable habitat for this species outside the Project footprint.

TABLE 8.2-1
Special-Status Species Potentially Occurring in Project Vicinity

Common Name	Scientific Name	Status Federal/State/CNPS	Primary Habitat and Critical Seasonal Periods	Likelihood for Occurrence in Project Area and Comments
San Pablo song sparrow	<i>Melospiza melodia samuelis</i>	MB/CSC/NA	This subspecies is currently found in marshes around San Pablo Bay and throughout the extensive marshes along the Petaluma, Sonoma and Napa rivers.	Low. This species has been recorded in the nearby Wildcat Marsh. There is no appropriate marsh habitat within the Project Area and the Project is not expected to result in direct or indirect affects to this marsh habitat.
Alameda song sparrow	<i>Melospiza melodia pusillula</i>	MB/CSC/NA	This subspecies is currently found in marshes from Coyote Creek, at the southern extremity of the Bay, northward along the west shore of south San Francisco Bay to Belmont Slough and along the east shore to San Lorenzo. Small populations also occur in small marshes at the northeast shore of Richmond Inner Harbor at El Cerrito, along the shoreline from Emeryville to the Oakland Bay Bridge Toll Playa, and at Arrowhead Marsh at the mouth of San Leandro Creek in San Leandro Bay.	Low. There is no appropriate marsh habitat within the Project Area and the Project is not expected to result in direct or indirect affects to this marsh habitat.
Saltmarsh common yellowthroat	<i>Geothlypis trichas sinuosa</i>	MB,FSC/CSC/NA	This species is typically found in moist saltmarsh habitats and willow thickets with dense, low cover.	Low. This species has a high potential to occur within Wildcat Marsh. There is no appropriate marsh habitat within the Project Area and the Project is not expected to result in direct or indirect affects to this marsh habitat.
Loggerhead shrike	<i>Lanius ludovicianus</i>	MB,FSC/CSC/NA	This species is commonly associated with shrublands and open grasslands.	Low. Although this species may forage in nearby open habitat and possibly nest in nearby trees, the Project site is heavily industrial and does not support forage habitat for this bird. The Project is not expected to result in direct or indirect affects to any suitable habitat for this species outside the Project footprint.
Mammals				
Salt marsh harvest mouse	<i>Reithrodontomys raviventris raviventris</i>	FE/CE/NA	This species is associated with saline emergent marshlands with dense pickleweed.	Low. This species has been recorded in the nearby Wildcat Marsh. There is no appropriate marsh habitat within the Project Area and the Project is not expected to result in direct or indirect affects to this marsh habitat.

TABLE 8.2-1
Special-Status Species Potentially Occurring in Project Vicinity

Common Name	Scientific Name	Status Federal/State/CNPS	Primary Habitat and Critical Seasonal Periods	Likelihood for Occurrence in Project Area and Comments
Bats including: Townsend's western big-eared bat	<i>Corynorhinus townsendi townsendi</i>	FSC/CSC/NA	These bat species are found in various habitats; roosting sites include buildings and other man-made structures and trees.	Low. Although these species may forage in nearby open habitat and roost in nearby trees, and structures, the Project site is heavily industrial and does not support forage habitat for these bats. The Project is not expected to result in direct or indirect affects to any suitable habitat for these species outside the Project footprint.
Greater western mastiff bat	<i>Eumops perotis californicus</i>			
Pallid bat	<i>Antrozous pallidus</i>			
Also several <i>Myotis</i> spp.				
San Pablo vole	<i>Microtus californicus sanpabloensis</i>	--/CSC/NA	This species is typically found in grassy habitats associated with salt-marshes.	Low. This species has been recorded in Wildcat Marsh. There is no appropriate marsh habitat within the Project Area and the Project is not expected to result in direct or indirect affects to this marsh habitat.
Salt marsh wandering shrew	<i>Sorex vagrans halicoetes</i>	FSC/CSC/NA	This species is associated with salt marsh habitat with abundant pickleweed and driftwood.	Low. This species has been recorded in San Pablo Creek marsh, about 1 mi north. There is no appropriate marsh habitat within the Project Area and the Project is not expected to result in direct or indirect affects to this marsh habitat.

Notes:

* Federally-listed in Santa Barbara and Sonoma Counties only

Key to Status Codes:Federal:

FC = Federal Candidate Species

FE = Federal Endangered

FP = Federal Protected

FPE = Federal Proposed Endangered

FSC = Federal Species of Concern

FT = Federal Threatened

MB = Federal Migratory Bird Treaty Act

State:

CE = State Endangered

CR = State Rare

CT = State Threatened

CSC = California Species of Special
Concern

Other:

CNPS = California Native Plant Society Listed

1B = Plants, rare, threatened or endangered in California and elsewhere and are rare throughout their range.

According to CNPS, all of the plants constituting List 1B meet the definitions of Section 1901.

1B.2 = Fairly endangered in California

FP = Fully Protected

R = Rare

NA = Not Applicable

Sources: CDFG. 2007. *California Natural Diversity Database*. Search of San Quentin, Richmond, Mare Island, and Oakland 7.5-minute U.S. Geological Survey quadrangles. January 2007.
California Native Plant Society. 2007. *Online Inventory of Rare and Endangered Vascular Plants Of California*.



LEGEND

- Plant Area
- Laydown Area
- Alameda song sparrow
- Angel Island mole
- Berkeley kangaroo rat
- Bridges' coast range shoulderband (snail)
- California black rail
- California clapper rail
- California red-legged frog
- California seablite
- Caspian tern
- Coastal Brackish Marsh
- Coastal Terrace Prairie
- Contra Costa goldfields
- Cooper's hawk
- Diablo helianthella
- Franciscan thistle
- Lee's micro-blind harvestman
- Loma Prieta hoita
- Marin hesperian
- Marin knotweed
- Marin western flax
- Mission blue butterfly
- North Coast semaphore grass
- Northern Coastal Salt Marsh
- Northern Maritime Chaparral
- Oregon meconella
- Point Reyes bird's-beak
- Sacramento perch
- San Pablo song sparrow
- San Pablo vole
- Santa Cruz microseris
- Santa Cruz tarplant
- Serpentine Bunchgrass
- Suisun Marsh aster
- Tamalpais oak
- Tiburon Indian paintbrush
- Tiburon jewel-flower
- Tiburon mariposa lily
- Tiburon micro-blind harvestman
- Valley Needlegrass Grassland

- alkali milk-vetch
- bald eagle
- bent-flowered fiddleneck
- big free-tailed bat
- black-crowned night heron
- burrowing owl
- coastal bluff morning-glory
- double-crested cormorant
- dune gilia
- fragrant fritillary
- great blue heron
- great egret
- hairless popcorn-flower
- marsh microseris
- California brackishwater snail
- minute pocket-moss
- monarch butterfly
- northern harrier
- pallid bat
- pallid manzanita
- robust monardella
- round-leaved filaree
- salt-marsh harvest mouse
- salt-marsh wandering shrew
- saltmarsh common yellowthroat
- short-eared owl
- showy indian clover
- small groundcone
- snowy egret
- soft bird's-beak
- southern sea otter
- tidewater goby
- western leatherwood
- western pond turtle
- white-rayed pentachaeta
- white-tailed kite
- yellow-headed blackbird

FIGURE 8.2-2
CNDDDB OCCURRENCES
WITHIN 10 MILES OF PROJECT SITE
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA

8.3. Cultural Resources

This section of the Small Power Plant Exemption (SPPE) Application determines whether cultural resources are present and could be affected adversely by the construction and operation of the Chevron Refinery Power Plant Replacement Project (PPRP, or the Project). The significance of any potentially affected resources is assessed, and measures are proposed to mitigate potential adverse Project effects. This study was conducted by Clint Helton, M.A., RPA (Registered Professional Archaeologist), a Cultural Resource Specialist who meets the qualifications for Principal Investigator stated in the Secretary of the Interior's standards and guidelines for archaeology and historic preservation (USNPS, 1983).

This section is consistent with state regulatory requirements for cultural resources pursuant to the California Environmental Quality Act (CEQA). The study scope was developed in consultation with the California Energy Commission's (CEC's) cultural resources staff and complies with *Instructions to the California Energy Commission Staff for the Review of and Information Requirements for an Application for Certification* (CEC, 1992) and *Rules of Practice and Procedure & Power Plant Site Certification Regulations* (CEC, 1997).

Cultural resources include prehistoric and historic archaeological sites¹, districts and objects; standing historic structures, buildings, districts, and objects; and locations of important historic events, or sites of traditional/cultural importance to various groups.²

Section 8.3.2 discusses the laws, ordinances, regulations, and standards (LORS) applicable to the protection of cultural resources. Section 8.3.3 describes the cultural resources environment that might be affected by the Project. Section 8.3.4 discusses the environmental impacts of construction of the proposed development. Section 8.3.5 discusses whether there are any cumulative effects from the Project, and Section 8.3.6 presents mitigation measures that will be implemented to avoid construction impacts. Section 8.3.7 lists the agencies involved and agency contacts, and Section 8.3.8 discusses permits and the permitting schedule. Section 8.3.9 lists reference materials used in preparing this section.

Appendix 8.3-A provides the resume for Clint Helton. Appendix 8.3-B contains a copy of a previous comprehensive cultural resources assessment of the Chevron Richmond Refinery prepared by LSA (1990). Figure 8.3-1 depicts the ethnographic distribution in the Project area per CEC Data Adequacy requirements. Much of the information contained in this section is consistent with the analysis prepared by ESA Associates, Inc. in the *Chevron Energy and Hydrogen Renewal Project Administrative Draft EIR* (ESA, 2006).

The Project is subject to CEC and CEQA regulatory requirements. The Project does not require review under federal regulations such as the National Environmental Policy Act (NEPA) and the Archaeological and Historic Preservation Act (AHPA) of 1974 (16 USC 469), among others, because it is not a federal undertaking (federally permitted or funded).

1 Site: "The location of a significant event, a prehistoric or historic occupation or activity, or a building or structure...where the location itself possesses historic, cultural, or archeological value." (USNPS-IRD 1991:15).

2 The "federal definition" of cultural resources is typically applied to non-federal projects (NHPA, Title III, Section 301).

8.3.1 Introduction

Chevron is proposing the PPRP to add an additional 60 megawatts (MW) net generation to its existing refinery electrical generation located within Chevron's Richmond Refinery in the City of Richmond (see Figure 1.2-1) in Contra Costa County, California. The proposed PPRP will be integrated into Chevron's plans to meet its growing refinery electrical load, and produce steam to replace an existing boiler plant that is approaching its end of life. The PPRP is a subset of the larger Richmond Refinery Renewal Project that is concurrently undergoing CEQA review by the City of Richmond. The CEC has jurisdiction for only the PPRP portion of the Renewal Project that is the subject of this application.

The PPRP will consist of the following components:

- A nominal 43-MW net, natural gas- or liquid petroleum gas (butane)-fired cogeneration train consisting of one combustion turbine generator (CTG), a refinery fuel gas-fired heat recovery steam generator, 13.8-kV switchgear and ancillary equipment.
- Shutdown of the existing No. 1 power plant refinery steam boilers currently providing steam to the Refinery.
- A 17-MW net extraction, condensing steam turbine generator (STG), an associated cooling tower, and 12-kV switchgear installed as part of the new hydrogen production facility (the remainder of the hydrogen plant is under CEQA review as part of the Renewal Project). The new hydrogen plant will be a net generator of steam for both the STG and the refinery steam system.
- Reconductoring of approximately 4,000 feet of existing onsite double-circuit overhead 115-kV transmission line to upgrade its ampacity. The reconductoring will reuse existing transmission line structures.
- Adjacent onsite service connections for fuel, reclaimed water, water, wastewater, steam, and electricity to existing piperacks, with the exception of the reconductoring noted above.

The Cogen 3000 portion of the PPRP will occupy approximately 0.5 acre within an existing 5.2-acre cogeneration facility, and the STG and associated equipment (H₂-STG) will occupy approximately 0.5 acre within a new 7.9-acre hydrogen plant that will be built as part of the Richmond Refinery Renewal Project. The PPRP will be located well within the heart of the existing 2,900-acre Richmond Refinery. Temporary construction laydown and parking for the PPRP will be provided in various existing laydown areas within the refinery that are currently used for ongoing maintenance and project laydown. A complete description of the PPRP is provided in Section 2.0.

8.3.2 Laws, Ordinances, Regulations, and Standards

Among the local LORS discussed in this section are certain ordinances, plans or policies of the City of Richmond. For informational purposes, this section reviews compliance of the Project with such requirements even though the Applicant understands that they are not applicable to the Project as a matter of law. (See Section 8.4, Land Use for a discussion of this issue.) The analysis of City LORS in this section is informational and does not address the jurisdictional issues which are discussed in Section 8.4, Land Use.

A summary of LORS is provided in Table 8.3-1.

TABLE 8.3-1
Applicable Cultural Resource Laws, Ordinances, Regulations, and Standards

Law, Ordinance, Regulation, or Standard	Applicability	Project Conformity?
California Environment Quality Act Guidelines	Project construction may encounter archaeological and/or historical resources	Yes
Health and Safety Code Section 7050.5	Construction may encounter Native American graves; coroner calls the Native American Heritage Commission (NAHC)	Yes
Public Resources Code Section 5097.98	Construction may encounter Native American graves; NAHC assigns Most Likely Descendant	Yes
Public Resources Code Section 5097.5/5097.9	Would apply only if some Project land were acquired by the state (currently no state land)	Yes
City of Richmond General Plan	Project construction may encounter archaeological and/or historical resources	Yes

8.3.2.1 State of California Statutes

CEQA requires a review to determine if a project will have a significant effect on archaeological sites or a property of historic or cultural significance to a community or ethnic group eligible for inclusion in the California Register of Historical Resources (CRHR).³ CEQA equates a substantial adverse change in the significance of a historical resource with a significant effect on the environment (Section 21084.1 of the Public Resources Code) and defines substantial adverse change as demolition, destruction, relocation, or alteration that would impair historical significance (Section 5020.1). Section 21084.1 stipulates that any resource listed in, or eligible for listing in, the CRHR is presumed to be historically or culturally significant.⁴

Resources listed in a local historic register or deemed significant in a historical resource survey (as provided under Section 5024.1g) are presumed historically or culturally significant unless the preponderance of evidence demonstrates they are not.

3 The CRHR is a listing of "...those properties which are to be protected from substantial adverse change." Any resource eligible for listing in the California Register is also to be considered under CEQA.

4 A historical resource may be listed in the CRHR if it meets one or more of the following criteria: "(1) is associated with events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States; (2) is associated with the lives of persons important to local, California or national history; (3) embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of a master or possesses high artistic values; or (4) has yielded or has the potential to yield information important in prehistory or history (...of the local area, California or the nation)" (Public Resources Code §5024.1, Title 14 CCR, Section 4852). Automatic CRHR listings include NRHP listed and determined eligible historic properties (either by the Keeper of the NRHP or through a consensus determination on a project review); State Historical Landmarks from number 770 onward; and Points of Historical Interest nominated from January 1998 onward. Landmarks prior to 770 and Points of Historical Interest may be listed through an action of the State Historical Resources Commission.

A resource that is not listed in or determined to be eligible for listing in the CRHR, is not included in a local register of historic resources, nor deemed significant in a historical resource survey, may nonetheless be historically significant (Section 21084.1; see Section 21098.1).

CEQA requires a Lead Agency to identify and examine environmental effects that may result in significant adverse effects. Where a project may adversely affect a unique archaeological resource,⁵ Section 21083.2 requires the Lead Agency to treat that effect as a significant environmental effect and prepare an Environmental Impact Review (EIR). When an archaeological resource is listed in or is eligible to be listed in the CRHR, Section 21084.1 requires that any substantial adverse effect to that resource be considered a significant environmental effect. Sections 21083.2 and 21084.1 operate independently to ensure that potential effects on archaeological resources are considered as part of a project's environmental analysis. Either of these benchmarks may indicate that a project may have a potential adverse effect on archaeological resources.

Other state-level requirements for cultural resources management appear in the California Public Resources Code Chapter 1.7, Section 5097.5 (Archaeological, Paleontological, and Historical Sites), and Chapter 1.75, beginning at Section 5097.9 (Native American Historical, Cultural, and Sacred Sites) for lands owned by the state or a state agency.

The disposition of Native American burials is governed by Section 7050.5 of the California Health and Safety Code and Sections 5097.94 and 5097.98 of the Public Resources Code, and falls within the jurisdiction of the Native American Heritage Commission (NAHC).

If human remains are discovered, the Contra Costa County coroner must be notified within 48 hours and there should be no further disturbance to the site where the remains were found. If the remains are determined by the coroner to be Native American, the coroner is responsible for contacting the NAHC within 24 hours. The NAHC, pursuant to Section 5097.98, will immediately notify those persons it believes to be most likely descended from the deceased Native American so they can inspect the burial site and make recommendations for treatment or disposal.

8.3.2.2 Local Policies

As discussed above, among the local LORS discussed in this section are certain ordinances, plans or policies of the City of Richmond. For informational purposes, this section reviews compliance of the Project with such requirements even though the Applicant understands that they are not applicable to the Project as a matter of law. (See Section 8.4, Land Use, for a discussion of this issue.) The analysis of City LORS in this section is informational and does not address the jurisdictional issues which are discussed in Section 8.4, Land Use.

5 Public Resources Code 21083.2 (g) defines a unique archaeological resource to be: An archaeological artifact, object, or site, about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria: (1) contains information needed to answer important scientific research questions and there is a demonstrable public interest in that information; (2) has a special and particular quality such as being the oldest of its type or the best available example of its type; or (3) is directly associated with a scientifically recognized important prehistoric or historic event or person.

8.3.2.2.1 City of Richmond

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:

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.

8.3.3 Affected Environment

In California, cultural resources extend back in time for at least 11,500 years. Written historical sources tell the story of the past 200 years. Archaeologists have reconstructed general trends of prehistory.

8.3.3.1 Regional Setting

The Project is situated within the existing Chevron Richmond Refinery site in the City of Richmond, Contra Costa County, California. 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. 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, gas, and hydrogen, primarily for its own use.

8.3.3.2 Prehistoric Period

The general trend throughout California prehistory has been an increase in population density over time, coupled with greater sedentism and the use of a greater diversity of food resources. There is abundant evidence that humans were present in the New World for at least the past 11,500 years. There is also fragmentary, but growing, evidence that humans were present long before that date. Linguistic and genetic studies suggest that a date of 20,000 to 40,000 years ago

for the human colonization of the New World may be correct. The evidence of this earlier occupation is not yet conclusive, but it is beginning to be accepted by archaeologists. The Meadowcroft Rockshelter in Pennsylvania and Monte Verde in Chile, for instance, are two early sites that have produced apparently reliable dates as early as 12,500 years before present. These earliest known remains indicate very small, mobile populations, apparently dependent on hunting of large game animals as the primary subsistence strategy.

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.

This section discusses general trends in California prehistory. The general trend throughout California prehistory was the increase in population density over time, coupled with greater sedentism and the use of a greater diversity of food resources. Chartkoff and Chartkoff (1984) identified three major periods of prehistory observed throughout California: Pre-Archaic, Archaic, and Pacific. These patterns are roughly correlated with the Paleoindian, Archaic, and Emergent periods developed by Fredrickson (1994) for west-central California. As Chartkoff and Chartkoff observe, culture change occurred in different ways and at different times throughout California. These changes nevertheless followed a broad pattern, outlined below.

8.3.3.2.1 Pre-Archaic Period (Prior to 11,000 years before present [BP])

Evidence throughout California and the western United States generally suggests that Pre-Archaic (or Paleoindian) populations were small and their subsistence economies included the capture of big game such as now-extinct large Pleistocene mammals including mammoth and mastodon. Recent research in the Great Basin, which offers better preservation of Pre-Archaic sites than does California, indicates that the economies of the Pre-Archaic peoples of the far western United States were based on a wide-ranging hunting and gathering strategy, dependent to a large extent on local lake-marsh habitats (Willig, 1988).

Large, fluted lanceolate projectile points known as Clovis points, which are the most widely recognized markers for this time period, have been found in the Clear Lake locality at the Borax Lake Site to the north of the Project area (Meighan and Haynes, 1970), the Tulare Lake Basin to the south (Wallace and Riddell, 1988), and sporadically elsewhere in California. There are no known Pre-Archaic sites in the Bay Area.

8.3.3.2.2 Early to Middle Archaic Period (11,000-6,000 years BP)

During the Early and Middle Archaic periods, northern California prehistoric cultures, as elsewhere, began to put less emphasis on large game hunting. Subsistence economies probably diversified somewhat, and Archaic-era people may have begun to use certain ecological zones, such as the coast littoral, more intensively than before. Advances in technology, such as the advent of milling stones, indicate that new food processing methods became important during the Archaic period, enabling more efficient use of certain plant foods including grains and plants with hard seeds. A model of early Holocene adaptation devised for the eastern Great Basin (Price and Johnston, 1988) may be applicable to California. According to this model, this was a period of gradual warming and drying that

supported a specialized economy based largely on marsh, lake, and stream resources. It supported higher population densities and a greater degree of sedentism than the Pre-Archaic period.

The earliest Archaic sites from west-central California are from the Los Vaqueros Reservoir area in eastern Contra Costa County, where two sites have recently produced artifact assemblages and human burials dated between 9,870 and 6,600 years BP. Prior to the Los Vaqueros excavations, Early to Middle Archaic deposits in the Bay-Delta areas were limited to isolated human burials. No sites dating to these periods have been found in the immediate Project vicinity. However, the lack of sites from these periods may reflect the alluvial environment as well as the extensive urban development that may have destroyed or covered sites. It is possible that as-yet undiscovered Early and/or Middle Archaic sites lie deeply buried or beneath existing paved and landscaped surfaces in the Project area.

8.3.3.2.3 Late Archaic Period (6,000-4,000 years BP)

One important technological advance during the Late Archaic was the discovery of a process for removing the tannins from acorns, which made it possible to exploit this abundant and nutritious, though labor intensive, resource (Chartkoff and Chartkoff, 1984). Prehistoric trade networks also began to diversify and develop during the Late Archaic, bringing raw materials and finished goods from one region to another. Resource exploitation during this period, as well as during the Early and Middle Archaic, was generally seasonal. Bands moved between established locations within a clearly defined and defended territory, scheduling the harvest of particular resources according to the time of their availability. Aggregations of food resources, such as occurred at the shores of a large body of water or along a major fish-producing river, allowed for larger aggregations of people, at least seasonally. Dispersed resources, such as large and small mammalian game during the winter, meant dispersal across the landscape into small family groups for more efficient food harvesting. The spear thrower (atl-atl) may have been introduced or increased in importance during this period, accounting for the change in projectile point styles from the Western Stemmed series to the Pinto and Humbolt series, which are generally stemmed or have indented bases, or both. There was also an increase in the importance of seed grinding (Price and Johnston 1988).

It appears that the shell mound sites along San Francisco Bay were first occupied during the Late Archaic. Shell mound sites excavated in the Coyote Hills area contain Late Archaic components. Most of these sites have produced intact human burials and a great variety of artifacts, a reflection of the diverse subsistence practices. Acorns and other nut and berry crops appear to have been the primary plant resources targeted during this period. At sites along the Bay, the abundant remains of marine animals, including shellfish, fish, and mammals, reflect the occupants' early adaptation to the marine and bayshore estuarine environment. Obsidian from the North Coast Ranges and eastern Sierra also appears at these sites, reflecting the early existence of extensive trade networks.

8.3.3.2.4 Early and Middle Pacific Periods (4,000-1,500 years BP)

According to Chartkoff and Chartkoff (1984), the beginning of the Pacific Period is marked by the advent of acorn meal as the most important staple food resource for most California Indians. Increasing population densities throughout the period made it desirable and necessary for California populations to produce more food from available land and to seek more dependable food supplies. The increasing use of food processing techniques, such as

seed grinding and acorn leaching, developed during the Archaic, allowed for the exploitation of more dependable food resources. Increasing use of previously neglected ecological zones may also have been part of this trend.

In the Bay Area, Early and Middle Pacific sites are typically composed of well-developed midden deposits with human burials and residential features, representing long-term permanent villages. During this period, archaeological evidence indicates an increase in the use of the estuarine and marine zones and fully developed exploitation of these areas. Site assemblages are characterized by a well-developed bone tool and ornament industry; shell beads, ornaments, and pendants; and both unshaped and well-shaped mortars and pestles. Stone tools are manufactured of both locally available chert and imported obsidian. The predominant projectile point type is the shouldered lanceolate form, although side-notched and stemmed points and large lanceolate-shaped bifaces also occur. Burials are typically in a flexed position.

8.3.3.2.5 Late and Final Pacific Period (1,500 years BP-Historic Era)

A.D. 500 (1,500 years BP) is a cultural watershed throughout California. Sometime near this date, the bow and arrow replaced the spear thrower and dart as the hunting tool and weapon of choice. The most useful markers for this period tend to be the small projectile points used as arrow tips. The date of bow and arrow introduction is a point of some controversy, but most authors place it between A.D. 500 and 600. Others believe bows and arrows were introduced as early as A.D. 250 (750 years BP; Hughes, 1986) or as late as A.D. 700 (1,300 years BP; Bennyhoff et al., 1982).

During the Final Pacific Period, populations became increasingly sedentary and dependent on stored staple foods. Staple foods were stored for the winter in permanent settlements with populations as high as 1,000 persons. At the same time, there is evidence of continued diversification of the resource base. By the Final Pacific Period, every available ecological niche was exploited, at least on a seasonal basis. There was full exploitation of the marine/estuarine zone and further development of long-distance trade networks and more complex social and political systems.

Late and Final Pacific period sites are generally well-developed midden deposits, some with surface components. The midden deposits contain both cremated and intact human burials and residential features, including house floors, reflecting the increasingly sedentary populations. Bedrock mortar milling stations were first established in the Bay Area around 1,300 years ago. Although portable mortars and pestles continued to be used, smaller specimens were preferred. Changes in the size of ground stone tools reflect the dramatic increase in the use of small-seeded plant resources. Olivella and clamshell disc beads, frequently found in burials, appear to have been manufactured at Bay Area sites. Small unmodified obsidian pebbles and large flake blanks were imported almost exclusively from the Napa Valley. There is evidence that, during this period, inhabitants of the Bay Area had well-established trade relations with the Yurok, the Maidu, the Miwok, and several other interior groups. This period has its end in the late 18th century with the arrival of Euroamericans in the Project area.

8.3.3.3 Archaeology and Archaeological Sensitivity of the Project Area

Upland areas near watercourses were favored locations for prehistoric occupation. In the San Francisco Bay Area, the Bay margins are also high sensitivity areas for archaeological resources, due to their proximity to fish and shellfish resources in the Bay. The Project area is of sensitivity for prehistoric archaeological deposits, because this boundary area was a frequent site for villages and temporary camps.

Along the shores of San Francisco Bay, including the Project area, occupation was intermittent and sparse prior to around 5,000 to 7,000 years ago. In addition, evidence for occupation prior to 7,000 years ago was hidden by rising sea levels or buried under sediments caused by natural and man-made Bay marshland infilling along estuary margins.

The first formal archaeological study in the San Francisco Bay Area was conducted by Max Uhle, who, in 1902, excavated a trench into a shell mound site on the eastern shore of the Bay at Emeryville (Site CA-Ala 309). At that time, it was assumed that prehistoric California Indian culture had been primitive and unchanging. Although Uhle found stratigraphic differences in mortuary patterns and artifactural assemblages, other scholars largely ignored the evidence of social complexity and maintained the assumption that no meaningful changes took place during California's prehistory (Uhle, 1907; Kroeber, 1925).

Nels Nelson was the first person to carry out formal archaeological research in the Bay Area. He surveyed the prehistoric shell mounds of the Bay Area and identified more than 400 mounds around the Bay. Some of the largest Nelson sites included Uhle's Emeryville mound (1,000 by 300 feet and 32 feet deep), the Stege mounds (240 by 160 feet and 350 by 250 feet), and the Ellis Landing mound (460 by 245 feet and more than 30 feet deep). Unfortunately, Nelson did not formally record or accurately map these sites and their approximate locations have been inferred from site remnants, topographic indications, and other lines of evidence.

Nelson and other early researchers in the Bay Area believed that there were no important breaks in the cultural record of the Bay Area and no important cultural changes during the area's prehistory. Although Nelson found differences in shellfish species between upper and lower portions of the Ellis Landing mound, which he excavated, he attributed these differences to environmental causes (changes in the environment led to changes in the abundance of different shellfish species). More recent research in the Project area and archaeological excavations, largely conducted to mitigate the impacts of various construction projects, has disproven the theory that prehistoric culture was static in the Project area. Instead, we know that a series of prehistoric cultural developments occurred, as outlined above.

8.3.3.3.1 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 and 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 Site 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.

8.3.3.2 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.

8.3.3.3.3 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, 2006). 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 industries 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.

8.3.3.4 Resources Inventory

The Richmond Refinery was subjected to both an archival literature search at the Northwest Information Center of the California Historical Resources Information System (CHRIS) and a field reconnaissance by ESA archaeologist Dean Martorana (Martorana, 2006) in support of the larger *Chevron Energy and Hydrogen Renewal Project Administrative Draft EIR* (ESA, 2006), of which the CRPPRP is a part. These studies considered potential resources within the entire existing Refinery boundary, and in the case of the literature search, a quarter-mile buffer surrounding the Refinery. In addition, ESA found that fourteen cultural resource investigations have been conducted within the Project area. Most notably LSA (1990) conducted a historic resource evaluation of seven potentially historic properties on the 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 the California Register of Historical Resources. A copy of this report has been provided as Appendix 8.3-B.

In addition, on November 16, 2006 Clint Helton, RPA of CH2M HILL conducted a field reconnaissance and windshield survey of the PPRP components, as part of a guided site visit to the Chevron Richmond Refinery. No historic resources were noted.

Because all of the PPRP Project components fall within these previous study areas, no additional archival research or field survey was undertaken by CH2M HILL for the PPRP. This section summarizes the results of the technical study conducted by ESA (Martorana, 2006), the detailed and comprehensive study conducted by LSA (1990) and the field reconnaissance/windshield survey conducted by Clint Helton, RPA of CH2M HILL. The results of these resource inventories are presented in summary in the sections below.

8.3.3.4.1 Archival Research

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). The City of Richmond's (2006) Historic Register and list of City Landmarks was also consulted. The Project Area was defined as the Chevron Richmond Refinery along with a quarter-mile radius around the facility.

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. LSA (1990) conducted a 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 the California Register of Historical Resources.

Table 8.3-2 describes sites located within 1 mile of the Project. Table 8.3-3 describes the seven refinery facilities previously recorded and evaluated by LSA (1990) within the Chevron Richmond Refinery.

TABLE 8.3-2
Summary of Sites within One Mile of the Project Area of Potential Effects

Site Designation	Type	Description	Effect
CA-CCo-283	Prehistoric	Shellmound	None; outside APE
CA-CCo-506H	Historic	Chinese earthenware; misc. debris	None; outside APE
CA-CCo-765H	Historic	Submerged ship hull	None; outside APE
CA-CCo-276	Prehistoric	Shellmound	None; outside APE
CA-CCo-277	Prehistoric	Shellmound	None; outside APE
CA-CCo-278	Prehistoric	Shellmound	None; outside APE
CA-CCo-281	Prehistoric	Shellmound	None; outside APE
CA-CCo-282	Prehistoric	Shellmound	None; outside APE
CA-CCo-284	Prehistoric	Shellmound	None; outside APE
CA-CCo-423	Prehistoric	Shellmound	None; outside APE

Note:

APE = Area of Potential Effects

TABLE 8.3-3
Summary of Previously Recorded Refinery Facilities within the Chevron Richmond Refinery

Site Designation	Type	NRHP/CRHR Status	Effect
No. 10 Battery	Historic	Not Eligible	None; outside APE
No. 11 Battery	Historic	Not Eligible	None; outside APE
Vapor Recovery Plant	Historic	Not Eligible	None; outside APE
No. 3 Saltwater Station	Historic	Not Eligible	None; outside APE
No. 1 Power Plant	Historic	Not Eligible	None; outside APE
Aromatics Recovery Unit	Historic	Not Eligible	None; outside APE
LPG Boiler House	Historic	Not Eligible	None; outside APE

Notes:

APE = Area of Potential Effect

CRHR = California Register of Historical Resources

NRHP = National Register of Historic Places

Source: LSA 1990

8.3.3.4.2 Field Survey

On November 16, 2006 Clint Helton, RPA of CH2M HILL conducted a field reconnaissance and windshield survey of the PPRP components, as part of a guided site visit to the Chevron Richmond Refinery. CEC cultural resources specialist Dorothy Torres was also in attendance. All of the Project components are located within heavily developed areas of the Refinery with very little to no surface visibility. No archaeological resources, either prehistoric or historic, were noted, and the potential for such resources is considered to be extremely low. Most Project components are located within operational areas of the Refinery providing little or no native habitat or soils that would provide adequate visibility of archaeological materials, if present and intact. No architecturally significant structures were noted within any of the PPRP components. The No. 10 Battery and No. 11 Battery facilities previously recorded are immediately west of the proposed laydown area for the PPRP but they are not significant and fall outside of the area of impact. Similarly, the previously recorded Aromatics Recovery Unit is immediately west of the plant area but is not significant and falls outside the area of impact. Many, if not all, of the facilities in the Refinery have been subject to structural changes from maintenance and upgrading. Moreover, it was noted by Chevron personnel that many of the Project components sit on deep artificial fill.

Most recently 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. ESA's field reconnaissance did not result in the identification of any additional historic resources, including unique archaeological resources (personal communication, January 5, 2007).

8.3.3.4.3 Native American Consultation

ESA contacted the NAHC by letter on October 26, 2005 to request information about traditional cultural properties such as cemeteries and sacred places in the Project area (Marorana, 2006). 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 are known.

The NAHC record search of the Sacred Lands file failed to indicate the presence of Native American cultural resources in the immediate Project area. The record search conducted at the Northwest Information Center of CHRIS also failed to indicate the presence of Native American traditional cultural properties.

8.3.4 Environmental Analysis

This section describes the environmental impacts of the Project's construction and operation.

CH2M HILL considered previous archival research and cultural resource investigation reports, and performed Native American consultation as well as a site visit and field reconnaissance. As a result of these activities, CH2M HILL did not detect within the Project area any significant prehistoric or historic archaeological remains, or any historically or architecturally significant buildings that have the potential to be impacted by the PPRP. No impacts on architectural resources are expected to occur.

In general, Project facilities and equipment would be constructed on disturbed soils within current and previously used process areas within the Refinery. There would be minor demolition activities (for example, pipe supports, concrete slabs) associated with proposed modifications to other Refinery units. These activities, as well as the management and disposal of the wastes from the various construction activities (for example, 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. All construction would take place within the Refinery boundaries. Any required staging, fabrication, or laydown areas would also be within Refinery boundaries, and would not result in significant impacts to adjacent facilities. Temporary construction-related impacts are addressed in Sections 8.1, Air Quality; 8.5, Noise; and 8.9, Traffic and Transportation.

Both the CHRIS literature search and several previous field surveys have failed to identify significant archaeological sites or significant architectural resources. The seven architectural resources that were documented by LSA in 1990 are located outside of the area of potential effect of the PPRP components, and none were evaluated as architecturally significant. Therefore, no impacts to cultural resources are expected to occur.

8.3.4.1 Environmental Checklist

The checklist in Table 8.3-4 is used by the California Energy Commission to assess the significance of potential impacts.

TABLE 8.3-4
California Energy Commission's Environmental Checklist

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

8.3.5 Cumulative Effects

Because the Project will not affect known significant cultural resources, the Project will not likely cause significant cumulative impacts. If construction of the Project or its linear components were to encounter a large, stratified, buried prehistoric archaeological site or discrete filled-in historic period features, the possibility of cumulative impacts would arise because such sites might be highly significant, and many have been destroyed or damaged by commercial/industrial/residential development and agricultural activity in the Project vicinity. Given the low level of impact to such a site that the Project will cause, it is also unlikely that the proposed Project activities will lead to significant cumulative impacts, depending on the extent of Project impact to any such discovered archaeological deposits. Any potential impact to an unknown site would be minimized by a stop-work procedure if a site were uncovered. No impacts on architectural resources are expected to occur.

8.3.6 Mitigation Measures

Although significant archaeological and historical sites were not found during the previous field surveys, it is possible that subsurface construction could encounter buried archaeological remains. For this reason, the Applicant proposes to implement measures to mitigate any potential adverse impacts that could occur if there were an inadvertent discovery of buried cultural resources. These measures include: (1) procedures for halting construction in the event that there is an inadvertent discovery of unknown historical resources, including archaeological resources; and (2) procedures for contacting the Contra Costa County coroner in the event previously unidentified human remains are damaged.

8.3.6.1 Inadvertent Discovery of Unknown Historical Resources, Including Archaeological Resources

In the event that any prehistoric or historic subsurface cultural resources are discovered 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 and professional museum curation, and documented according to current professional standards.

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.

8.3.6.2 Damage to Previously Unidentified Human Remains

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 descendants regarding their recommendations, if applicable, taking into account the possibility of multiple human remains.

8.3.7 Involved Agencies and Agency Contacts

Table 8.3-5 lists the state agencies involved in cultural resources management for the Project and a contact person at each agency. These agencies include the NAHC and, for federal lands, the Office of Historic Preservation.

TABLE 8.3-5
Cultural Resources Agency Contacts

Issue	Contact	Title	Telephone
Native American traditional cultural properties	Debbie Treadway NAHC	Associate Governmental Program Analyst	(916) 653-4082
Federal agency NHPA Section 106 compliance	Milford Wayne Donaldson Office of Historic Preservation	State Historic Preservation Officer	(916) 653-6624

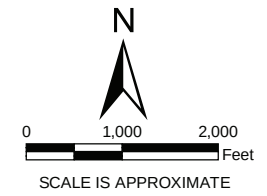
8.3.8 Permits Required and Schedule

Other than certification by the CEC, no state, federal, or local permits are required by the Project for the management of cultural resources. Consultation with the State Historic Preservation Officer (SHPO) and Advisory Council on Historic Preservation (ACHP) would be required under Section 106 of the National Historic Preservation Act if, for example, as the result of a later project change, the Project were to become a federal undertaking and significant cultural resources were likely to be affected by the Project.

8.3.9 References

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LEGEND

-  Plant Area
-  Laydown Area
-  Transmission Line
-  1 Mile Buffer

Note: Project site is located entirely within Ohlone/Costanoan Cultural Area, which covers entire area depicted on this map.



FIGURE 8.3-1 OHLONE/COSTANOAN CULTURAL AREA

CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA

CH2MHILL

8.4 Land Use

This section inventories existing land uses in the vicinity of the proposed site for the Chevron Refinery Power Plant Replacement Project (PPRP, or the Project) Small Power Plant Exemption (SPPE) and discusses the potential land use impacts associated with the proposed Project. The local, state, and federal jurisdictions potentially affecting the proposed Project are identified, as are their respective plans, policies, laws, regulations (including zoning), and potentially sensitive land uses. The conformance of the proposed Project with local plans and regulations, and the compatibility of the proposed Project with land uses in the area, are evaluated. No significant impacts to land use are expected to occur, therefore, no mitigation is necessary.

8.4.1 Introduction

Chevron is proposing the PPRP to add an additional 60 megawatts (MW) net generation to its existing refinery electrical generation located within Chevron's Richmond Refinery in the City of Richmond (see Figure 1.2-1) in Contra Costa County, California. The proposed PPRP will be integrated into Chevron's plans to meet its growing refinery electrical load, and produce steam to replace an existing boiler plant that is approaching its end of life. The PPRP is a subset of the larger Richmond Refinery Renewal Project that is concurrently undergoing California Environmental Quality Act (CEQA) review by the City of Richmond. The California Energy Commission (CEC) has jurisdiction for only the PPRP portion of the Renewal Project that is the subject of this application.

The PPRP will consist of the following components:

- A nominal 43-MW net, natural gas- or liquid petroleum gas (butane)-fired cogeneration train consisting of one combustion turbine generator (CTG), a refinery fuel gas-fired heat recovery steam generator, 13.8-kV switchgear and ancillary equipment.
- Shutdown of the existing No. 1 power plant refinery steam boilers currently providing steam to the Refinery.
- A 17-MW net extraction, condensing steam turbine generator (STG), an associated cooling tower, and 12-kV switchgear installed as part of the new hydrogen production facility (the remainder of the hydrogen plant is under CEQA review as part of the Renewal Project). The new hydrogen plant will be a net generator of steam for both the STG and the refinery steam system.
- Reconductoring of approximately 4,000 feet of existing onsite double-circuit overhead 115-kV transmission line to upgrade its ampacity. The reconductoring will reuse existing transmission line structures.
- Adjacent onsite service connections for fuel, reclaimed water, water, wastewater, steam, and electricity to existing piperacks, with the exception of the reconductoring noted above.

The cogeneration portion of the PPRP (Cogen 3000) will occupy approximately 0.5 acre within an existing 5.2-acre cogeneration facility, and the STG and associated equipment (H₂-STG) will occupy approximately 0.5 acre within a new 7.9-acre hydrogen plant that will

be built as part of the Richmond Refinery Renewal Project. The PPRP will be located well within the heart of the existing 2,900-acre Richmond Refinery. Temporary construction laydown and parking for the PPRP will be provided in various existing laydown areas within the Refinery that are currently used for ongoing maintenance and project laydown. A complete description of the PPRP is provided in Section 2.0.

8.4.2 Laws, Ordinances, Regulations, and Standards

8.4.2.1 Local Land Use Plans and Policies

The Project site is situated within the existing Chevron Richmond Refinery in the City of Richmond, California. The Project area has been the subject of numerous planning studies and plans aimed at establishing guidelines for development along the Richmond shoreline. A brief summary of the applicable land use plans and policy documents and their relevance to the 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. General Plan Land Use Designations for the Refinery and vicinity are shown in Figure 8.4-1.

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 8.4-1). The proposed Project area is classified as *Heavy Industry*. 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 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.

Additionally, the following guideline pertains to the West Shoreline area and would be relevant to the Project:

- **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.

8.4.2.1.1 City of Richmond Zoning Ordinance

The proposed Project site is zoned M-3 (Heavy Industrial) (see Figure 8.4-2: 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 8.4-2) include M-2 (Light Industrial), M-4 (Marine Industrial), and CRR (Community and Regional Recreation District). As illustrated in Figure 8.4-2, zoning districts immediately adjacent to the Refinery include CRR, MFR-1 (Multi-Family Residential), M-4, and PC (Public and Civic Uses).

8.4.2.1.2 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 (Richmond, 2005).

All Refinery property lies within the City of Richmond, except an approximately 320,000-square-foot area (400 feet by 800 feet, 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. Uses may include metalworking, chemical or petroleum product processing and refining, and heavy equipment operation and similar activities” (p. 3-19). The Contra Costa County Zoning Ordinance designates the Chevron Refinery property as *HI*. Chevron has no facilities in this area, nor any plans to construct in this area, which is located within the internal Refinery buffer zone (ESA, 2006).

8.4.2.2 Regional Land Use Plans and Policies

8.4.2.2.1 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. A trail alignment has been proposed along the western shoreline, 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.

8.4.2.2.2 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 (SFBCDC, 2003). Water-related industry is defined as “certain industries requiring a waterfront 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 (SFBCDC, 2003).

8.4.2.2.3 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 Metropolitan Transportation Commission, the East Bay Regional Park District (EBRPD) (EBRPD Master Plan), and the Association of Bay Area

Governments (San Francisco Bay Trail). The Bay Trail Plan also identifies a bicycling trail near the Richmond Refinery.

8.4.2.2.4 East Bay Regional Park District Master Plan

The 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 Master Plan indicates that plans for the Bay Trail may include the shoreline lands of the Refinery.

8.4.2.2.5 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 the following recommendations for future uses of the Peninsula and conceptual plans:

- 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 plans for this property include provision of Class I and Class II recreational trails through the property (ESA, 2006).

8.4.2.3 State Policies

The California Energy Commission has both policy development and permitting responsibilities for thermal generating projects that have a capacity of over 50 MW. Generating facilities such as the proposed Project require CEC approval; however, since the Project is below 100 MW, it may obtain a SPPE from the CEC. The CEC’s siting process has been deemed functionally equivalent to CEQA. The CEC serves as the lead agency and must follow appropriate State of California (State) law and guidelines.

8.4.2.4 Federal Policies

No applicable federal land use policies have been identified for the proposed Project.

8.4.3 Setting

8.4.3.1 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

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).

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 (West County), Central Contra Costa County, and East Contra Costa County. West 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 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 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 County waterfront include the 2,315-acre Point Pinole Regional Shoreline Park, the 295-acre Miller-Knox Regional Shoreline Park, 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.

8.4.3.2 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,

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.

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 percent of its land) for heavy industrial, port, maritime, and light industrial uses (amendments to the General Plan since 1984 have reduced some of this acreage.)

8.4.3.3 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 8.4-1.⁶ The closest residential uses to the Project site consist of multi-family housing situated south of the laydown area, outside of the southern boundary of the Refinery.

TABLE 8.4-1
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)

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 Chapter 4.4, *Biological Resources*.

TABLE 8.4-1
Land Uses Adjacent to and in the Immediate Vicinity of the Refinery

Name	Address	General Land Use Type	Proximity to Refinery
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)

Portions of five residential neighborhoods are located within one mile of the Refinery (see Figure 8.4-3). 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 County Sanitary Landfill, Wildcat Creek, San Pablo Creek, and the Shields-Reid Community Center.

- **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; and 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.

⁷ Atchison Village is listed on the National Register of Historic Places.

- **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.

- **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 Point 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 Fe 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 condominiums); Seacliff Marina (300 residential condominiums); 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.

8.4.3.4 Land Use within the 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, gas, and hydrogen primarily for its own use. Examples of

⁸ The Point Richmond area is listed on the National Register of Historic Places.

existing plants onsite include No. 4 Crude Unit, which distills crude oil; a 99-MW 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.

Within the existing Refinery site, Project related structures would be located adjacent to existing wastewater processing and oil processing areas, the rail yard area, and the boiler and cogeneration area. Project laydown areas would be situated within the existing storage tank fields.

8.4.4 Impacts

In accordance with CEC guidelines, potential impacts to land use, planning, and recreation are summarized below.

8.4.4.1 Environmental Checklist

Table 8.4-2 includes the checklist used by the CEC to assess the significance of potential impacts.

TABLE 8.4-2
CEC Checklist to Assess Potential Impacts

	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant	No Impact
LAND USE AND PLANNING —Would the Project:				
a) Physically divide an established community?				X
b) 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?				X
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?				X

TABLE 8.4-2
CEC Checklist to Assess Potential Impacts

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

8.4.4.2 Discussion of Impacts

8.4.4.2.1 Land Use Impacts

In accordance with the checklist criteria to address potential impacts to land use, the proposed Project will not have a significant impact to land use. The proposed Project is an allowable use within the existing land use designations and zoning districts prescribed by the jurisdictions affected by the Project. The Project would be compatible with existing, surrounding land uses, which predominantly consist of commercial and industrial uses. The Project would not divide an established community. No habitat conservation plan (HCP) applies at the Project site or nearby area.

The proposed Project would include the replacement and addition of certain electric generation facilities to improve the Refinery's ability to supply its own electrical demand. The proposed Project would not expand the Refinery's perimeter boundary, and would maintain the existing buffer between existing areas of operation and the Refinery's eastern and southern boundaries.

Construction

In general Project facilities and equipment would be constructed on disturbed soils within current and previously used areas within the Refinery. All construction would take place within the Refinery boundaries. Any required staging, fabrication, or laydown areas would also be within Refinery boundaries, and would not result in significant impacts to adjacent land uses. Temporary construction related impacts are addressed in Sections 8.1, Air Quality; 8.5, Noise; and 8.9, Traffic and Transportation.

Operation

The Project would not include any new uses that would physically divide an established community. Any potential land use conflict within the Refinery, or between the proposed Project and the surrounding community, would be less than significant.

Although the Project would intensify operational uses at the Refinery, it would not present a land use conflict outside of or within the Refinery. 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 in the Project vicinity. With the exception of the Point Richmond residential community, the Refinery is buffered by industrial, recreational, and institutional uses, including a landfill and a railroad yard. The Point Richmond area is located south of the Project site, and is separated by roadways and other Refinery uses from the Project.

The Project would be located in an area designated by the General Plan as *Heavy Industry*, and by the Zoning Ordinance as M-3 *Heavy Industrial*. The proposed Project would, therefore, be consistent with both the General Plan land use designation and the Zoning. The Project would also conform to the San Francisco Bay Plan water-related industry priority use designation, and Contra Costa County's General Plan and Zoning designations.

The proposed Project complements an historic land use begun in 1901, and would be built within existing Chevron operations.

There are no 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.

8.4.4.2.2 Recreation Impacts

The proposed Project will not have an impact to recreational uses. The Project would not include any new residential or commercial development that would contribute to increased use of open space resources in the Project area. Therefore, no recreational areas would be affected such that increased demand would contribute to the deterioration of a recreational resource. The proposed Project does not involve a recreational project that could have an adverse physical effect on the environment.

8.4.4.3 Cumulative Impacts

The proposed Project is part of a larger Renewal Project that would intensify the use of land onsite that is developed for Refinery-related operations. As part of the Conditional Use Permit (CUP) approval for the larger Renewal Project, the Planning Commission may impose additional conditions requiring that the Renewal Project comply with the applicable Commercial and Industrial provisions in Section 15.04.820 of the Zoning Ordinance.

Further, the Design Review Board may impose conditions requiring that the Renewal Project comply with Performance Standards in Section 15.04.840 of the Zoning Ordinance related to screening of mechanical equipment, landscaping, and buffering the facilities onsite 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 minimize both Project specific and cumulative impacts associated with potential land use conflicts.

Further, the Project would be within the scope of development of the Richmond General Plan and would not make a cumulatively considerable contribution to future cumulative development within the city. For these reasons, the cumulative impacts of the proposed

Project in relationship to existing land uses onsite and in the proposed Project vicinity would be less than significant.

8.4.5 Involved Agencies and Agency Contacts

Table 8.4-3 provides a list of interested agencies and agency contacts.

TABLE 8.4-3
List of Agency Contacts for the Proposed Project

Agency	Name/Title	Phone Number and Address
City of Richmond Planning Department	Richard Mitchell/Director of Planning and Building	(510) 620-6706 1401 Marina Way South Richmond, CA 94804
Bay Conservation and Development Commission	Andrea Guat/Principal Permit Analyst	(415) 352-3618 50 California Street, Suite 2600 San Francisco, CA 94111

8.4.6 References

City of Richmond. 2005. City of Richmond website: <http://ca-richmond.civicplus.com>

Contra Costa County. 2005. *Contra Costa County General Plan: 2005-2020*. January.

Environmental Science Associates (ESA). 2006. *Chevron Energy and Hydrogen Renewal Project Administrative Draft EIR* (State Clearinghouse No. 2005072117). Prepared for City of Richmond, CA October.

San Francisco Bay Conservation and Development Commission (SFBCDC). 2003. *San Francisco Bay Plan*.



- Refinery Boundary
 - General Plan Designation
 - Transmission Line
 - Plant Area
 - Laydown Area
-
- 901 - Heavy Industry
 - 906 - Port/Marine Terminal/Ship Repair
 - 908 - Recreation Lands
 - 910 - Water Related Commerce and Commercial Recreation
 - 917 - Low Density Residential
 - 918 - Medium Density Residential
 - 919 - Light Industry
 - 922 - General Commercial
 - 922A - Neighborhood Retail
 - 931 - City Center

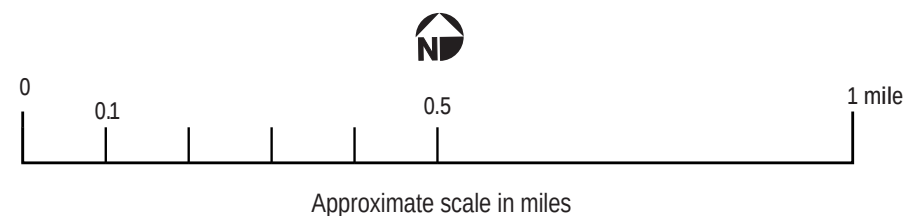
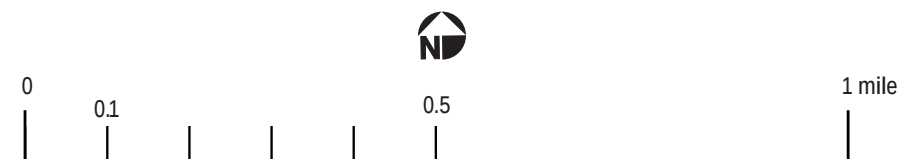


FIGURE 8.4-1
GENERAL PLAN LAND USE DESIGNATIONS:
REFINERY AND VICINITY
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA

SOURCE: Chevron, 2005



- Refinery Boundary
 - 906 General Plan Designation
 - Transmission Line
 - Plant Area
 - Laydown Area
- M-2 - Light Industrial
 M-3 - Heavy Industrial
 M-4 - Marine Industrial
 PC - Public and Civic Uses
 CRR - Community and Regional Recreation District
 MFR-1 - Multi-Family Residential
 SFR-2 - Single-Family-Very Low Density Residential
 C-1 - Neighborhood Commercial
 C-2 - General Commercial



SOURCE: Chevron, 2005

Approximate scale in miles

FIGURE 8.4-2
ZONING DISTRICTS
REFINERY AND VICINITY
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA



- Refinery Boundary
- Transmission Line
- Internal Refinery Buffer Area
- Plant Area
- Laydown Area

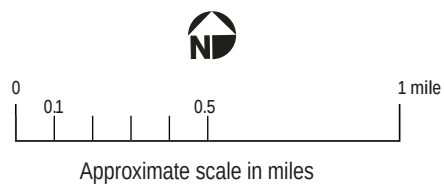


FIGURE 8.4-3
CHEVRON REFINERY FUNCTIONAL LAND USE
AND RICHMOND NEIGHBORHOODS MAP
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA

SOURCE: ESA, 2005

8.5 Noise

This section presents an evaluation of potential noise effects related to the operation of the proposed Chevron Richmond Refinery Power Plant Replacement Project (PPRP, or the Project) at the Richmond Refinery in Richmond, California.

Noise is defined as unwanted sound. Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. There are several different ways to measure noise, depending on the source of the noise, the receiver, and the reason for the noise measurement. Technical noise terms used in this section are summarized in Table 8.5-1.

TABLE 8.5-1
Definitions of Acoustical Terms

Term	Definitions
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	Noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, time of occurrence, and tonal or informational content as well as the prevailing ambient noise level.
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the sound pressure to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
A-Weighted Sound Level (dBA)	The sound pressure level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighted filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted.
Equivalent Noise Level (L_{eq})	The average A-weighted noise level during the measurement period.
Percentile Noise Level (L_n)	The noise level exceeded during n percent of the measurement period, where n is a number between 0 and 100 (e.g., L_{90}).
Community Noise Equivalent Level (CNEL)	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels to sound levels occurring between 7:00 p.m. and 10:00 p.m. and 10 decibels to sound levels between 10:00 p.m. and 7:00 a.m.
Day-Night Noise Level (L_{dn} or DNL)	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to sound levels occurring from 10:00 p.m. to 7:00 a.m.

In this section, some statistical noise levels are stated in terms of decibels on the A-weighted scale (dBA). Noise levels stated in terms of dBA reflect the response of the human ear by filtering out some of the noise in the low and high frequency ranges that the human ear does not detect well. The A-weighted scale is used in most ordinances and standards. The equivalent sound pressure level (L_{eq}) is defined as the average noise level, on an energy basis, for a stated period (e.g., hourly).

In practice, the level of a sound source is conveniently measured using a sound level meter that includes an electrical filter corresponding to the A-weighted curve. The sound level meter

also performs the calculations required to determine the L_{eq} for the measurement period. The statistical descriptors, L_n , relate to the noise level distribution over the measurement period. For example, the L_{90} is the noise level that is exceeded during 90 percent of the measurement period. Similarly, the L_{10} represents the noise level exceeded for 10 percent of the measurement period.

To account for human sensitivity to nighttime noise levels, the Community Noise Equivalent Level (CNEL) was developed. CNEL is a noise index that accounts for the greater annoyance of noise during the evening and nighttime hours. CNEL values are calculated by averaging hourly L_{eq} sound levels for a 24-hour period, and applying penalties to evening and nighttime L_{eq} values. The penalties, which reflect the increased sensitivity to noise during evening and nighttime hours, are added to each hourly L_{eq} sound level before the 24-hour CNEL is calculated. For the purposes of assessing noise with the CNEL metric, the 24-hour day is divided into three time periods, with the following penalties:

- Daytime: 7 a.m. - 7 p.m.; no penalty
- Evening: 7 p.m. - 10 p.m.; penalty of 5 dBA
- Nighttime: 10 p.m. - 7 a.m.; penalty of 10 dBA

The Day-Night Sound Level (L_{dn} or DNL) differs from the CNEL in that it divides the day into only two periods, with the following penalties:

- Daytime: 7 a.m. - 10 p.m.; no penalty
- Nighttime: 10 p.m. - 7 a.m.; penalty of 10 dBA

Generally, there is very little difference between the CNEL and L_{dn} metrics.

The effects of noise on people can be listed in three general categories:

- Subjective effects of annoyance, nuisance, and dissatisfaction
- Interference with activities such as speech, sleep, and learning
- Physiological effects such as startling and hearing loss

In most cases, environmental noise produces effects in the first two categories only. However, workers in industrial plants typically experience noise effects in the last category. No completely satisfactory way exists to measure the subjective effects of noise, or to measure the corresponding reactions of annoyance and dissatisfaction. This lack of a common standard is primarily due to the wide variation in individual thresholds of annoyance and habituation to noise.

Table 8.5-2 shows the relative A-weighted noise levels of common sounds measured in the environment and in industry for various sound levels (Beranek, 1988).

TABLE 8.5-2
Typical Sound Levels Measured in the Environment and Industry

Noise Source At a Given Distance	A-Weighted Sound Level (dBA)	Noise Environments	Subjective Impression
Shotgun	140	Carrier Flight Deck	
Civil Defense Siren (100 ft)	130		
Jet Takeoff (200 ft)	120		Threshold of Pain
Loud Rock Music	110	Rock Music Concert	
Pile Driver (50 ft)	100		Very Loud
Ambulance Siren (100 ft)			
	90	Boiler Room	
Freight Cars (50 ft)		Printing Press Plant	
Pneumatic Drill (50 ft) Freeway (100 ft)	80	Noisy Restaurant	
Busy Traffic; Hair Dryer	70		Moderately Loud
Normal Conversation (5 ft)	60	Data Processing Center	
Air Conditioning Unit (100 ft)		Department Store	
Light Traffic (100 ft); Rainfall	50	Private Business Office	
Large Transformer (200 ft)			
Bird Calls (distant)	40	Average Living Room Library	Quiet
Soft Whisper (5 ft); Rustling Leaves	30	Quiet Bedroom	
	20	Recording Studio	
Normal Breathing	10		
	0		Threshold of Hearing

Source: Beranek 1988

8.5.1 Introduction

Chevron is proposing the PPRP to add an additional 60 megawatts (MW) net generation to its existing refinery electrical generation located within Chevron's Richmond Refinery in the City of Richmond (see Figure 1.2-1) in Contra Costa County, California. The proposed PPRP will be integrated into Chevron's plans to meet its growing refinery electrical load, and produce steam to replace an existing boiler plant that is approaching its end of life. The PPRP is a subset of the larger Richmond Refinery Renewal Project that is concurrently undergoing California Environmental Quality Act (CEQA) review by the City of Richmond. The California Energy Commission (CEC) has jurisdiction for only the PPRP portion of the Renewal Project that is the subject of this application.

The PPRP will consist of the following components:

- A nominal 43-MW net, natural gas- or liquid petroleum gas (butane)-fired cogeneration train consisting of one combustion turbine generator (CTG), a refinery fuel gas-fired heat recovery steam generator, 13.8-kV switchgear and ancillary equipment.
- Shutdown of the existing No. 1 power plant refinery steam boilers currently providing steam to the Refinery.
- A 17-MW net extraction, condensing steam turbine generator (STG), an associated cooling tower, and 12-kV switchgear installed as part of the new hydrogen production facility (the remainder of the hydrogen plant is under CEQA review as part of the Renewal Project). The new hydrogen plant will be a net generator of steam for both the STG and the refinery steam system.
- Reconductoring of approximately 4,000 feet of existing onsite double-circuit overhead 115-kV transmission line to upgrade its ampacity. The reconductoring will reuse existing transmission line structures.
- Adjacent onsite service connections for fuel, reclaimed water, water, wastewater, steam, and electricity to existing piperacks, with the exception of the reconductoring noted above.

The Cogen 3000 portion of the PPRP will occupy approximately 0.5 acre within an existing 5.2-acre cogeneration facility, and the STG and associated equipment (H₂-STG) will occupy approximately 0.5 acre within a new 7.9-acre hydrogen plant that will be built as part of the Richmond Refinery Renewal Project. The PPRP will be located well within the heart of the existing 2,900-acre Richmond Refinery. Temporary construction laydown and parking for the PPRP will be provided in various existing laydown areas within the Refinery that are currently used for ongoing maintenance and project laydown. A complete description of the PPRP is provided in Section 2.0.

8.5.2 Affected Environment

The Project is located within the Chevron Richmond 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; industrial developments including the Santa Fe Intermodal Facility and railyards 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 Santa Fe. To the south is the Point Richmond neighborhood. Generally, the nearest residences are approximately 2,500 feet or farther from the nearest proposed Project feature.

Sources of environmental noise in the vicinity of the Project site include existing Refinery operations, local and highway traffic, and Union Pacific Railroad operations.

8.5.2.1 Noise Survey

Existing noise levels were measured at three locations designated as M1, M2 and M3 on Figure 8.5-1 (figures are located at the end of the section) by Environmental Science Associates in September 2005. Table 8.5-3 describes the noise monitoring locations, their distances to the proposed Project site and the L_{dn} at each monitoring location.

Appendix 8.5-A presents the detailed noise monitoring data that was transmitted to CH2M HILL by the City of Richmond's EIR contractor, Environmental Science Associates (ESA). This report presents a histogram of the 691,200 samples that were recorded over the 24-hour monitoring periods (8 samples per second). The lowest value reported in any of the three data files was 43 dBA (file C-2671.txt). This occurred for less than 73 minutes of the 24-hour measurement period (34,826 of the 691,200 samples). The $L_{99.9}$ at this location was 43 dBA and the L_{50} was 46 dBA. Since a direct correspondence between these data and the monitoring locations was unavailable, it was conservatively assumed that the lower, 43 dBA level would be considered the representative background noise level throughout the Project area.

TABLE 8.5-3
Noise Monitoring Locations

Monitoring Location Map ID*	Location	Land Use	Approximate Distance to PPRP (feet)	L_{dn}
M1	Near corner of Tewksbury Avenue and Marie Street	Residential	2,500	72
M2	At the northeast corner of the reclamation area, near Gertrude Street	Industrial	2,600	59
M3	Along the eastern property line of the Refinery next to Castro Street and just south of the General Chemical Plant	Industrial	2,600	67

Source: Environmental Science Associates, 2005

* See Figure 8.5-1.

L_{dn} = Day-Night Noise Level, in dBA

The distances presented in Table 8.5-3 represent the distances from the monitoring locations to the closest PPRP feature. 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 Shields-Reid residential neighborhood is located approximately 1,000 feet to the east of monitoring location M2. The residential communities of Atchison Village and Iron Triangle are located to the east of Richmond Parkway, approximately 1,000 feet to the east of monitoring location M3.

8.5.3 Environmental Consequences

8.5.3.1 Environmental Checklist

The following CEQA checklist shown in Table 8.5-4 is used by the CEC in its assessment of potential noise impacts.

TABLE 8.5-4
CEQA Checklist Used by CEC to Assess Noise Impacts

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
NOISE – Would the Project result in:				
a) Exposure of person 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?			X	
b) Exposure of persons to or generation of excessive ground-borne vibration noise levels?				X
c) A substantial permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project?			X	
d) A substantial temporary or periodic increase in ambient noise levels in the Project vicinity above levels existing without the Project?			X	
e) Exposure of residents or people working in the area to excessive noise levels (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 use airport)?				X
f) Exposure of residents or people working in the area to excessive noise levels (for a project within the vicinity of a private air strip)?				X

8.5.3.2 Discussion of Impacts

Operational Impacts

A noise model of the PPRP was developed using source input levels derived from manufacturers' data and field surveys of similar equipment. The noise model divides the proposed facility into a list of individual point and area noise sources representing each piece of equipment that produces a significant amount of noise. Using these standard power levels as a basis, the model calculates the sound pressure level that would occur at each receptor from each source after losses from distance, air absorption, and blockages are considered. The sum of all these individual levels is the total plant noise level at the modeling point. The sound propagation factors used in the model were adopted from International Standards Organization (ISO) 9613-2 *Acoustics - Sound Attenuation During Propagation Outdoors* (ISO 1989).

The sound power levels, by octave band, used in the model are summarized in Table 8.5-5.

TABLE 8.5-5
Octave Band Sound Power Levels Used to Model PPRP Operations, dB (Flat)

Plant Component	Octave Band Center Frequency, Hz									dBA
	31.5	63	125	250	500	1k	2k	4k	8k	
Combustion Turbine Generator	113	113	110	110	102	99	98	97	91	107
Heat Recovery Steam Generator (HRSG)	122	117	111	106	100	82	74	66	50	102
HRSG Stack	115	115	111	114	110	96	84	75	65	110
H ₂ Steam Turbine	113	113	109	108	107	103	102	99	98	110
Transformers	98	98	100	93	91	89	85	81	75	94
Cogen Gas Compressor	105	107	111	106	108	105	101	99	97	110
Boiler Feed Water Pump	97	103	101	100	99	98	97	96	92	104
Circulation Water Pump	106	109	107	104	101	106	104	96	87	110
Chiller	96	86	92	83	91	89	70	59	41	92
H ₂ Cooling Tower	N/A	107	108	106	100	92	89	86	84	102

Table 8.5-6 summarizes the predicted steady-state plant noise levels at the noise monitoring locations depicted in Figure 8.5-1. The maximum steady-state noise level at any existing residence is not predicted to exceed 46 dBA instantaneous or 52 L_{dn}. Monitoring location M2 is closer (approximately 1,000 feet closer) to the proposed Project than the residences in that area, which are located on the opposite side of the railroad tracks.

TABLE 8.5-6
Predicted PPRP-generated Noise Levels (dBA)

Map Identifier*	Predicted L _{dn} Sound Pressure Level	Predicted Instantaneous Sound Pressure Level
M1	52	46
M2	54	48
M3	46	40

Note:

* See Figure 8.5-1.

Adding the maximum predicted Project noise level at a residence of 46 dBA to the existing level of 43 dBA results in 48 dBA. This represents a 5 dBA increase over the existing level, which is considered a less than significant increase according to CEC guidelines. The resulting level is also less than the 50 dBA nighttime level referenced in the City of Richmond's Noise Ordinance (discussed in Section 8.5.5).

Tonal Noise

Power plants have several components that can produce tones. As a general rule, modern packaged power plants, even those without significant noise controls, do not produce discrete tones that are prominent or noticeable at typical residential distances. At the monitoring locations modeled here no significant tones are anticipated.

That is not to say that the generation of audible tones is impossible — certain sources within the plant such as the combustion turbine inlets, transformers, pump motors, and cooling tower fan gearboxes have been known to produce significant tones. It is the Applicant's intention to anticipate the potential for audible tones in the design and specification of the plant's equipment and take necessary steps to prevent sources from emitting tones that might be disturbing at the nearest receptors.

Ground and Airborne Vibration

Ground- and airborne-induced vibration from operation of the proposed Project will not affect the local area. The proposed Project is primarily driven by gas turbines exhausting into a Heat Recovery Steam Generator (HRSG) duct. These very large ducts greatly reduce low frequency noise, which is mainly the source of airborne-induced vibration of structures.

The equipment that would be used in the proposed Project is well balanced and is designed to produce very low vibration levels throughout the life of the proposed Project. An imbalance could contribute to ground vibration levels in the vicinity of the equipment. However, vibration-monitoring systems installed in the equipment are designed to ensure that the equipment remains balanced. Should an imbalance occur, the event would be detected and the equipment would automatically shut down.

Construction Impacts

Construction of the power facility is expected to be typical of other comparable power plants in terms of schedule, equipment used, and other types of activities. The noise level will vary during the construction period, depending upon the construction phase.

The Federal Highway Administration's (FHWA's) Roadway Construction Noise Model (RCNM; FHWA 2006) represents the most complete and current assessment of noise from heavy equipment operation. This data set was developed from the Central Artery/Tunnel (otherwise known as "the Big Dig") project in Boston, Massachusetts, which began in the early 1990s and is the largest urban construction project ever conducted in the United States. The equipment evaluated in the RCNM is similar to that expected to be used to construct this Project. The RCNM database of measured noise levels at 50 feet and the predicted level at 2,500 feet are presented in Table 8.5-7. These predictions are conservative since the only attenuating mechanism considered was divergence of the sound waves in open air (6 dB reduction per doubling of distance).

Mitigation measures will be developed for pile-driving to reduce noise impacts on sensitive receptors.

TABLE 8.5-7
Summary of Construction Equipment Noise Levels (dBA)

Equipment	Impact Device	Measured L _{max} (50 ft)	Predicted L _{max} (2,500 ft)
Auger Drill Rig	No	84	51
Backhoe	No	78	45
Boring Jack Power Unit	No	83	50
Clam Shovel (dropping)	Yes	87	54
Compactor (ground)	No	83	50
Compressor (air)	No	78	45
Concrete Mixer Truck	No	79	46
Concrete Pump Truck	No	81	48
Concrete Saw	No	90	57
Crane	No	81	48
Dozer	No	82	49
Drill Rig Truck	No	79	46
Drum Mixer	No	80	47
Dump Truck	No	76	43
Excavator	No	81	48
Flat Bed Truck	No	74	41
Front End Loader	No	79	46
Generator	No	81	48
Generator (<25 kVA, VMS signs)	No	73	40
Gradall	No	83	50
Grapple (on backhoe)	No	87	54
Horizontal Boring Hydr. Jack	No	82	49
Impact Pile Driver	Yes	101	68
Jackhammer	Yes	89	56
Man Lift	No	75	42
Mounted Impact Hammer (hoe ram)	Yes	90	57
Pavement Scarifier	No	90	57
Paver	No	77	44
Pickup Truck	No	75	42
Pneumatic Tools	No	85	52
Pumps	No	81	48
Rivet Buster/chipping gun	Yes	79	46
Rock Drill	No	81	48
Roller	No	80	47
Scraper	No	85	52

TABLE 8.5-7
Summary of Construction Equipment Noise Levels (dBA)

Equipment	Impact Device	Measured $L_{\max}$ (50 ft)	Predicted $L_{\max}$ (2,500 ft)
Shears (on backhoe)	No	96	63
Slurry Plant	No	78	45
Slurry Trenching Machine	No	80	47
Vacuum Excavator (Vac-truck)	No	85	52
Vacuum Street Sweeper	No	82	49
Vibrating Hopper	No	87	54
Vibratory Concrete Mixer	No	80	47
Vibratory Pile Driver	No	101	68
Welder / Torch	No	74	41

Note:

$L_{\max}$ = Maximum A-weighted Sound Level

Construction activities will be conducted in accordance with the City of Richmond's requirements and will be of limited duration.

Steam blows are anticipated to be silenced to a level of 90 dBA at 50 feet (57 dBA at 2,500 feet) and be limited to daytime hours.

Noise generated during the testing and commissioning phase of the Project is not expected to be substantially different from that produced during normal full-load operation. Starts and abrupt stops are more frequent during this period, but on the whole, they are usually short-lived.

8.5.4 Cumulative Impacts

This power generation facility is proposed as part of a larger Refinery modification that is being analyzed by the City of Richmond. Accordingly, noise generated by the proposed Refinery modifications (including this power facility) would be less than 60 dBA at the residential receptors. Because the PPRP is expected to be less than 48 dBA at the closest monitoring location (which is approximately 1,000 feet closer to the Project than the nearest residential receptor), it will not significantly contribute to the overall facilities noise levels.

8.5.5 Mitigation

The following mitigation measures are anticipated to be included in the Project:

Noise Mitigation Measure #1: The Project owner shall establish a telephone number for use by the public to report any significant undesirable noise conditions associated with the construction and operation of the Project. If the telephone is not staffed 24 hours per day, the Project owner shall include an automatic answering feature, with date and time stamp recording, to answer calls when the phone is unattended. This telephone number shall be posted at the Project site during construction in a manner visible to passersby. This telephone number shall be maintained until the Project has been operational for at least one year.

Noise Mitigation Measure #2: Throughout the construction and operation of the Project, the Project owner shall document, investigate, evaluate, and attempt to resolve all legitimate Project-related noise complaints.

The Project owner or authorized agent shall:

- Use the Noise Complaint Resolution Form typically suggested by CEC, or functionally equivalent procedure, to document and respond to each noise complaint
- Attempt to contact the person(s) making the noise complaint within 24 hours
- Conduct an investigation to determine the source of noise related to the complaint
- If the noise complaint is legitimate, take all feasible measures to reduce the noise at its source

Noise Mitigation Measure #3: 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.

8.5.6 Laws, Ordinances, Regulations, and Standards

The following are the applicable laws, ordinances, regulations, and standards (LORS) that apply to noise generated by the PPRP.

8.5.6.1 Federal

The federal government has no standards or regulations applicable to offsite noise levels from the Project.

Onsite noise levels are regulated, in a sense, through the Occupational Health and Safety Act of 1970 (OSHA). The noise exposure level of workers is regulated at 90 dBA over an 8-hour work shift to protect hearing (29 Code of Federal Regulations [CFR] 1910.95). Areas above 85 dBA will be posted as high noise level areas and hearing protection will be required. The Project will implement a hearing conservation program for applicable employees.

8.5.6.2 State

Two state laws apply to the Project that address occupational noise exposure and vehicle noise. The California Department of Industrial Relations, Division of Occupational Safety and Health enforces California Occupational Safety and Health Administration (Cal-OSHA) regulations, which are the same as the federal OSHA regulations described above. The regulations are contained in 8 California Code of Regulations (CCR), General Industrial Safety Orders, Article 105, Control of Noise Exposure, Sections 5095, et seq.

Noise limits for highway vehicles are regulated under the California Vehicle Code, Sections 23130 and 23130.5. The limits are enforceable on the highways by the California Highway Patrol and the County Sheriff's Office.

8.5.6.3 Local

The California State Planning Law (California Government Code Section 65302) requires that all cities, counties, and entities (such as multi-city port authorities) prepare and adopt a General Plan to guide community change. City General Plan contains noise provisions.

City of Richmond

The City of Richmond's Noise Element of the City's General Plan (City of Richmond 1994) contains goals and policies to reduce or eliminate the effects of excessive noise in the community. Goals and policies applicable to the Proposed Project include:

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 that 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 (Table 8.5-8). The compatibility guidelines recognize that some land uses are more sensitive to ambient noise levels than others. For Residential uses, the most sensitive land use, a noise environment of L_{dn} 60 dBA or less is considered "normally acceptable," while a noise environment between L_{dn} 60 and 70 dBA is considered "conditionally acceptable," a L_{dn} of 70 to 75 dBA is considered "normally unacceptable," and a L_{dn} of 75 dBA and above is considered "normally unacceptable."

The City of Richmond also regulates exterior noise levels through their Community Noise Ordinance (Chapter 9.52.100 of the Richmond Municipal Code). Table 8.5-9 presents the maximum allowable exterior noise levels specified in the Noise Ordinance. 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.

TABLE 8.5-8
City of Richmond's Land Use Compatibility Guidelines

Land Use Category	Community Noise Exp. Ldn or CNEL dB						Interpretation
	55	60	65	70	75	80	
Residential, low-density, single family duplex, mobile homes							Normally Acceptable Specific land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise requirements.
Residential multi-family							Conditionally Acceptable New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements has been made and needed noise insulation features have been included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
Transient lodging—motels, hotels							Normally Unacceptable 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 necessary noise insulation features must be included in the design.
Schools, libraries, churches, hospitals, nursing homes							
Auditoriums, concert halls, amphitheaters							
Sports arenas, outdoor spectator sports							
Playgrounds, neighborhood parks							
Golf courses, riding stables, water recreation, cemeteries							
Office buildings, business commercial and professional							
Industrial, manufacturing utilities, agriculture							

The standard limits described in Table 8.5-9 are to 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.

TABLE 8.5-9
Maximum Allowable Exterior Noise Standards for Specified Land Uses, dBA

Zoning District	Level, in dBA, Not to be Exceeded More Than 30 Minutes in Any Hour		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.
Single Family Residential	60	--	--
Multi Family Residential	65	--	--
Commercial	70	60	50 or ambient noise level
Light Industrial and Office	70	60	50 or ambient noise level
Heavy and Marine Industrial	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

Source: Section 9.52.100 of the Community Noise Ordinance, Richmond Municipal Code.

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 between 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 that results in a noise disturbance. 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 8.5-10.

TABLE 8.5-10
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

Source: Section 9.52.110 of the Community Noise Ordinance, Richmond Municipal Code

A summary of these various LORS is presented in Table 8.5-11.

TABLE 8.5-11
Laws, Ordinances, Regulations, and Standards Applicable to Noise

LORS	Applicability	Conformance (Sec. No.)
Federal—Offsite U.S. Environmental Protection Agency (USEPA)	No applicable LORS.	Not Applicable
Federal—Onsite OSHA	Exposure of workers over 8-hour shift limited to 90 dBA.	PPRP will comply (Section 8.5.5.1)
State—Onsite Cal-OSHA 8 CCR Article 105, Sections 5095 et seq.	Exposure of workers over 8-hour shift limited to 90 dBA.	PPRP will comply (Section 8.5.5.2)
State—Offsite California Vehicle Code Sections 23130 and 23130.5	Regulates vehicle noise limits on California highways.	Delivery trucks and other vehicles will meet Code requirements.
Local California Government Code Section 65302	Requires local government to prepare plans that contain noise provisions.	City of Richmond conforms
City of Richmond General Plan	Establishes permissible outdoor noise levels based on receiving land use.	PPRP will comply (Section 8.5.5.3)
City of Richmond Ordinance	Establishes permissible outdoor noise levels based on receiving land use, time of day and type of source (operational/construction).	PPRP will comply (Section 8.5.5.3)

8.5.7 Permits Required

No noise permits are required.

8.5.8 Involved Agencies and Agency Contacts

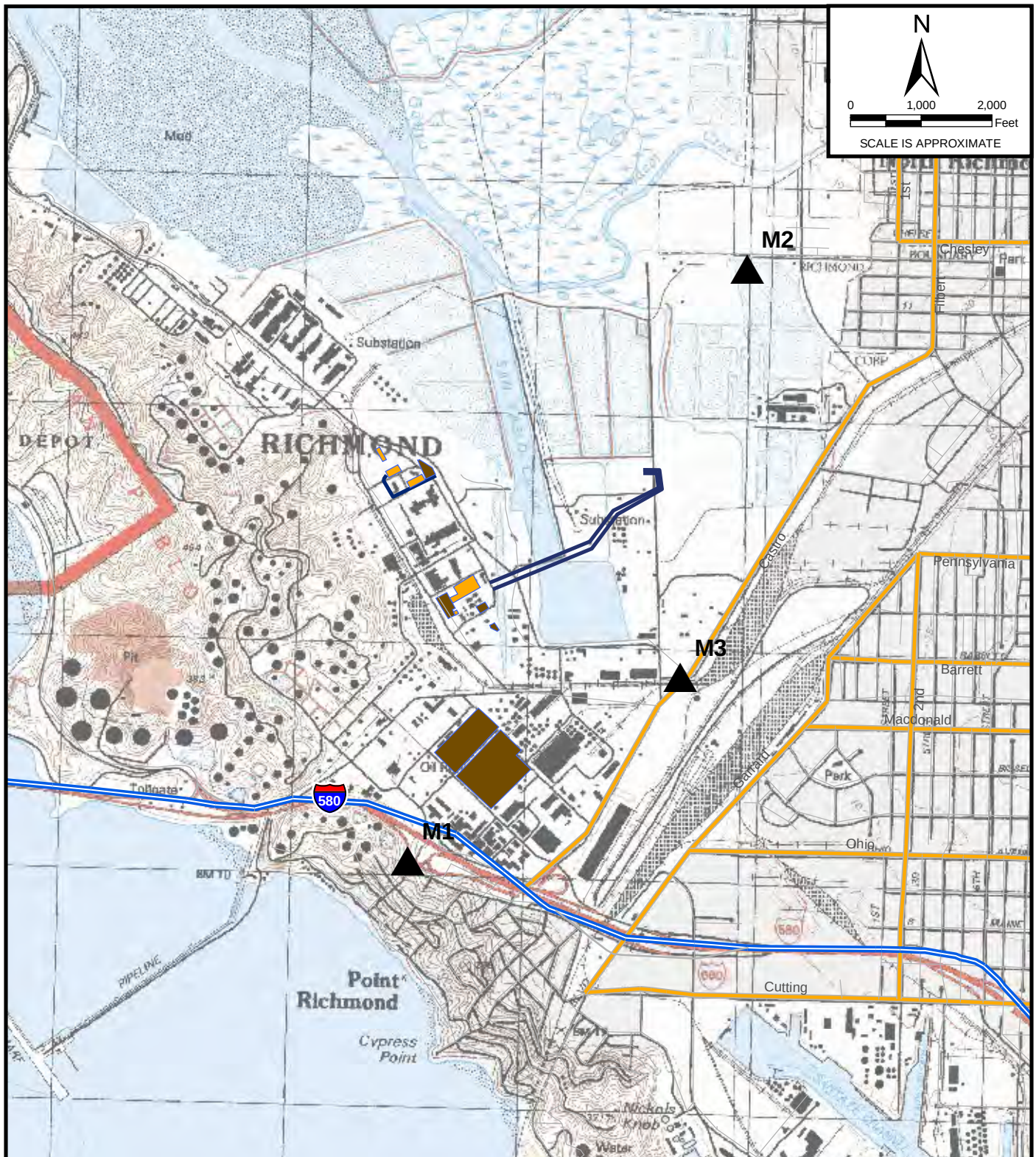
Table 8.5-12 provides a list of interested agencies and agency contacts.

TABLE 8.5-12
List of Agency Contacts for the Proposed Project

Agency	Name/Title	Phone Number and Address
City of Richmond Planning Department	Richard Mitchell/Director of Planning and Building	(510) 620-6706 1401 Marina Way South Richmond, CA 94804

8.5.9 References

- Barnes, J. D., L. N. Miller, and E. W. Wood. 1976. *Prediction of Noise from Power Plant Construction*. Bolt Beranek and Newman, Inc., Cambridge, Massachusetts. Prepared for Empire State Electric Energy Research Corporation, Schenectady, New York.
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- Federal Highway Administration (FHWA). 2006. *FHWA Roadway Construction Noise Model, Version 1.0 User's Guide*. U.S. Department of Transportation. January.
- Federal Transit Administration (FTA). 2006. *Transit Noise and Vibration Impact Assessment*, May 2006.
- International Standards Organization (ISO). 1989. *Acoustics-Attenuation of Sound During Propagation Outdoors, Part 2, A General Method of Calculation*. ISO 9613-2, Geneva.
- Miller, N., E. W. Wood, R. M. Hoover, and A. R. Thompson, Anthony R. 1984. *Electric Power Plant Environmental Noise Guide*, 2nd Edition, Edison Electric Institute, New York.
- Miller, L. N., E. W. Wood, R. M. Hoover, A. R. Thompson, S. L. Thompson, and S. L. Paterson. 1978. *Electric Power Plant Environmental Noise Guide*, Vol. 1. Bolt Beranek & Newman, Inc. Cambridge, MA. Prepared for the Edison Electric Institute, New York, NY.
- U.S. Environmental Protection Agency (USEPA). 1971. *Noise from Construction Equipment and Operations, US Building Equipment, and Home Appliances*. Prepared by Bolt Beranek and Newman for USEPA Office of Noise Abatement and Control, Washington, DC.



LEGEND

-  Plant Area
-  Laydown Area
-  Transmission Line
-  Noise Monitoring Location



FIGURE 8.5-1
NOISE MONITORING LOCATIONS
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA

CH2MHILL

8.6 Public Health

This section presents the methodology and results of the human health risk assessment (HHRA) performed to assess the potential impacts and public exposure associated with airborne emissions from the routine operation of the proposed Chevron Richmond Refinery Power Plant Replacement Project (PPRP, or the Project). Section 8.6.1 presents a summary description of the proposed Project. Section 8.6.2 describes the affected environment, Section 8.6.3 lists the applicable laws, ordinances, regulations, and standards (LORS); and Section 8.6.4 provides an analysis of construction and operational impacts of the power plant and associated facilities. Section 8.6.5 discusses compliance with LORS applicable to the Project. Section 8.6.6 identifies the mitigation measures. Section 8.6.7 discusses the cumulative impacts, and Section 8.6.8 presents the references cited in preparing this section.

8.6.1 Introduction

Chevron (“the Applicant”) is proposing the PPRP to add an additional 60 megawatts (MW) net generation to its existing refinery electrical generation located within Chevron’s Richmond Refinery in the City of Richmond (see Figure 1.2-1) in Contra Costa County, California. The proposed PPRP will be integrated into Chevron’s plans to meet its growing refinery electrical load, and produce steam to replace an existing boiler plant that is approaching its end of life. The PPRP is a subset of the larger Richmond Refinery Renewal Project (“Renewal Project”) that is concurrently undergoing California Environmental Quality Act (CEQA) review by the City of Richmond. The California Energy Commission (CEC) has jurisdiction for only the PPRP portion of the Renewal Project and serves as the subject of this application.

The PPRP will consist of the following components:

- A nominal 43-MW net, natural gas- or liquid petroleum gas (butane)-fired cogeneration train (Cogen 3000) consisting of one combustion turbine generator (CTG), a refinery fuel gas-fired heat recovery steam generator with duct burner (HRSG), 13.8-kV switchgear, and ancillary equipment.
- Shutdown of the existing No. 1 power plant refinery steam boilers currently providing steam to the Refinery.
- A 17-MW net extraction, condensing steam turbine generator (STG), an associated cooling tower, and 12-kV switchgear installed as part of the new hydrogen production facility (the remainder of the hydrogen plant is under CEQA review as part of the Renewal Project). The new hydrogen plant will be a net generator of steam for both the STG (“H₂-STG”) and the refinery steam system.
- Reconductoring of approximately 4,000 feet of existing onsite double-circuit overhead 115-kV transmission line to upgrade its ampacity. The reconductoring will reuse existing transmission line structures.
- Adjacent onsite service connections for fuel, recycled water, water, wastewater, steam, and electricity to existing pipe racks, with the exception of the reconductoring noted above.

The Cogen 3000 portion of the PPRP will occupy approximately 0.5 acre within an existing 5.2-acre cogeneration facility, and the STG and associated equipment (H₂-STG) will occupy approximately 0.5 acre within a new 7.9-acre hydrogen plant that will be built as part of the Renewal Project. The PPRP will be located well within the heart of the existing 2,900-acre Richmond Refinery. Temporary construction laydown and parking for the PPRP will be provided in various existing laydown areas within the Refinery that are currently used for ongoing maintenance and project laydown. A complete description of the PPRP is provided in Section 2.0.

8.6.2 Affected Environment

The proposed Renewal Project site is located in the western portion of the city of Richmond, California at 841 Chevron Way. The new equipment associated with the PPRP will be located within the boundaries of the existing Chevron Refinery property. The Project site is relatively flat at an elevation of approximately 15 feet (5 meters) above sea level. The hills which border the western property boundary rise to an elevation of approximately 450 feet. The hills east of the Project site rise to a height of approximately 400 to 600 feet approximately 4 to 5 miles from the site, and gradually rise to approximately 1,500 feet southeast of the facility. The Coastal Mountain range lies approximately 5 miles to the west of the facility across the San Pablo Bay in Marin County and includes Mount Tamalpais, which has a peak height of approximately 2,600 feet above sea level.

Surrounding land uses include industrial, residential, recreational, and commercial classifications. The surrounding land uses are described in further detail in Section 8.4, Land Use. Based on the EDR "Offsite Receptor Report" (EDR, 2007), approximately 220,000 residents live within a six-mile radius of the proposed Renewal Project. Sensitive receptors, which are defined as groups of individuals that may be more susceptible to health risks due to chemical exposure (such as schools, daycare facilities, convalescent centers, or hospitals) are also located within six miles of the proposed Project. The sensitive receptors located within a 6-mile radius of the Project Site are presented in Appendix 8.6-A. The nearest sensitive receptor is a day care center located approximately one and one quarter miles south/southeast of the property boundary.

8.6.3 Laws, Ordinances, Regulations, and Standards

An overview of the regulatory process for public health issues is presented in this section. The relevant LORS that affect public health and are applicable to the Project are identified in Table 8.6-1. Table 8.6-2 summarizes the primary agencies responsible for public health, the general category of the public health concern regulated by each of the agencies, and the conformity of the Project to each of the LORS applicable to public health. Points of contact with the primary agencies responsible for public health are identified in Table 8.6-2.

8.6.4 Environmental Analysis

8.6.4.1 Toxic Air Contaminant (TAC) Exposure Assessment

Human health risks potentially associated with TAC emissions from the operation of the proposed Project were evaluated. The HHRA was performed following the latest guidance outlined in the Air Toxics Hot Spots Program Risk Assessment Guidelines (Office of Environmental Health Hazard Assessment [OEHHA], 2003), the U.S. Environmental

TABLE 8.6-1

Applicable Federal, State, and Local Laws, Ordinances, Regulations, and Standards

LORS	Purpose	Regulating Agency	Applicability/Compliance Strategy
Title 40 CFR, Part 63	Establishes national emission standards to limit emissions of hazardous air pollutants (HAPs, or air pollutants identified by USEPA as causing or contributing to the adverse health effects of air pollution but for which National Ambient Air Quality Standards (NAAQS) have not been established) from facilities in specific categories.	BAAQMD, with USEPA Region IX oversight	Title 40, Code of Federal Regulations, Part 63 - National Emission Standards for Hazardous Air Pollutants for Source Categories, establishes emission standards to limit emissions of hazardous air pollutants from specific source categories. Sources subject to Part 63 requirements must either use the maximum achievable control technology (MACT), be exempted under Part 63, or comply with published emission limitations. The applicable MACT standard to the Project is Subpart YYYY, which sets a formaldehyde emission limit or an operational limit of 91 parts per billion volume (ppbv) for subject sources.
40 CFR Part 68 (Risk Management Plan) and Health and Safety Code Sections 25531 to 25541	Regulate public exposure to regulated substances	USEPA Region IX	Prepare Risk Management Plan (RMP) and offsite consequence analysis if required.
Health and Safety Code Sections 44360 to 44366 (Air Toxics "Hot Spots" Information and Assessment Act— AB 2588)	Requires preparation and biennial updating of facility emission inventory of hazardous substances; risk assessments.	BAAQMD with oversight from CARB/OEHHA	An estimate of toxic air contaminant (TAC) emissions and associated risk will be evaluated as part of this section.
Health and Safety Code 25249.5 et seq. (Safe Drinking Water and Toxic Enforcement Act of 1986— Proposition 65)	Provides notification of Proposition 65 chemicals.	OEHHA	Comply with all signage and notification requirements, if required.
BAAQMD Regulation 2, Rule 2 (Permits – New Source Review [NSR])	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 may be granted.	BAAQMD	A source shall be exempt from MACT requirements if the combined potential to emit from all related sources in a proposed modification is less than 10 tons per year of any HAP and less than 25 tons per year of any combination of HAPs. (BAAQMD 2-2-114)

TABLE 8.6-1

Applicable Federal, State, and Local Laws, Ordinances, Regulations, and Standards

LORS	Purpose	Regulating Agency	Applicability/Compliance Strategy
BAAQMD Regulation 2, Rule 5 (Permits – Toxics NSR)	The purpose of this rule is to provide for the review of new and modified sources of TAC emissions in order to evaluate potential public exposure and health risk, to mitigate potentially significant health risks resulting from these exposures, and to provide net health risk benefits by improving the level of control when existing sources are modified or replaced.	BAAQMD	TBACT shall be applied to any new or modified source of TACs where the source risk is a cancer risk greater than 1.0 in a million (10^{-6}), and/or a chronic hazard index greater than 0.20. An Authority to Construct (ATC) or (PTO) will be denied if the cancer risk exceeds 10 in a million, or the chronic hazard index exceeds 1.0, or the acute hazard index exceeds 1.0.
BAAQMD Regulation 7 (Odorous Substances)	The purpose of this regulation is to place general limitations on odorous substances and specific emission limitations on certain odorous compounds.	BAAQMD	Emissions of odorous substances shall not remain odorous after dilution with odor-free air at a rate of 1,000 volumes of odor-free air per volume of source sample). The maximum emissions of ammonia shall not exceed 5000 ppm.
BAAQMD Regulation 11, Rule 10	The purpose of this rule is to reduce emissions of hexavalent chromium from cooling towers by eliminating chromium based circulating water treatment programs.	BAAQMD	Hexavalent chromium levels in the circulating water must be less than 0.15 milligrams/liter.

TABLE 8.6-2
Summary of Agency Contacts for Public Health

Agency	Authority	Regulatory Contact
USEPA Region IX	Regulatory oversight	Gerardo Rios USEPA Region IX 75 Hawthorne Street San Francisco, CA 94105 (415) 947-3974
CARB	Regulatory oversight	Michael Tollstrup Project Assessment Branch California Air Resources Board 2020 L Street Sacramento, CA 95814 (916) 322-6026
OEHHA	Assess public exposure to toxic air contaminants from existing sources	Cynthia Oshita or Susan Long Office of Environmental Health and Hazard Assessment 1001 I Street Sacramento, CA (916) 445-6900
BAAQMD	Permit issuance, enforcement	Brian Bateman Bay Area Air Quality Management District 939 Ellis Street San Francisco, CA 94109 (415) 771-6000
Contra Costa County	Environmental Health Division	Richard Lee/Assistant Director 50 Douglas Drive Martinez, CA 94553 925-646-5225, ext. 200
Richmond Fire Department	Hazardous response	Michael Banks, Fire Chief Richmond City Hall 1401 Marina Way South, Richmond, CA 94804 510-307-8031

Protection Agency's (USEPA's) Guideline on Air Quality Models (USEPA, 2005), the California Air Resources Board's (CARB) Recommended Interim Risk Management Policy for Inhalation-based Residential Cancer Risk (CARB, 2003), and the Bay Area Air Quality Management District's (BAAQMD's) *Air Toxics NSR Program Health Risk Screening Analysis (HRS) Guidelines*. (BAAQMD, 2005b). The CARB Hotspots Analysis Reporting Program (HARP, version 1.3, October 2006) was used to conduct the HHRA analysis.

The HHRA process requires four general steps to estimate health impacts: (1) identify and quantify project-generated emissions; (2) evaluate pollutant transport (air dispersion modeling) to estimate ground-level TAC concentrations at each receptor location; (3) assess human exposure, and (4) use a risk characterization model to estimate the potential health risk at each receptor location. The following sections describe in detail the methods used in this HHRA.

8.6.4.1.1 TAC Emission Calculations

Emissions associated with the Project will consist primarily of combustion by-products produced by the natural gas-fired combustion turbine, and particulate emissions from the STG cooling tower. The Project is also expected to emit small quantities of TACs, including ammonia. The TACs are compounds that have been identified as pollutants that may pose a significant health hazard by the CARB.

Non-criteria pollutant emission factors for the analysis of emissions from the gas turbine were obtained from the Energy & Environmental Research Corporation (EERC) August 1998 publication entitled "Air Toxic Emission Factors for Combustion Sources Using Petroleum Based Fuels, Final Report, Volume II" (EERC, 1998). Emission factors for the cooling water were based on information provided by Chevron as part of the BAAQMD permit application (Chevron, 2006).

The health risk analysis was conducted assuming that the combustion turbines would be operated 8,760 hours per year at the maximum heat input rating. This would be a conservative estimate of emissions, as the planned operating rates will likely be less than this amount due to scheduled/unscheduled maintenance activities and the fact that refinery steam demand fluctuates.

The combustion turbine emissions are presented in Table 8.6-3. Detailed emission calculations for the non-criteria pollutants are provided in Appendix 8.1-B.

TABLE 8.6-3
Non-criteria Pollutant Emissions Cogen Unit

Pollutant	Emission Factor (pounds per million standard cubic feet [lb/MMscf]) ^a	Emissions	
		lb/hr	tpy
Acetaldehyde	1.53E-05	1.29E-02	0.056
Ammonia @ 10 ppm slip ^b	4.49E-03	3.77	16.5
Arsenic	8.50E-07	7.14E-04	0.003
Benzene	6.47E-05	5.43E-02	0.24
Benzo(a)pyrene	8.96E-08	7.53E-05	0.0003
Benzo(b)fluoranthene	4.04E-08	3.39E-05	0.0001
Benzo(k)fluoranthene	2.41E-08	2.02E-05	0.0001
Cadmium	9.88E-07	8.30E-04	0.004
Copper	4.21E-06	3.54E-03	0.02
Formaldehyde	1.11E-04	9.32E-02	0.41
Indeno(1,2,3-cd)pyrene	1.03E-07	8.65E-05	0.0004
Lead	4.89E-06	4.11E-03	0.02
Manganese	6.81E-06	5.72E-03	0.03
Mercury	1.80E-07	1.51E-04	0.0007
Naphthalene	3.13E-07	2.63E-04	0.0012

TABLE 8.6-3
Non-criteria Pollutant Emissions Cogen Unit

Pollutant	Emission Factor (pounds per million standard cubic feet [lb/MMscf]) ^a	Emissions	
		lb/hr	tpy
Nickel	9.42E-06	7.91E-03	0.03
Phenol	5.63E-06	4.73E-03	0.02
Selenium	1.96E-08	1.65E-05	0.0001
Toluene	1.07E-04	8.99E-02	0.39
Xylenes	3.73E-05	3.13E-02	0.14
Zinc	2.08E-05	1.75E-02	0.08
Total TAC Emissions			17.9
Highest Individual HAP (formaldehyde)			0.4

Note:

^a Emission factors based on the "Air Toxic Emission Factors for Combustion Sources Using Petroleum Based Fuels, Final Report, Volume II" (EERC, 1998)

^b The ammonia emission factor may be adjusted as a result of the BAAQMD's review of the air permit application.

lb/MMscf = pounds per million standard cubic feet ; lb/hr = pounds per hour; tpy = tons per year

The health risk analysis was conducted assuming the cooling tower will be operated 8,760 hours per year, at the maximum circulation rate. This would be a conservative estimate of emissions, as the planned operating rates will likely be less than this amount due to scheduled/unscheduled maintenance activities and the fact that refinery steam demand fluctuates.

The cooling tower emissions are presented in Table 8.6-4. Detailed emission calculations for the non-criteria pollutants are provided in Appendix 8.1-B.

TABLE 8.6-4
Non-criteria Pollutant Emissions For STG Cooling Tower

Pollutant	Max. Concentration for Cooling Tower Discharge (lb/hr/gpm)	Average Concentration for Cooling Tower Discharge (lb/hr/gpm)	Emissions*	
			lb/hr	tpy
Bromine & Compounds	1.5E-01	1.25E-01	5.4E-05	2.0E-04
Chlorine	6.74E-02	5.62E-02	2.4E-05	8.9E-05
Chloroform	5.06	4.2	1.8E-03	6.6E-03
Total Cooling Tower HAP emissions			7.6E-03	

Note:

* Emission factors based on BAAQMD permit application (Chevron, 2006)

8.6.4.1.2 Dispersion Modeling

Air dispersion modeling was performed to evaluate pollutant transport and predict ground level concentrations. The dispersion modeling was conducted within HARP using the USEPA Industrial Source Complex Short-Term (ISCST3) model (EPA, 1995). ISCST3 model options include the use of site-specific vertical profiles of wind speed and temperature, consideration of stack and building wake effects, and time-dependent exponential decay of pollutants. Five years of on-site meteorological data collected by the BAAQMD from 1999 to 2003 was used in the dispersion modeling. The surface meteorological data was preprocessed by the BAAQMD for ISCST3 using a mixing height of 600 meters. Other dispersion modeling options were based on the BAAQMD's *Permit Model Guidance* (BAAQMD, 2005a):

- Rural dispersion coefficients
- Final plume rise
- Stack tip downwash
- Buoyancy induced dispersion
- Calm processing
- No missing data processing
- Default wind profile exponents
- Default vertical potential temperature gradients
- 10-meter anemometer height

Two receptor grids were used to analyze the potential impacts. An initial coarse grid with 100 meter spacing extending to 10 kilometers from the center of the facility was used to identify the location of the maximum predicted impacts. A second, refined grid with 30-meter spacing extending to 2 kilometers was centered on the point of maximum impact (PMI) and the maximum exposed individual resident (MEIR). The potential impacts at the sensitive receptors were evaluated based on the nearest 100 or 30 meter grid location.

Receptor and source base elevations were determined using the 7.5-minute U.S. Geological Survey (USGS) Digital Elevation Model (DEM) data (i.e., 30-meter spacing between grid nodes). All coordinates were referenced to the Universal Transverse Mercator (UTM) North American Datum 1927 (NAD27), zone 10.

Detailed source parameters for the Cogen 3000 and H₂-STG are presented in Appendix 8.1-C.

8.6.4.1.3 Risk Characterization

The results of the dispersion modeling analysis represent an intermediate product in the HHRA process. The HARP model was subsequently used to determine cancer, chronic, and acute health risks.

Cancer risks were evaluated based on the annual TAC ground-level concentrations, inhalation cancer potency, oral slope factor, frequency and duration of exposure at the receptor, and breathing rate of the exposed persons. Cancer risks were estimated using a conservative assumption of 70-year continuous exposure duration for residential receptors and a 40-year, 5-day week, 8-hours-per-day exposure duration for commercial/industrial receptors. In addition, for predicted cancer risks where the inhalation pathway is the dominant pathway of cancer risks, the Derived (Adjusted) Method in HARP was used for

the cancer risk evaluation, based on the *Recommended Interim Risk Management Policy for Inhalation-Based Residential Cancer Risk* (CARB, 2003).

Chronic toxicity is defined as adverse health effects from prolonged chemical exposure, caused by chemicals accumulating in the body. Acute toxicity is defined as adverse health effects caused by a brief chemical exposure of no more than 24 hours. To assess chronic and acute non-cancer exposures, annual and 1-hour TAC ground-level concentrations are compared with the Reference Exposure Levels (RELs) developed by OEHHA to obtain a chronic or acute hazard index. The REL is a concentration in ambient air at or below which no adverse health effects are anticipated.

OEHHA/CARB Cancer and Non-Cancer RELs

This HHRA included potential health impacts from home grown produce, dermal absorption, soil ingestion, and mother's milk, as required by OEHHA guidelines (OEHHA, 2003). The inhalation cancer potency, oral slope factor values, and RELs used to characterize health risks associated with the modeled impacts were obtained from the *Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values* (OEHHA and CARB, 2005), and are shown in Table 8.6-5.

Significance Criteria

Cancer Risk. Residential cancer risk is the probability or chance of contracting cancer over a human life span (assumed to be 70 years). Carcinogens are not assumed to have a threshold below which there would be no human health impact. In other words, any exposure to a carcinogen is assumed to have some probability of causing cancer; the lower the exposure (time or mass), the lower the cancer risk (i.e., a linear, no-threshold model). Under various state and local regulations, an incremental increased cancer risk greater than 10 in 1 million due to a project is considered to be a significant impact on public health. For example, the 10-in-1-million risk level is used by the Air Toxics Hot Spots (AB 2588) program and California's Proposition 65 as the public notification level for air toxic emissions from existing sources.

Non-Cancer Risk. Non-cancer health effects can be either chronic or acute. In determining potential non-cancer health risks (chronic and acute) from air toxics, it is assumed there is a dose of the TAC below which there would be no impact on human health. The air concentration corresponding to this dose is called the Reference Exposure Level. Non-cancer health risks are measured in terms of a hazard quotient, which is the calculated exposure of each contaminant divided by its REL. Hazard quotients for pollutants affecting the same target organ are typically summed with the resulting totals expressed as hazard indexes for each organ system. A hazard index of less than 1.0 is considered to be an insignificant health risk. For this health risk assessment, all hazard quotients were summed regardless of target organ.

8.6.4.1.4 Summary of TAC Exposure Assessment Results

A summary of the PMI UTM locations for increased cancer risk, chronic health index, and acute health index have been included in Table 8.6-6 along with the predicted health risk impacts. An evaluation of the chemicals and sources contributing to the maximum predicted risks are also presented in this section. In addition, the HARP report files were also prepared and submitted on CD (see Appendix 8.6-B for a description of HARP files included on the CD).

TABLE 8.6-5
Risk Assessment Health Values for Substances of Potential Concern

Compound	Cancer Risk		Non-cancer Effects	
	Inhalation Cancer Potency (mg/kg-day)	Oral Slope Factor ($\mu\text{g}/\text{m}^3$) ⁻¹	Chronic Inhalation Reference Exposure Level ($\mu\text{g}/\text{m}^3$)	Acute Inhalation Reference Exposure Level ($\mu\text{g}/\text{m}^3$)
Acetaldehyde	1.0 E-2	--	9.00E+00	--
Ammonia	--	--	2.0E+02	3.2E+03
Arsenic	1.2 E+1	1.5 E0	3.0 E-2	1.9 E-1
Benzene	1.0E-01		6.0E+01	1.3E+03
Benzo(a)pyrene	3.9 E+0	1.2 E+1	--	--
Benzo(b)fluoranthene	3.9 E-1	1.2 E+0	--	--
Benzo(k)fluoranthene	3.9 E-1	1.2 E+0	--	--
Cadmium	1.5 E+1	--	2.0 E-2	--
Copper	--	--	2.4 E+0	1.0 E+2
Formaldehyde	2.1 E-2	--	3.0 E+0	9.4 E+1
Indeno(1,2,3-cd) pyrene	3.9 E-1	1.2 E+0	--	--
Lead	4.2 E-2	8.5 E-3	--	--
Manganese	--	--	2.0 E-1	--
Mercury	--	--	9.0 E-2	1.8 E+0
Naphthalene	1.2 E-1	--	9.0 E+0	--
Nickel	9.1 E-1	--	5.0 E-2	6.0 E+0
Phenol	--	--	2.0 E+2	5.8 E+3
Selenium	--	--	2.0 E+1	--
Toluene	--	--	3.0 E+2	3.7 E+4
Xylenes	--	--	7.0 E+1	--
Zinc	--	--	3.5 E+1	--
Bromine & Compounds	--	--	1.7 E+0	--
Chlorine	--	--	2.0 E-1	2.1 E+2
Chloroform	1.9 E-2	--	3.0 E+2	1.5 E+2

Note:

mg/kg-day = milligrams per kilogram per day

$\mu\text{g}/\text{m}^3$ = micrograms per cubic meter

Source: OEHHA/CARB, 2005

TABLE 8.6-6
HHRA Summary – PPRP

Risk	Receptor Number	Value	UTM (NAD 27)	File Name
70-yr Cancer Der. MEIR	31,548	0.189 per million	553756, 4197622	Rep_Can_70yr_DerOEH_Rec31548_AllSrc_AllCh_BySrc_ByChem_Site.txt
70-yr Cancer Der. Adj. MEIR	31,548	0.178 per million	553756, 4197622	Rep_Can_70yr_DerAdj_Rec31548_AllSrc_AllCh_BySrc_ByChem_Site.txt
Cancer MEIW	1,180	0.394 per million	552556, 4199102	Rep_Can_WRK_Avg_Rec1180_AllSrc_AllCh_BySrc_ByChem_Site.txt
Resident Chronic HI	31,548	0.00125	553756, 4197622	Rep_Chr_Res_DerOEH_Rec31548_AllSrc_AllCh_BySrc_ByChem_Site.txt
Worker Chronic HI	1,180	0.00869	552556, 4199102	Rep_Chr_Wrk_PtEst_Rec1180_AllSrc_AllCh_BySrc_ByChem_Site.txt
Resident Acute HI	31,345	0.00149	553786, 4197652	Rep_Acu_Rec31345_AllSrc_AllCh_BySrc_ByChem_Site.txt
Work Acute HI	3,360	0.0114	552601, 4199228	Rep_Acu_Rec3360_AllSrc_AllCh_BySrc_ByChem_Site.txt
70-yr Cancer Der. PMI	3,344	1.32 per million	552588, 4199070	REP_PMI.txt
70-yr Cancer Der. Adj. PMI	1,180	1.24 per million	552556, 4199102	
Chronic HI PMI	1,180	0.00869	552556, 4199102	
Acute HI PMI	3,360	0.0114	552601, 4199228	

Notes:

Adj. = adjusted

Der. = derived

HI = Hazard Index

MEIR = maximum exposed individual resident

MEIW = maximally-exposed individual worker

NAD = North American Datum

PMI = point of maximum impact

UTM = Universal Transverse Mercator

The cancer risk at the PMI is approximately 1.2 in a million (70-year derived adjusted cancer value). The PMI is located along the western boundary of the facility. The derived adjusted cancer MEIR is predicted to be 0.178 in a million. The receptor location for the MEIR is about 400 meters (m) south of the facility's southwest boundary. The maximally-exposed individual worker (MEIW) is predicted to be 0.394 in a million, located on the western border of the facility boundary. Both the MEIR and MEIW for the proposed Project are below the BAAQMD's Regulation 2, Rule 5 significance threshold of one in one million.

The maximum chronic hazard index increment is predicted to be approximately 0.0087 and is located on the western border of the facility fence line.

The maximum acute hazard index is predicted to be approximately 0.01 and is located along the facility's western boundary. The chronic and acute index increments predicted for the proposed Project are all below the BAAQMD's Regulation 2, Rule 5 significance threshold of 1.0.

The contributions from the Cogen 3000 and H₂-STG cooling tower to the maximum health risk impacts from the proposed Project are shown in Table 8.6-7. Combustion emissions from the turbines contributed a majority of the cancer, chronic, and acute risks at both the maximum residential and worker receptors.

TABLE 8.6-7
Contribution of Sources to the Health Risks at the Maximum Exposed Receptors

Source	Cancer		HIC		HIA	
	Resident	Worker	Resident	Worker	Resident	Worker
Turbines	0.19 per million	0.39 per million	0.00124	0.00867	0.00147	0.0114
Cooling Tower	<0.001 per million	<0.001 per million	<0.0001	<0.0001	<0.0001	0.000135

Note:

HIA = acute hazard index; HIC = chronic hazard index

Table 8.6-8 presents the top contributors of the TACs to the maximum health risk values for the Project operation. Arsenic is the highest contributor to cancer risks and acute health risks. Nickel is the highest contributor to the predicted chronic risk value.

Modeling showed that the MEIR excess lifetime cancer risk was 0.19 in a million, and the MEIW excess lifetime cancer risk was 0.39 in a million. Excess lifetime cancer risks less than (10 in 1 million) are unlikely to represent public health impacts that require additional facility emission controls.

For residential receptors, arsenic has the highest potential to contribute to the cancer impact; however, the contribution is less than 0.2 in 1 million. The dominant exposure pathway for arsenic is oral exposure. Other substances each contribute less than 0.1 in 1 million at the MEIR.

8.6.4.2 Construction Impacts

The construction phases of the Hydrogen Plant Replacement Project and the Power Plant Replacement Project are expected to take place over a period of approximately 28 to

30 months. Diesel PM₁₀ (particulate matter of 10 microns) emissions from construction equipment exhaust would potentially cause short-term human health impacts during construction. However, the BAAQMD *CEQA Guidelines* (BAAQMD, 1999) emphasize implementation of effective control measures rather than detailed quantification of construction emissions. Therefore, the Applicant will incorporate diesel PM₁₀ control measures as outlined in the Draft Environmental Impact Report (DEIR) for the Renewal Project (ESA, 2007). As a result of the implementation of diesel PM₁₀ control measures, no significant public health effects are expected during the construction phase.

TABLE 8.6-8
Contributions of the TACs to the Maximum Predicted Impact at the MEIR, MEIW, PMI Locations

TACs	Cancer Risks	Chronic Risks	Acute Risks
Acetaldehyde	1.27 E-9	4.88 E-5	NA
Ammonia @ 10 ppm slip	NA	6.45 E-4	3.8 E-3
Arsenic	8.3 E-7	1.59 E-3	8.82 E-3
Benzene	5.37 E-8	3.10 E-5	8.74 E-5
Benzo(a)pyrene	1.02 E-7	NA	NA
Benzo(b)fluoranthene	4.61 E-9	NA	NA
Benzo(k)fluoranthene	2.75 E-9	NA	NA
Cadmium	1.23 E-7	1.82 E-3	NA
Copper	NA	5.04 E-5	1.14 E-4
Formaldehyde	1.94 E-8	1.06 E-3	3.20 E-3
Indeno(1,2,3-cd)pyrene	1.17 E-8	NA	NA
Lead	1.37 E-8	NA	NA
Manganese	NA	9.78 E-4	NA
Mercury	NA	2.28 E-4	2.71 E-4
Naphthalene	3.12 E-10	9.99 E-7	NA
Nickel	7.12 E-8	5.41 E-3	4.25 E-3
Phenol	NA	8.09 E-7	2.63 E-6
Selenium	NA	2.81 E-8	NA
Toluene	NA	1.02 E-5	7.84 E-6
Xylenes	NA	1.53 E-6	4.59 E-6
Zinc	NA	1.71 E-5	NA
Bromine & Compounds	NA	4.39 E-6	NA
Chlorine	NA	1.68 E-5	4.26 E-6
Chloroform	1.36 E-9	8.40 E-7	1.47 E-4

Note:
NA = Not Applicable

8.6.4.3 Hazardous Materials

Hazardous materials will be used and stored at the facility. The quantities of hazardous materials proposed to be stored onsite and a description of their uses are presented in Section 8.11, Hazardous Materials and Waste. Use of hazardous materials at the proposed facility will be in accordance with standard practices for their storage and management. Normal use of hazardous materials, therefore, will not pose significant impacts to public health. While mitigation measures will be in place to prevent releases, accidental releases that migrate offsite could result in potential impacts to the public.

The California Health and Safety Code Sections 25531 to 25541 and Title 40 CFR Part 68 under the Clean Air Act establish emergency response planning requirements for some of the hazardous materials to be used and stored at the facility. The hazardous materials regulated under these LORS are termed “regulated substances.” These regulations require preparation of a Risk Management Plan (RMP), which is a comprehensive program to identify hazards and predict the areas that may be affected by a release of a regulated substance. The only regulated substance to be used at the facility is anhydrous ammonia, which is produced and used at the facility. No new sources of ammonia are required for the proposed Project and the Refinery will update the existing RMP when applicable to include the use of ammonia in the Cogen 3000 project.

8.6.4.4 Operation Odors

Small amounts of ammonia used to control nitrogen oxides (NO_x) emissions may escape up the exhaust stack but would not produce operational odors. The expected exhaust gas ammonia concentration, known as ammonia “slip,” will be less than 10 parts per million (ppm). After mixing with the atmosphere, the concentration at ground level will be far below the BAAQMD Regulation 7 limit of 5,000 ppm. Therefore, potential ammonia emissions are not expected to create objectionable odors.

8.6.5 Compliance With LORS

Table 8.6-9 presents a compliance evaluation for the applicable LORS and permits.

8.6.6 Mitigation Measures

8.6.6.1 Criteria Pollutants

Emissions of criteria pollutants will adhere to National Ambient Air Quality Standards (NAAQS) or California Ambient Air Quality Standards (CAAQS) as discussed in Section 8.1, Air Quality. The proposed facility also will include emission control technologies necessary to meet the required emission standards specified for criteria pollutants under BAAQMD rules. Offsets or net reductions in air emissions will ensure that the Project will not result in an increase in total emissions in the air basin. Air dispersion modeling results (presented in Section 8.1, Air Quality) show that Project emissions will not cause or contribute to the violation of ambient air quality standards (either NAAQS or CAAQS) for those pollutants for which the area is designated as in attainment. These standards are intended to protect the general public with a wide margin of safety. Therefore, the Project is not anticipated to have a significant impact on public health from emissions of criteria pollutants. For those criteria pollutants (and their precursor pollutants) where the

ambient air quality standards are not in attainment, mitigation will be provided to reduce the impacts to less than significant levels (see Section 8.1).

TABLE 8.6-9

Compliance Evaluation for the Applicable Laws, Ordinances, Regulations, Standards and Permits for Protection of Air Quality

LORS	Compliance Assessment
Federal	
Title 40 CFR, Part 63	The Chevron Richmond Refinery exceeds the major source thresholds for HAPs (10 tons per year for any one pollutant or 25 tons per year for all HAPs combined). Therefore, National Emissions Standards for Hazardous Air Pollutants (NESHAP) regulations apply. The Cogen 3000 emissions associated with the PPRP will be 63 parts per billion volume (ppbv) formaldehyde. Therefore, the Project complies with Subpart YYYYY formaldehyde emission limit of 91 ppbv. Furthermore, the Cogen 3000 HRSG incorporates an oxidation catalyst system that would be expected to control formaldehyde emissions, resulting actual emissions below the estimated 63 ppbv.
40 CFR Part 68 (Risk Management Plan) and Health and Safety Code Sections 25531 to 25541	The Applicant will prepare required materials. A complete hazardous materials assessment is included in Section 8.11.
State	
California Code of Regulations Sections 93300- 93347 (Toxic “Hot Spots” Act)	The maximum exposed individual resident and worker cancer risk are 0.18 and 0.39 in a million, respectively. The maximum chronic and acute hazard indices are 0.00869 and 0.0114, respectively. The levels are below the BAAQMD Authority to Construct (ATC) or Permit to Operate (PTO) thresholds for cancer risk of 10 in a million, and/or the chronic and acute hazard index of 1.0.
Health and Safety Code 25249.5 et seq. (Safe Drinking Water and Toxic Enforcement Act of 1986—Proposition 65)	The facility, during construction and operation, will comply with all Prop. 65 signage and notification requirements.
Local	
BAAQMD Regulation 2, Rule 2 (Permits – New Source Review [NSR])	The Chevron Richmond Refinery exceeds the major source thresholds for HAPs (10 ton per year for any one pollutant or 25 ton per year for all HAPs combined). Therefore, NESHAP regulations apply (BAAQMD 2-2-114).
BAAQMD Regulation 2, Rule 5 (Permits – Toxics NSR)	The maximum exposed individual resident and worker cancer risk are 0.18 and 0.39 in a million, respectively. The maximum chronic and acute hazard indices are 0.00869 and 0.0114, respectively. The values are less than the TBACT thresholds of 1.0 in a million (10^{-6}), and/or a chronic hazard index greater than 0.20. The levels are also below the ATC or PTO thresholds for cancer risk of 10 in a million, or the chronic and acute hazard index of 1.0.
BAAQMD Regulation 7 (Odorous Substances)	Ammonia emissions from the SCR catalyst will be less than 10 ppmv. Therefore, maximum emissions will be below the 5,000 ppm limit and odors from the PPRP are expected to be less than significant.
BAAQMD Regulation 11, Rule 10	The Applicant will obtain water from EBMUD; therefore, hexavalent chromium levels are expected to be below the 0.15 milligrams/liter limit. Furthermore, Chevron Richmond Refinery has not used chromium-based cooling tower treatment chemicals in the last twenty years.

8.6.7 Cumulative Impacts

Section 5.2 of the DEIR for the Chevron Renewal Project (ESA, 2007) presents an analysis of the cumulative impacts of the Renewal Project, including the PPRP, and other planned development projects. The DEIR's cumulative impact analysis considered following documents to determine the effects of projects that may not be well defined:

- Richmond General Plan
- North Richmond Specific Plan
- Contra Costa County General Plan
- Contra Costa County Transportation Authority Transportation Plan
- Bay Conservation Development Commission Plans
- Regional Planning Documents from the Associations of Bay Area Governments, Metropolitan Transportation Commission, and the Regional Water Quality Control Board
- Bay Area Air Quality Management District's 2005 Ozone Strategy Plan

Through this process, a total of 17 pending projects were identified. Of these 17 projects, nine of them included projects planned by the Chevron Richmond Refinery. The remaining eight were the following non-Chevron projects:

- East Bay Municipal Utility District's Richmond Advanced Recycling Expansion (RARE) Water Project
- Valero Benicia Refinery Improvement Project
- PG&E's Richmond Fuel Oil Pipeline Divestiture Project
- ConocoPhillips Clean Fuels Expansion Project
- Praxair Contra Costa Pipeline Project
- Praxair Contra Costa Hydrogen Pipeline Project
- Praxair Natural Gas Pipeline Project
- Point Molate Reuse Project

The results of this analysis, presented in Section 5.2.5.12 of the DEIR, indicate that it is unlikely that cumulative construction or operational impacts are expected.

8.6.8 References

Bay Area Air Quality Management District (BAAQMD). 2005a. Permit Modeling Guidance. May.

_____. 2005b. Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines. June.

- _____. 1999. BAAQMD CEQA Guidelines, Assessing the Air Quality Impacts of Projects and Plans. December.
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- Office of Environmental Health Hazard Assessment (OEHHA). 2003. Air Toxics Hotspots Program Guidance Manual for Preparation of Health Risk Assessments.
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- USEPA. 2005. Guideline on Air Quality Models, 40 CFR, Part 51, Appendix W.
- _____. 1995. User's Guide for the Industrial Source Complex (ISCST3) Dispersion Model. USEPA-454/B-95-003a.

8.7 Socioeconomics

Socioeconomic issues relevant to the affected environment include population, housing, and employment. The socioeconomic analysis also includes consideration of environmental justice, a determination of whether any project impacts fall disproportionately on a low-income or minority population. Several areas of interest and concern related to socioeconomics apply to the proposed Chevron Richmond Refinery Power Plant Replacement Project (PPRP, or the Project), as discussed below.

8.7.1 Introduction

Chevron is proposing the PPRP to add an additional 60 megawatts (MW) net generation to its existing refinery electrical generation located within Chevron's Richmond Refinery in the City of Richmond (see Figure 1.2-1) in Contra Costa County, California. The proposed PPRP will be integrated into Chevron's plans to meet its growing refinery electrical load, and produce steam to replace an existing boiler plant that is approaching its end of life. The PPRP is a subset of the larger Richmond Refinery Renewal Project that is concurrently undergoing California Environmental Quality Act (CEQA) review by the City of Richmond. The California Energy Commission (CEC) has jurisdiction for only the PPRP portion of the Renewal Project that is the subject of this application.

The PPRP will consist of the following components:

- A nominal 43-MW net, natural gas- or liquid petroleum gas (butane)-fired cogeneration train consisting of one combustion turbine generator (CTG), a refinery fuel gas-fired heat recovery steam generator, 13.8-kV switchgear and ancillary equipment.
- Shutdown of the existing No. 1 power plant refinery steam boilers currently providing steam to the Refinery.
- A 17-MW net extraction, condensing steam turbine generator (STG), an associated cooling tower, and 12-kV switchgear installed as part of the new hydrogen production facility (the remainder of the hydrogen plant is under CEQA review as part of the Renewal Project). The new hydrogen plant will be a net generator of steam for both the STG and the Refinery steam system.
- Reconductoring of approximately 4,000 feet of existing onsite double-circuit overhead 115-kV transmission line to upgrade its ampacity. The reconductoring will reuse existing transmission line structures.
- Adjacent onsite service connections for fuel, reclaimed water, water, wastewater, steam, and electricity to existing piperacks, with the exception of the reconductoring noted above.

The Cogen 3000 portion of the PPRP will occupy approximately 0.5 acre within an existing 5.2-acre cogeneration facility, and the STG and associated equipment (H₂-STG) will occupy approximately 0.5 acre within a new 7.9-acre hydrogen plant that will be built as part of the Richmond Refinery Renewal Project. The PPRP will be located well within the heart of the existing 2,900-acre Richmond Refinery. Temporary construction laydown and parking for the PPRP will be provided in various existing laydown areas within the Refinery that are

currently used for ongoing maintenance and project laydown. A complete description of the PPRP is provided in Section 2.0.

8.7.2 Affected Environment

The Chevron Richmond Refinery is located along the western edge of the City of Richmond, in Contra Costa County, California. 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). The Project is located within the Chevron Richmond Refinery (see Figure 2.1-1).

8.7.2.1 Demographic Characteristics

Population. Contra Costa County encompasses approximately 732 square miles (land area) located along the eastern edge of San Francisco Bay, and the southern edge of San Pablo Bay and the Carquinez Strait. It is one of the nine counties that comprise the Bay Area (Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma Counties) (Association of Bay Area Governments [ABAG], 2006). The Project is located within 6 miles of both Alameda and Marin Counties.

According to the 2000 U.S. Census, Contra Costa County had a total population of 948,816 persons, with a 2005 population estimate of 1,017,787 persons. Alameda County is located approximately 4 miles from the Project site and had a total population of 1,443,741 persons, with a 2005 population estimate of 1,421,308 persons. Marin County, located two and one-half miles from the Project site had a total population of 247,289 persons in 2000, with a 2005 population estimate of 235,609 persons (U.S. Census Bureau, 2006b).

According to the 2000 U.S. Census, the City of Richmond had a total population of approximately 99,220 persons, with a 2005 population estimate of approximately 102,330 persons. 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 Richmond from 1990 to 2000 was slightly lower than in Contra Costa County as a whole, which experienced an 18 percent increase during the same 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 to 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 by 2030 (a 22.5 percent increase from 2005) (ABAG, 2006).

Environmental Justice. On February 11, 1994, President Clinton issued "Executive Order 12898 on Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." The Order is designed to focus attention on environmental

and human health conditions in areas of high minority populations and low-income communities, and to promote nondiscrimination in programs and projects substantially affecting human health and the environment (Federal Register, 1994). The Order requires the U.S. Environmental Protection Agency (USEPA) and all other federal agencies (as well as state agencies receiving federal funds) to develop strategies to address this issue. The agencies are required to identify and address any disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and/or low-income populations.

The ethnic and income distribution by census tract within a 6-mile radius of the Project site (see Figure 8.7-1) are provided in Tables 8.7-1 and 8.7-2 (located at the end of this section), respectively. Data for both of these tables were taken from 2000 U.S. Census data, as specified in the USEPA Guidelines (Guidelines) for use in an environmental justice analysis (USEPA, 1996). According to the Guidelines, a minority population exists if minorities comprise 50 percent or more of the affected area's general population. The distribution of minority and Hispanic-origin populations within a 6-mile radius of the proposed Project site is summarized in Table 8.7-1. As shown in Table 8.7-1, a minority population exists in 60 percent of the census tracts.

Housing. There were currently approximately 35,928 housing units in the City of Richmond in 2000. There are approximately 354,577 housing units in Contra Costa County, 552,258 housing units in Alameda County, and 106,598 housing units in Marin County (ESA, 2006).

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 persons, respectively (U.S. Census Bureau, 2006).

New housing authorizations for Contra Costa County totaled 5,639 units in 2000. Of the 5,639 new housing authorizations, 4,344 units were single-family units and 1,295 were multi-family units. These authorizations were valued at \$1.2 million (California Department of Finance [DOF], 2006). According to the 2000 U.S. Census, the median value of owner-occupied housing units was \$267,800. The vacancy rate declined from 5 percent in 1990 to 3 percent in 2000.

Employment and Economy. 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, 2006).

According to the 2000 Census, 42,769 Richmond residents were employed in 2000, 39 percent of whom worked within Contra Costa County (U.S. Census Bureau, 2006a). The Chevron Richmond Refinery currently employs approximately 1,170 full-time permanent employees and approximately 400 contract workers (ESA, 2006). Employment data for the City of Richmond, surrounding Counties, and California is shown in Table 8.7-3.

TABLE 8.7-3
Employment Data, 2006

Area	Labor Force	Employment	Unemployment	Unemployment Rate (%)
City of Richmond	50,500	47,400	3,100	6.7
Contra Costa County	519,500	500,000	19,500	3.8
Alameda County	757,700	727,400	30,300	4.0
Marin County	132,000	127,900	4,100	3.1
California	17,863,600	17,106,900	756,700	4.2

Source: California Employment Development Department (CEDD), 2006.

Details of the characteristics of the regional labor force are shown in Table 8.7-4. It shows 2001 employment data for the City of Richmond, Alameda County, Contra Costa County, and Marin County compared to California as a whole. Unemployment rates are higher in the City of Richmond (6.7 percent) than they are at the state level (4.2 percent).

Unemployment rates are lower in Alameda County (4.0 percent), Contra Costa County (3.8 percent), and Marin County (3.1 percent) than they are in the City of Richmond.

8.7.2.1.1 Project Work Force

Construction Work Force. Construction of the Project will require approximately 19 months for the Cogen 3000 project construction and 7 months for the H₂-STG construction. The construction personnel requirements for Cogen 3000 are shown in Table 8.7-4. As presented in Table 8.7-4, there will be an average and peak workforce of approximately 124 and 180, respectively, of construction craft people, supervisory, support, and construction management personnel onsite during construction of the Cogen 3000 project.

The construction personnel requirements for the H₂-STG construction are shown in Table 8.7-5.

Operations Work Force. Commercial operation is expected to commence no later than second quarter 2009. The Project is expected to operate using Chevron Richmond Refinery current employees.

8.7.2.1.2 Fiscal Resources

The initial capital cost is estimated at \$100 million. The estimated value of materials and supplies that will be purchased locally (within Contra Costa County) during construction is expected to be about \$60 million. The total local sales tax expected during construction is about \$4.5 million (that is, 7.75 percent of local sales). The Project will provide about \$40 million in construction payroll.

TABLE 8.7-4
 Cogen 3000 Construction Personnel by Discipline

Job Category	Months After Notice to Proceed																			Totals
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
Mechanical							68	68	68	68	68	68	68	68	68	68	68	68	68	884
Civil	33	33	33	33	33	33														198
Electrical & Instrumentation and Controls								33	33	33	33	33	33	33	33	33	33	33	33	396
Insulation														33	33	33	33	33	33	198
Paint														16	16	16	16	16	16	96
Scaffold							15	15	15	15	15	15	15	15	15	15	15	15	15	195
Craft Subtotal	33	33	33	33	33	33	83	116	116	116	116	116	116	165	165	165	165	165	165	1967
Construction Manager	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	285
Total Project	48	48	48	48	48	48	98	131	131	131	131	131	131	180	180	180	180	180	180	2252

TABLE 8.7-5
H₂-STG Construction Personnel by Discipline

Job Category	Months after Notice to Proceed									Totals
	6	7	8	9	10	11	12	13	14	
Insulation Workers								2		2
Boilermakers										0
Carpenters		6								6
Electricians							2	4		6
Ironworkers		4						4		8
Laborers					1	1	1	1		4
Millwrights				2	6	10	10			28
Operating Engineers				1	1	1	1	1		5
Painters								1		1
Pipefitters						6	6			12
Craft Subtotal	0	10	0	3	8	18	20	13	0	72
Management		1		1	1	2	3	3		11
Engineering		1		1	1	1	1	1		6
Clerical		1		1	1	1	1	1		6
Staff Subtotal	0	3	0	3	3	4	5	5	0	23
Total Project	0	13	0	6	11	22	25	18	0	95

8.7.2.2 Public Services

This section describes public services in the Project area.

Law Enforcement. The Plant Protection Department of the Refinery provides 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, and drug and alcohol cases; and conducting contraband inspections (ESA, 2006). During the morning and afternoon peak traffic periods when major Refinery turnarounds occur, and also during large construction projects, Plant Protection hires (on an overtime basis) the Richmond Police Department to provide traffic control at contractor gates (ESA, 2006).

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 (ESA, 2006). Of the department's fifteen police beats, one covers the geographic area in which the Refinery is

located. Approximately 1.13 percent of that beat's activities are associated with serving the Refinery on an active or stand-by basis (ESA, 2006).

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 3 to 5 minutes or less for top priority calls (for example, robberies in progress and imminent danger to life). The Refinery will continue to be operated as currently implemented.

Fire Protection. The Plant Protection Department of the Chevron Richmond Refinery also operates a 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, which occurs six or fewer times a year (ESA, 2006). When called, the City of 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 called to be on standby at a Chevron Fire Station and provides backup while Chevron Richmond Refinery firefighters are handling the emergency. Over the last 10 years the City Fire Department has actually helped respond to an emergency on five occasions (ESA, 2006).

The Chevron Richmond Refinery Fire Department consists of 38 uniformed personnel. This organization is supplemented by a 75-person volunteer fire brigade. All of these people are trained in responding to emergencies associated with an oil refinery. The department has 21 vehicles equipped to respond to emergencies. These vary from fire engines to quick-attack vehicles. Over the last 3 years, the average response time to any location in the Refinery has been 2 minutes or less (ESA, 2006).

The current staffing of the City of 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 (ESA, 2006).

The three City fire stations which are the first responding units to a Chevron Richmond Refinery incident are Station 61, at 108 W. Richmond in Point 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 2 and 5 minutes (ESA, 2006).

In addition to responding to fire, rescue, and emergency medical incidents at the Refinery, the City Fire Department makes routine and regular fire inspections. A fire inspector is assigned to the Refinery and inspects once a week for Uniform Fire Code inspections, 8 hours a quarter for State-mandated hazardous materials inspections, and as needed by contractors doing contract work in the Refinery (ESA, 2006). The Refinery will continue to be operated as currently implemented.

Hazardous Materials. The Chevron Richmond Refinery maintains an emergency response program designed to protect workers, public safety, and 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 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 Supervisor of Fire Protection, whose responsibility it is to ensure that the Emergency Response Plan is implemented and followed in the preparation for, and response to, emergencies at the Refinery.

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 City's Fire Department and/or Contra Costa County Health Services on potential fires and/or hazardous materials releases.

Hospitals. There are eight hospitals in Contra Costa County. The closest hospital is Doctors Hospital, located 2.6 miles from the Refinery.

Doctors Hospital is a 100-bed facility serving the City of Richmond and other surrounding communities. Although Doctors Hospital does not have a trauma center, it can handle minor injuries. The Doctors Medical Center and Memorial Medical Center has a 24-hour Emergency department, equipped with an onsite helicopter pad.

Water Supply and Wastewater Systems. Potable water is provided to the City of Richmond by the East Bay Municipal Utility District (EBMUD). EBMUD obtains approximately 90 percent of its municipal water supply from the Mokelumne River, and 10 percent 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 (ESA, 2006).

The Project site is served by the Richmond Sewer District, which is one of three sewer districts that service 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 million gallons per day (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.

Telephone. AT&T provides telephone service to most of the City of Richmond.

8.7.3 Environmental Consequences

8.7.3.1 Environmental Checklist

The checklist shown in Table 8.7-6 is used by the CEC to assess the significance of potential impacts.

TABLE 8.7-6
Population and Housing Socioeconomic Impacts

	Potentially Significant Impact	Less than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Would the Project 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)?				X
b) Would the Project displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?				X
c) Would the Project displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?				X
d) Does a demographic analysis indicate a significant minority or low-income population within a 6-mile radius of the Project that may be subject to disproportionate adverse effects of the Project?			X	

This section analyzes the distributional patterns of high-minority and low-income populations on a regional basis and characterizes the distribution of such populations adjacent to the proposed Project area. This analysis focuses mainly on whether the proposed Project has the potential to affect area(s) of high-minority population(s) and low-income communities disproportionately, and thus would potentially create an adverse environmental justice impact. According to Executive Order 12898, an environmental justice impact would be considered significant and would require mitigation if the construction or operation of the Project would cause any minority or low-income population to bear a disproportionate share of an adverse impact.

8.7.3.2 Impacts

The Project will require approximately 19 months for construction. There would be an average and peak construction workforce of 124 and 180 workers, respectively. The majority of construction workers are expected to come from the local area or commute from the greater Bay Area counties and cities. Since the construction duration is relatively short, and local workforce is sufficient, it is not expected that construction workforce would relocate to the area during the construction period. No impact, therefore, would occur on population growth in the Project area.

The workforce in the region will be adequate to fulfill the Project's labor requirements for construction. The Project will require a construction work force that is available regionally, with most workers expected to commute to the Project site from existing residences. Short-term increases in lodging and dining business from construction workers also will provide a benefit to the local economy.

The Contra Costa County 2005 population is estimated at approximately 1,017,787, with 577,314 households (DOF, 2006). According to the State of California Department of Finance, there was a 3.0 percent housing vacancy rate in Contra Costa County in 2002, yielding over 7,700 available housing units (DOF, 2006). Since it is expected that most workers would commute to the Project site, this would have minimal impact on the housing supply. No impact, therefore, would occur on existing housing in the Project area.

Since Project operations would not require additional workers, the PPRP would not alter the location, distribution, density, or growth rate of the population of the City of Richmond or Contra Costa County. The Project would not induce significant population growth in the area, nor would it involve the displacement of housing or people. The Project, therefore, would not result in any significant adverse impacts to population or housing.

As discussed in Section 8.7.2.1 and shown on Table 8.7-1, a “minority population” (i.e., minorities comprise 50 percent or more of the population, per the USEPA Guidelines [USEPA, 1996]) exists in 60 percent of the census tracts within a 6-mile radius of the Project site. There are no significant impacts to minority populations, however, in terms of Air Quality, Noise, Public Health, Traffic, and Visual Resources. (See Sections 8.1, 8.5, 8.6, 8.9 and 8.10, respectively, for these analyses). The minority populations, therefore, would not be impacted by the PPRP.

Because the Guidelines do not give a percentage of the population as a threshold to determine the existence of a “low-income population,” the 50 percent rule required for minority populations was used. As shown in Table 8.7-2, low-income population in the affected area does not exist. Thus, any potential impacts from Air Quality, Noise, Public Health, Traffic, and Visual Resources would not disproportionately affect a low-income population in the Project area.

8.7.4 Cumulative Impacts

The Project would result in the intermittent presence of an expected average workforce of approximately 124 during the 19-month construction, with a peak workforce of 180. The temporary addition of this construction workforce would not be considered a significant impact of the Project. While other local projects may, in combination with the Project, result in a large increase in temporary construction workers in the Project area, adequate labor exists in the Bay Area to fill most of the jobs the Project would create, but a fraction of the jobs created by the Project and other cumulative projects could be filled temporarily from outside the Bay Area. The Project would not induce significant population growth in the area, nor would it involve the displacement of housing or people. The Project’s contribution to cumulative population growth and associated housing impacts, therefore, would not be cumulatively considerable, and would not result in any significant adverse impacts to population or housing. The Project does not have any cumulative socioeconomic impacts.

8.7.5 Mitigation Measures

No specific socioeconomic mitigation measures are required.

8.7.6 Laws, Ordinances, Regulations, and Standards

8.7.6.1 Federal

8.7.6.1.1 Executive Order 12898

As previously discussed in Section 8.7.2.1, President Clinton issued “Executive Order 12898 on Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” on February 11, 1994. The Order is designed to focus attention on environmental and human health conditions in areas of high minority populations and low-income communities, and to promote nondiscrimination in programs and projects substantially affecting human health and the environment (Federal Register, 1994). The Order requires the USEPA and all other federal agencies (as well as state agencies receiving federal funds) to develop strategies to address this issue. The agencies are required to identify and address any disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and/or low-income populations.

8.7.6.1.2 Environmental Justice Implementation Plan

In 1996, the USEPA’s Office of Environmental Justice released the *Environmental Justice Implementation Plan*, supplementing the USEPA’s environmental justice strategy and providing a framework for developing specific plans and guidance for implementing Executive Order 12898. In 1998, federal agencies received a framework for the assessment of environmental justice in the USEPA’s *Guidance for Incorporating Environmental Justice Concerns* in the EPA’s *National Environmental Policy Act (NEPA) Compliance Analysis*. This framework emphasizes the importance of selecting an analytical process appropriate to the unique circumstances of the potentially affected community.

8.7.6.2 State

California Code of Regulations, Section 15131, stipulates the following:

- Economic or social factors of a project may be used to determine the significance of physical changes caused by the Project.
- Economic, social, and particularly housing factors shall be considered by public agencies, together with technological and environmental factors, in deciding whether changes in a project are feasible to reduce and/or avoid the significant effects on the environment.

8.7.6.2.1 California Government Code

Section 65040.12 of the California Government Code states that “Environmental justice means fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations and policies.”

While several California state agencies have used the USEPA’s *Environmental Justice Implementation Plan* (USEPA, 1996) as a basis for the development of their own

environmental justice strategies and policies, the majority of these agencies do not yet have guidance for incorporating environmental justice impact assessment into the CEQA analysis. For example, the California Air Resources Board examined this issue and received advice from legal counsel in a memorandum entitled “CEQA and Environmental Justice” (California Air Resources Board [CARB], 2002). This memorandum states, in part:

“... [W]e would conclude that the CEQA can readily be adapted to the task of analyzing cumulative impacts/environmental justice whenever a public agency (including the California Air Resources Board, the air pollution control districts, and general purpose land use agencies) undertakes or permits a project or activity that may have a significant adverse impact on the physical environment. All public agencies in California are currently obliged to comply with the CEQA, and no further legislation would be needed to include an environmental justice analysis in the CEQA documents prepared for the discretionary actions that the public agencies undertake.”(CARB, 2002)

8.7.6.2.2 Assembly Bill

Under Assembly Bill (AB) 1553, signed into law in October 2001, the Governor’s Office of Planning and Research is required to adopt guidelines for addressing environmental justice issues in local agencies’ general plans. Currently, the Office of Planning and Research is in the process of updating the General Plan Guidelines to incorporate the requirements of AB 1553.

8.7.6.2.3 Environmental Justice Policy

The California State Lands Commission (CSLC) has developed and adopted an Environmental Justice Policy to ensure equity and fairness in its own processes and procedures. The CSLC adopted an amended Environmental Justice Policy on October 1, 2002, to ensure that “environmental justice is an essential consideration in its processes, decisions and programs and that all people who live in California have a meaningful way to participate in these activities” (CSLC, 2002). The policy stresses equitable treatment of all members of the public and commits to considering environmental justice in its processes, decision-making, and regulatory affairs. The policy is implemented, in part, by identifying and communicating with relevant populations that could be adversely and disproportionately affected by CSLC projects or programs, and by ensuring that a range of reasonable alternatives is identified that would minimize or eliminate environmental impacts affecting such populations. This discussion is provided in this document consistent with and in furtherance of the CSLC’s Environmental Justice Policy. The staff of the CSLC is required to report back to the Commission on how environmental justice is integrated into its programs, processes, and activities (ESA, 2007).

8.7.7 Permits Required

No permits specific to socioeconomics are required.

8.7.8 Involved Agencies and Agency Contacts

No agencies were involved or contacted specific to socioeconomics.

8.7.9 References

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TABLE 8.7-1
Distribution of Minority and Hispanic-Origin Populations within a Six-Mile Radius

Census Tract	Population	White	Minority	Percent Minority	Hispanic Origin	Percent Hispanic
Alameda County						
4201	2,339	1,575	764	33	164	7
4202	2,672	1,554	1,118	42	231	9
4203	4,386	2,267	2,119	48	294	7
4204	1,721	425	1,296	75	239	14
4205	2,152	1,283	869	40	203	9
4220	1,333	561	772	58	180	14
Contra Costa County						
3560.02	6,431	2,382	4,049	63	606	9
3591.01	9,544	3,612	5,932	62	1,094	11
3591.02	5,216	2,087	3,129	60	868	17
3592.02	6,529	3,739	2,790	43	870	13
3601	9,200	4,656	4,544	49	996	11
3602	4,980	2,514	2,466	50	635	13
3610	4,199	1,926	2,273	54	704	17
3620	2,855	1,680	1,175	41	298	10
3630	6,829	2,964	3,865	57	906	13
3640.01	5,144	1,754	3,390	66	1,747	34
3640.02	5,556	2,396	3,190	57	1,306	24
3650.01	5,519	1,212	4,307	78	629	11
3650.02	4,076	88	3,988	98	1,763	43
3660.01	4,632	739	3,893	84	1,694	37
3660.02	5,856	817	5,039	86	2,898	50
3671	5,326	698	4,628	87	774	15
3672	4,372	740	3,632	83	1,681	38
3680	9,324	992	8,332	89	5,921	64
3690.01	7,053	1,559	5,494	78	2,014	29
3690.02	2,828	1,141	1,687	60	537	19
3700	2,934	1,367	1,567	53	504	17
3710	5,266	1,656	3,610	69	1,320	25
3720	7,133	1,600	5,533	78	2,925	41
3730	4,290	498	3,792	88	2,454	57
3740	4,517	1,197	3,320	74	1,498	33
3750	4,502	267	4,235	94	2,787	62
3760	5,959	158	5,801	97	2,189	37
3770	7,596	636	6,960	92	3,864	51

TABLE 8.7-1
Distribution of Minority and Hispanic-Origin Populations within a Six-Mile Radius

Census Tract	Population	White	Minority	Percent Minority	Hispanic Origin	Percent Hispanic
3780	2,895	2,170	725	25	266	9
3790	6,329	202	6,127	97	1,488	24
3800	6,002	1,732	4,270	71	1,136	19
3810	6,222	316	5,906	95	1,461	24
3820	7,256	593	6,663	92	797	11
3830	4,486	2,149	2,337	52	575	13
3840	3,840	2,159	1,684	44	178	5
3851	2,661	1,673	988	37	119	4
3852	1,440	722	718	50	65	5
3860	3,324	1,138	2,186	66	354	11
3870	2,294	1,199	1,095	48	226	10
3880	2,536	1,362	1,174	46	281	11
3891	1,908	1,074	834	44	195	10
3892	1,631	734	897	55	255	16
3901	2,150	1,430	720	33	84	4
3902	1,664	1,201	463	28	73	4
3910	2,458	1,988	470	19	78	3
3920	2,314	1,816	498	22	88	4
Marin County						
1060.01	3,826	2,991	835	22	264	7
1060.02	5,745	4,087	1,658	29	871	15
1101	5,643	4,572	1,071	19	614	11
1102	5,432	4,859	573	11	193	4
1122	11,679	1,921	9,758	84	8,192	70
1212	5,521	4,561	960	17	307	6
1220	6,362	2,210	4,152	65	1,325	21
1230	2,106	2,000	106	5	46	2
1241	5,377	4,620	757	14	183	3
1242	5,431	4,869	562	10	221	4

Note:

Hispanics or Latinos are those people who classified themselves in one of the specific Spanish, Hispanic, or Latino categories listed on the Census 2000 questionnaire—"Mexican, Mexican American, Chicano," "Puerto Rican," or "Cuban"—as well as those who indicate that they are "other Spanish/Hispanic/Latino." People who identify their origin as "other Spanish/Hispanic/Latino" may be of any race. Thus, the Hispanic population percentage should not be added to percentages for racial (that is, minority) categories.

Source: U.S. Census Bureau, 2006b

TABLE 8.7-2
Distribution of Low-Income Population within a 6-mile Radius

Census Tract	Population	Low Income*	Percent Low-Income*
Alameda County			
4201	2,243	106	5
4202	2,768	238	9
4203	4,410	404	9
4204	1,682	358	21
4205	2,134	119	6
4220	1,255	164	13
Contra Costa County			
3560.02	6,326	188	3
3591.01	9,485	455	5
3591.02	5,183	307	6
3592.02	6,485	176	3
3601	9,139	523	6
3602	4,950	522	11
3610	4,114	393	10
3620	2,855	175	6
3630	6,805	352	5
3640.01	5,128	577	11
3640.02	5,528	292	5
3650.01	4,776	429	9
3650.02	4,069	1,578	39
3660.01	4,596	942	20
3660.02	5,790	864	15
3671	5,271	508	10
3672	4,333	766	18
3680	9,278	1,816	20
3690.01	6,646	1,043	16
3690.02	2,782	263	9
3700	2,923	171	6
3710	5,239	351	7
3720	7,059	667	9
3730	4,208	1,050	25
3740	4,486	685	15
3750	4,453	1,083	24

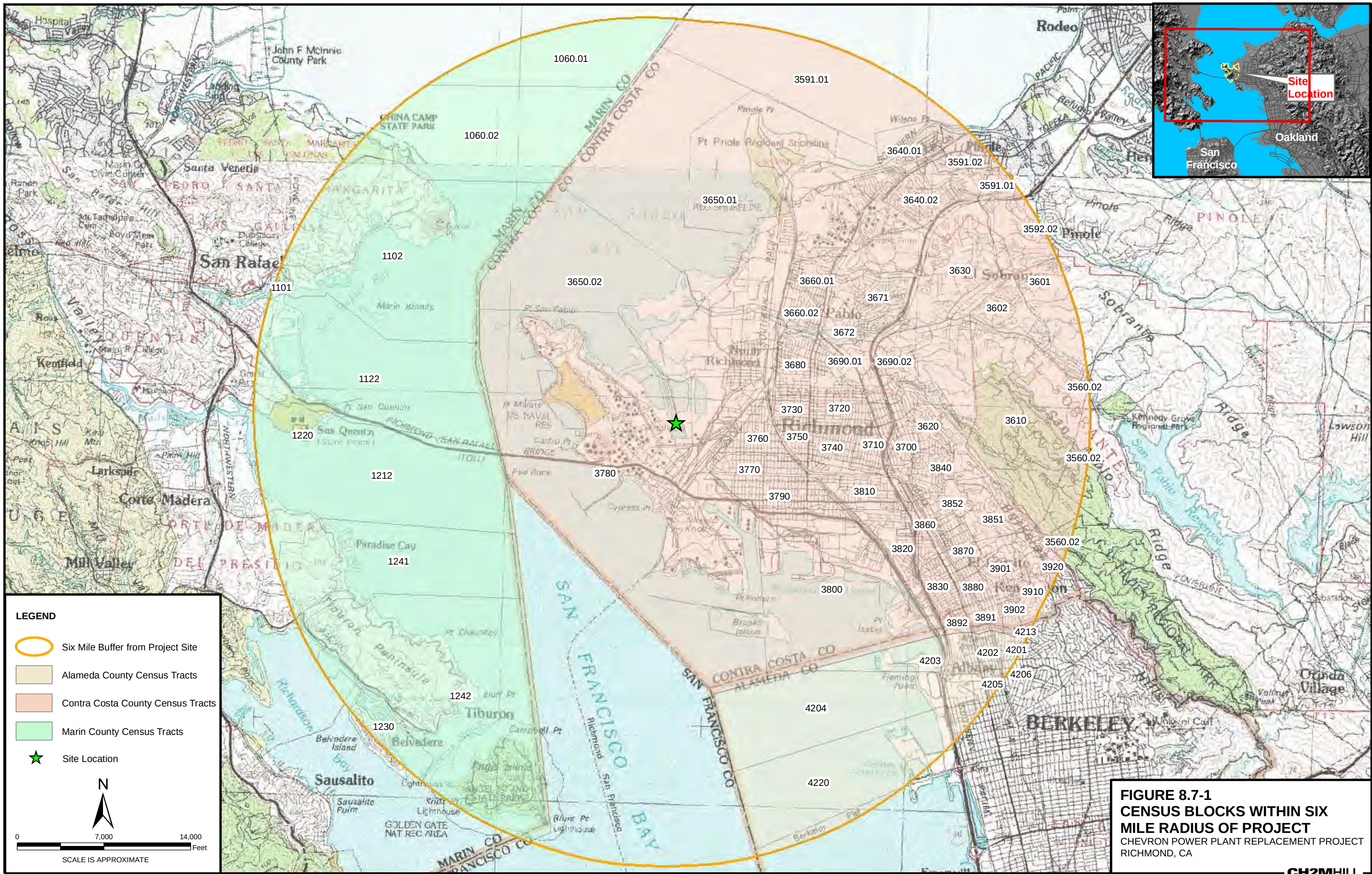
TABLE 8.7-2
Distribution of Low-Income Population within a 6-mile Radius

Census Tract	Population	Low Income*	Percent Low-Income*
3760	5,908	1,408	24
3770	7,480	2,322	31
3780	2,895	210	7
3790	6,216	1,825	29
3800	5,999	1,272	21
3810	6,152	1,207	20
3820	7,210	1,679	23
3830	4,475	280	6
3840	3,840	87	2
3851	2,652	71	3
3852	1,396	44	3
3860	3,329	328	10
3870	2,338	124	5
3880	2,529	219	9
3891	1,915	146	8
3892	1,595	200	13
3901	2,119	114	5
3902	1,683	106	6
3910	2,458	89	4
3920	2,300	72	3
Marin County			
1060.01	3,485	270	8
1060.02	5,269	389	7
1101	5,437	529	10
1102	5,414	116	2
1122	11,602	2,435	21
1212	5,512	367	7
1220	150	8	5
1230	2,104	113	5
1241	5,343	250	5
1242	5,349	225	4

Note:

* "Low income" population numbers are those for whom poverty was determined by the U.S. Census Bureau.

Source: U.S. Census Bureau, 2006b



8.8 Agriculture and Soils

The agriculture and soils section of this Small Power Plant Exemption (SPPE) Application discusses potential impacts of the proposed Chevron Richmond Refinery Power Plant Replacement Project (PPRP, or the Project) on agricultural lands and soil resources. This section provides an assessment of the significance of impacts during Project construction and operation for the PPRP site (including construction laydown areas) and electric transmission lines.

Section 8.8.2 presents the laws, ordinances, regulations, and standards (LORS) applicable to agriculture and soils. Section 8.8.3 describes the existing environmental setting that could be affected, including agricultural use and soil types. Section 8.8.4 identifies potential environmental effects, if any, from Project development, and Section 8.8.5 presents mitigation measures. Section 8.8.6 describes the required permits and provides agency contacts. Section 8.8.7 provides the references used to develop this section of the SPPE.

A map of soil types is provided in Figure 8.8-1 (all figures are located at the end of this section). Important farmlands are shown in Figure 8.8-2.

8.8.1 Introduction

Chevron is proposing the PPRP to add an additional 60 megawatts (MW) net generation to its existing refinery electrical generation located within Chevron's Richmond Refinery in the City of Richmond (see Figure 1.2-1) in Contra Costa County, California. The proposed PPRP will be integrated into Chevron's plans to meet its growing refinery electrical load, and produce steam to replace an existing boiler plant that is approaching its end of life. The PPRP is a subset of the larger Richmond Refinery Renewal Project that is concurrently undergoing California Environmental Quality Act (CEQA) review by the City of Richmond. The California Energy Commission (CEC) has jurisdiction for only the PPRP portion of the Renewal Project that is the subject of this application.

The PPRP will consist of the following components:

- A nominal 43-MW net, natural gas- or liquid petroleum gas (butane)-fired cogeneration train consisting of one combustion turbine generator (CTG), a refinery fuel gas-fired heat recovery steam generator, 13.8-kV switchgear and ancillary equipment.
- Shutdown of the existing No. 1 power plant refinery steam boilers currently providing steam to the Refinery.
- A 17-MW net extraction, condensing steam turbine generator (STG), an associated cooling tower, and 12-kV switchgear installed as part of the new hydrogen production facility (the remainder of the hydrogen plant is under CEQA review as part of the Renewal Project). The new hydrogen plant will be a net generator of steam for both the STG and the refinery steam system.
- Reconductoring of approximately 4,000 feet of existing onsite double-circuit overhead 115-kV transmission line to upgrade its ampacity. The reconductoring will reuse existing transmission line structures.

- Adjacent onsite service connections for fuel, reclaimed water, water, wastewater, steam, and electricity to existing piperacks, with the exception of the reconductoring noted above.

The Cogen 3000 portion of the PPRP will occupy approximately 0.5 acre within an existing 5.2-acre cogeneration facility, and the STG and associated equipment (H₂-STG) will occupy approximately 0.5 acre within a new 7.9-acre hydrogen plant that will be built as part of the Richmond Refinery Renewal Project. The PPRP will be located well within the heart of the existing 2,900-acre Richmond Refinery. Temporary construction laydown and parking for the PPRP will be provided in various existing laydown areas within the Refinery that are currently used for ongoing maintenance and project laydown. A complete description of the PPRP is provided in Section 2.0.

8.8.2 Laws, Ordinances, Regulations and Standards

The federal, state, and local LORS that apply to agricultural and soil resources for the Project are discussed below, and are summarized in Table 8.8-1.

8.8.2.1 Federal LORS

8.8.2.1.1 Federal Water Pollution Control Act of 1972 and the Clean Water Act of 1977

The Federal Water Pollution Control Act of 1972, commonly referred to as the Clean Water Act (CWA) following amendment in 1977, establishes requirements for discharges of stormwater or wastewater from any point source that would affect the beneficial uses of waters of the United States. The State Water Resources Control Board (SWRCB) adopted one statewide National Pollutant Discharge Elimination System (NPDES) General Permit that would apply to stormwater discharges associated with construction, industrial, and municipal activities. The San Francisco Bay Regional Water Quality Control Board is the administering agency for the NPDES permit program. The CWA's primary effect on agriculture and soils within the Richmond Refinery consists of control of soil erosion and sedimentation during construction. This includes the preparation and execution of erosion and sedimentation control plans, and measures for any soil disturbance during construction.

8.8.2.1.2 U.S. Department of Agriculture Engineering Standards

The U.S. Department of Agriculture, Natural Resources Conservation Service's (NRCS's) *National Engineering Handbook* (NRCS, 1983), Sections 2 and 3 provide standards for soil conservation during planning, design, and construction. Activities associated with the proposed Project will conform to applicable standards in the National Engineering Handbook to ensure that the Project will not cause soil loss through accelerated erosion.

8.8.2.2 State LORS

8.8.2.2.1 California Public Resources Code Section 25523(a); Title 20 CCR Sections 1752, 1752.5, 2300-2309, and Chapter 2, Subchapter 5, Article 1, Appendix B, Part (i)

These regulations stipulate the environmental review and siting procedures to be followed in the development of power generation projects larger than 50 megawatts. The CEC is the administering agency for this authority.

TABLE 8.8-1
Laws, Ordinances, Regulations, and Standards for Agricultural and Soil Resources

Jurisdiction	LORS	Purpose	Regulating Agency	Applicability (SPPE Section Explaining Conformance)
Federal	Federal Water Pollution Control Act of 1972: Clean Water Act (CWA) of 1977 (including 1987 amendments).	Regulates stormwater discharge from construction and industrial activities	RWQCB – San Francisco Bay Region under the SWRCB	Sections 8.8.2.1 and 8.8.4.2.
	National Resource Conservation Service (NRCS) (1983), <i>National Engineering Handbook</i> , Sections 2 and 3.	Standards for soil conservation	Natural Resources Conservation Commission	Sections 8.8.2.1 and 8.8.5.
State	California Public Resources Code 25523(a); 20 California Code of Regulation (CCR) 1752, 1752.5, 2300-2309, and Chapter 2, Subchapter 5, Article 1, Appendix B, Part (i).	Describes requirements for protection of environmental quality	California Energy Commission (CEC)	Section 8.8.2.2 and 8.8.4.2.
	Guidelines for Implementation of the California Environmental Quality Act (CEQA), Appendix G; 14 CCR 15000-15387.	Regulates erosion and sedimentation; conversion of agricultural lands	CEC	Section 8.8.2.2 and 8.8.4.2.
	Porter-Cologne Water Quality Control Act of 1972; California Water Code 13260-13269: 23 CCR Chapter 9.	Regulates stormwater discharge	CEC and the San Francisco Bay Region under the SWRCB	Section 8.8.2.2 and 8.8.5.
Local	City of Richmond General Plan, 1994.	Describes local policies for agricultural and soil resources	City of Richmond, Planning and Building Regulations Departments	Section 8.8.2.3.1.
	City of Richmond Municipal Code, 2006.	Regulates grading, erosion, and sediment control for construction projects within City limits and rights-of-way (ROWs)	City of Richmond, Planning and Building Regulations Departments	Section 8.8.2.3.2.
	California Land Conservation Act of 1965 (Williamson Act).	Provides financial incentives for conservation of agricultural lands	California Department of Conservation, Office of Land Conservation, Contra Costa County Board of Supervisors	Section 8.8.2.3.3.

8.8.2.2.2 Guidelines for Implementation of CEQA of 1970, 14 CCR, Sections 15000-15387, Appendix G

The CEQA authority must be considered for agriculture and soils for the PPRP because the Project could potentially affect the environment by causing excessive erosion or sedimentation, or impair the agricultural productivity of prime or unique farmlands, or farmlands of statewide importance.

8.8.2.2.3 California Porter-Cologne Water Quality Control Act of 1972; California Water Code, Sections 13260-13269; 23 CFR Chapter 9

The California Water Code requires protection of water quality by appropriate design, sizing, and construction of erosion and sediment controls. The discharge of soil into surface waters resulting from land disturbance may require filing a report of waste discharge (see Water Code Section 13260a).

8.8.2.3 Local LORS

The proposed Project is located entirely within the Chevron Richmond Refinery boundaries and does not affect lands in other portions of the City of Richmond or in unincorporated portions of Contra Costa County. As such, regulations associated with Contra Costa County authorities do not directly bear upon the Project.

8.8.2.3.1 City of Richmond General Plan, 1994

The City of Richmond General Plan (City of Richmond, 1994) presents policies within the Open Space and Conservation Element that provide for guidance and implementation of land use controls in and around the City's sphere of influence. Included in the general plan are provisions for protecting and maintaining open space land uses, which include agricultural uses such as nurseries and grazing lands. The primary impact on soils and agriculture from future development would be the loss of productive farmland.

The Open Space and Conservation Element also describes the City's policies towards minimizing soil erosion and sedimentation by requiring grading permits, and by having minimum standards for soil erosion and sedimentation control measures (City of Richmond, 1994).

The General Plan has other sections that address agricultural land uses. The identification of agricultural lands (especially those associated with specified preservation areas) is required within the Land Use Element (City of Richmond, 1994).

8.8.2.3.2 City of Richmond Municipal Code

The City of Richmond has established a permitting process to evaluate grading and excavation plans for proposed projects. The municipal code for the grading permit review process (City of Richmond Municipal Code Chapter 12.44) establishes permitting requirements and exemptions for general earthwork operations. Additionally, sediment transport and activities that could result in erosion that could cause the discharge of pollutants into stormwater systems or watercourses are regulated under Chapter 12.22 of the City of Richmond Municipal Code.

Prior to construction of the proposed Project, a construction stormwater pollution prevention plan (SWPPP) will be prepared. The SWPPP and an accompanying general stormwater NPDES permit application is submitted to the City's Engineering Division for

initial review and then the SWPPP and permit application is transmitted by the City to the San Francisco Bay Regional Water Quality Control Board (Davidson, pers. comm. 2006).

A grading permit will also be required for excavation and grading activities associated with the Project. The grading permit is secured through the Building Regulations Department and the associated permit fee is based upon a sliding scale depending on the estimated volume of soil that will be affected (Gandhi, pers. comm., 2006).

The site location and design information will be reviewed by the City of Richmond Planning Department (Velasco, pers. comm. 2006). Because the Project will not extend into public rights-of-way beyond the boundaries of the Chevron Richmond Refinery, no encroachment permit will be required.

8.8.2.3.3 California Land Conservation Act of 1965

The California Land Conservation Act of 1965, commonly referred to as the Williamson Act, enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space uses. A landowner can decide that he will not convert a certain parcel of land out of agricultural use for a 10-year period (with an annual review of the land use status). In return, the land is taxed at a rate based on the actual use of the land for agricultural purposes, as opposed to its unrestricted market value. Participation in the Williamson Act program is dependent on County adoption and implementation of the program, and is voluntary for landowners.

8.8.3 Environmental Setting

The Project is entirely within the 2,900-acre Chevron Richmond Refinery, which is located in the City of Richmond. The City is located in the western portion of Contra Costa County, California. The Refinery is located along the western edge of the City of Richmond and occupies the majority of the Point San Pablo Peninsula adjacent to the San Pablo Bay. The eastern and southern boundaries of the Refinery are located in the vicinities of residential communities within North Richmond and Point Richmond, respectively. The Chevron Richmond Refinery began operations in 1902 and has been in continuous operation since that time. Zoning for the area is Heavy Industrial land uses (City of Richmond, 1994).

The proposed Project will primarily consist of a combustion turbine with a heat recovery steam cogeneration system and a small cooling tower that provides cooling water for the cogeneration unit.

A new steam turbine generator associated with a new hydrogen plant will also be installed (Note: the new hydrogen plant is undergoing CEQA review by the City under a separate project). The STG also requires the installation and operation of a cooling tower that supplies cooling water to the STG.

Appurtenances associated with the proposed Project include pipeline connections for fuel lines to the cogeneration unit, process water, steam, and wastewater pipelines for both the cogeneration unit and hydrogen plant STG, as well as a new electrical interconnections for hydrogen plant STG and reconductoring of the existing cogeneration 115-kV transmission lines. All proposed facilities will be located within the existing Chevron Richmond Refinery boundaries.

Soil resource information for the Project site and vicinity was derived from published soil surveys prepared by the NRCS for Contra Costa County, California (NRCS, 1977), as shown on Figure 8.8-1. Detailed soil descriptions were developed from the soil survey (NRCS, 1977) and from the NRCS Official Series Descriptions (OSD) web page (<http://soils.usda.gov/technical/classification/osd/index.html>), as summarized in Table 8.8-2. Relevant soil characteristics in the Project area include depth, texture, drainage, permeability, erosion hazard rating, land capability classification, and Storie Index Ratings (used as an indicator of its revegetation potential). The important farmlands designation of the soil mapping unit is also included, where applicable.

TABLE 8.8-2
Mapping Unit Descriptions and Characteristics

Map Unit	Description
Cc	Clear Lake clay - slope class (0 to 2 percent) – No direct impacts from the Project to this soil unit – Prime Farmland – Poorly drained – Very deep soils, nearly level to gently sloping relief – Formed in alluvium mainly derived from sedimentary rocks – Very dark-gray clay surface and mottled very dark grayish-brown and grayish-brown clay subsurface – Slow to very slow permeability – Runoff is very slow – No hazard of erosion where soil is tilled and exposed – Capability Class: IIs-5 (17) – High shrink-swell potential – Storie Index Rating: Index 49; Grade 3, Drainage limitation – Taxonomic class: Fine, smectitic, thermic, Xeric Endoaquerts – Elevation range from 25 to 2,000 feet
CeB	Conejo clay loam - slope class (2 to 5 percent) – Approximately 205 feet of 115-kV transmission line runs through this soil unit. It is expected that two of the existing electrical towers are located within this unit. – Prime Farmland – Well drained – Very deep soils, gently sloping – Formed in alluvium from basic igneous or sedimentary rocks – Dark-gray clay loam surface and mottled, grayish-brown and brown clay loam subsurface – Moderately slow permeability – Runoff is slow – Hazard of erosion is slight where soil is tilled and exposed – Capability Class: IIe-1 (17) – Moderate shrink-swell potential – Storie Index Rating: Index 81; Grade 1 – Taxonomic class: Fine-loamy, mixed, superactive, thermic Pachic Haploxerolls – Elevation range from 30 to 2,000 feet

TABLE 8.8-2
Mapping Unit Descriptions and Characteristics

Map Unit	Description
LeG	Los Gatos loam - slope class (50 to 70 percent) – No direct impacts from the Project to this soil unit – Well drained – Located on steep or very steep mountainous areas – Formed in residuum from sandstone, shale, and metasedimentary rocks – Brown, heavy loam surface and brown, light clay loam subsurface – Moderate permeability – Runoff is very rapid – Hazard of erosion is high where soil is bare – Capability class: VIIe-1 (15) – Moderate shrink-swell potential – Storie Index Rating: Index 11; Grade 5; Nutrient level limitation – Taxonomic class: Fine-loamy, mixed, active, mesic Typic Argixerolls – Elevation range from 200 to 4,000 feet
MeG	Millsholm loam - slope class (50 to 70 percent) – No direct impacts from the Project to this soil unit – Well drained – Very steep, located on uplands – Formed from interbedded shale and fine-grained sandstone – Grayish-brown loam surface and subsurface – Moderate permeability – Runoff is rapid – Hazard of erosion is very high where the soil is bare – Capability class: VIIe-1 (15) – Low shrink-swell potential – Storie Index Rating: Index 8; Grade 6; Nutrient level limitation – Taxonomic class: Loamy, mixed, superactive, thermic Lithic Haploxerepts – Elevation range from 180 to 4,570 feet
Ra	Reyes silty clay - slope class (0 to 2 percent) – This soil unit is crossed at two locations (approximately 125 feet and 2, 200 feet) by the existing 115-kV transmission line, which will be reconductored for the Project. – Very poorly drained – Deep soils, nearly level – Formed in alluvium from mixed sources – Very dark grayish-brown silty clay surface and dark gray silty clay subsurface – Most areas subject to inundation during high tides – Slow permeability – Runoff is very slow or ponded – No hazard of erosion – Capability class: VIIlw-1 (16) – High shrink-swell potential – Storie Index Rating: Index 6; Grade 6; Tidal overflow limitation – Taxonomic class: Fine, mixed, active, acid, thermic Sulfic Fluvaquents – Elevation range from 2 feet below sea level to 10 feet above

TABLE 8.8-2
Mapping Unit Descriptions and Characteristics

Map Unit	Description
So	Sycamore silty clay loam - slope class (0 to 2 percent) – No direct impacts from the Project to this soil unit – Prime Farmland – Poorly drained – Located on nearly level flood plains – Formed in mixed sedimentary alluvium – Grayish-brown silty clay loam surface and mottled pale-brown to dark grayish-brown silt loam subsurface – Moderate to moderately slow permeability – Runoff is slow – Hazard of erosion is none to slight – Capability class: I (17) – Moderate shrink-swell potential – Storie Index rating: Index 81; Grade 1; Drainage limitation – Taxonomic class: Fine-silty, mixed, superactive, nonacid, thermic Mollic Endoaquepts – Elevation range from 10 to 100 feet
Sp	Sycamore silty clay loam, clay substratum - slope class (0 to 2 percent) – No direct impacts from the Project to this soil unit – Prime Farmland – Poorly drained – Located on nearly level flood plains – Formed in mixed sedimentary alluvium – Grayish-brown silty clay loam surface and mottled pale-brown to dark grayish-brown silt loam subsurface – Moderately slow permeability – Runoff is slow – Slight hazard of erosion – Capability class: Ilw-2 (17) – Moderate shrink-swell potential – Storie Index Rating: Index 77; Grade 2; Drainage limitation – Taxonomic class: Fine-silty, mixed, superactive, nonacid, thermic Mollic Endoaquepts – Elevation range from 10 to 100 feet
Ub	Urban Land (no slope class given but assumed to be 0 to 5 percent in Project area) – All proposed Project features and laydown areas, as well as majority of the existing 115-kV transmission line are within this soil unit – Variable drainage depending on nature and amount of fill – Located on the nearly all level margins of the San Francisco Bay – Variable characteristics depending on nature and origin of fill. Compacted construction fill is expected beneath existing structures, parking areas and roadways. – Many areas are covered with asphalt materials to reduce fire or erosion danger

Notes:

Soil characteristics are based on soil mapping provided in the published soil surveys (NRCS, 1977) and a review of corresponding OSDs. Soil map units described above are those that would be directly impacted by the Project or are within 1 mile of the Project facilities.

Figure 8.8-2 shows “Important Farmlands” as defined by the California Department of Conservation (CDC) (CDC, 2004). The Farmland Mapping and Monitoring Program (FMMP) designates specific important farmland areas as follows: Prime Farmland;

Farmland of Statewide Importance; Unique Farmland; and Farmlands of Local Importance. Other land use designations in the FMMP system include Grazing Land; Urban and Built-Up Land; Other Land; and Water.

8.8.3.1 Agricultural Use

Figure 8.8-2 shows that the Project facilities are located primarily in an area that is designated as Urban and Built-up Land. Aerial photographs indicate that there is an inundated area that is crossed by the existing 115-kV transmission line that will be reconducted due to this Project. This inundated area is an aerated lagoon operated by the Refinery, indicated on Figure 8.8-1 (shown as water) or Figure 8.8-2 (shown as Urban and Built-up Land). The only mapped important farmland property in proximity to the Project site is a small parcel of land approximately 0.8 mile to the northeast. This agricultural property is designated as Unique Farmland and will not be impacted by the proposed Project.

The Project site is located in an area that is not used for agricultural purposes and is zoned for heavy industrial activities. The majority of the Project features will be constructed within Urban and Built-Up Land areas. For these reasons, construction of the Project will not affect agricultural resources or any land that is currently under a Williamson Act contract.

8.8.3.2 Soil Types

As previously described, the soil mapping unit that would be primarily affected by the proposed Project is the Urban Land soil unit. As shown in Figure 8.8-1, two other soil units that may be impacted by the reconductoring of the existing 115-kV transmission lines include the [CeB] Conejo clay loam (2 to 5 percent slopes) and the [Ra] Reyes silty clay. The Conejo clay loam may be affected by over approximately 205 feet during the reconductoring of the existing 115-kV transmission line where the line passes through this soil unit. There are no apparent limitations of this soil unit with respect to construction and the erosion potential is slight.

The Reyes silty clay soil unit is found along the existing 115-kV transmission line. While this soil unit does not have any erosion hazard, it does exhibit high shrink/swell characteristics. However, since no ground-disturbing activities are associated with the transmission line reconductoring, the high shrink/swell characteristics will not affect the Project.

No other soil units mapped in the Project area would be impacted by the proposed Project activities.

8.8.3.3 Prime Farmlands

Important Farmlands in the Project vicinity are shown on Figure 8.8-2 (CDC, 2004) and are also summarized in Table 8.8-2. According to this information, there are no Prime Farmlands within 1 mile of the Project.

8.8.3.4 Soil Loss and Erosion

Soil loss and erosion in the Project area is expected to be negligible or slight. The majority of the Project site is within the Urban Land soil unit. Fill soils associated with existing or former structures, parking areas, and roadways are likely to consist of compacted

construction fill. Given the flat topography in the Project area, and that construction best management practices (BMPs) will be employed, the risk of erosion from these areas is considered negligible. Similarly, the other two soil units that would be affected by reconductoring of the existing 115-kV transmission line facilities, [CeB] Conejo clay loam (2 to 5 percent slopes) and the [Ra] Reyes silty clay, have slight or non-existent erosion hazards. Use of construction BMPs in these areas is expected to effectively control soil losses during construction that could impact air or surface water resources.

8.8.4 Impacts

8.8.4.1 Environmental Checklist

Table 8.8-3 provides the CEQA Checklist questions that are used in this SPPE Application to assess the significance of potential impacts.

TABLE 8.8-3
CEQA Checklist

Impacts	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
SOILS —Would the Project:				
Convert to non-agricultural use the Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, as shown on the maps for the FMMP by the California Resources Agency?				X
Conflict with existing zoning for agricultural use or a Williamson Act contract?				X
Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to non-agricultural use?				X
Impact jurisdictional wetlands?				X
Result in substantial soil erosion?				X
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?			X	
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?				X

8.8.4.2 Discussion of Impacts

The following information is intended to allow assessment of impacts associated with the specific proposed Project activities.

8.8.4.2.1 Buildings and Laydown Areas

The majority of the Project facilities are located on the Urban Land soil unit. As previously described, the soil survey does not provide specific descriptions of soil characteristics for these areas. This is because these conditions are a function of the type and amount of fill materials that have been imported to create the current landscape. It is expected, however, that in locations where previous Chevron Richmond Refinery facilities (for example, buildings, parking areas, and roadways) have been constructed, the fill will consist of compacted construction material. It is further expected that impacts to these soils from construction and operation of the proposed Project facilities will be negligible.

8.8.4.2.2 Transmission Lines

As previously described, the reconductoring of the existing transmission line would occur on the Urban Land soil unit and the [CeB] Conejo clay loam (2 to 5 percent slopes) and the [Ra] Reyes silty clay soil units. Since the reconductoring would not result in ground disturbance, impacts to these two soil units are not expected.

Changes in the physical characteristics of the soil will occur due to mechanical compaction required to provide suitable foundation support for the structures associated with the proposed facilities and transmission lines. Mechanical compaction will increase the *in situ* density of the soil, and reduce its porosity and permeability. The majority of existing area around the Project site is already paved or will be paved after completion of the Project. In areas that have existing or former facilities, it is expected that these soils will already have been compacted prior to previous construction activities. Any areas that are not paved after construction of the Project will be covered with gravel. This activity will reduce surface infiltration of the site and increase surface runoff. The additional surface water runoff will be directed via catchment basins and underground culverts to the Refinery's existing stormwater system.

The Chevron Richmond Refinery has not been used for agricultural purposes for the past 100 years. Furthermore, there is only a limited, mapped area of farmland within 1 mile of the proposed facilities (see Figure 8.8-2). There are no Prime Farmlands mapped within 1 mile of the proposed Project facilities. For these reasons, the Project will not result in any conversion of "Farmlands" to non-agricultural use. The mapped soil units that would be affected by the construction of the Project facilities indicate a negligible or slight potential for soil loss from water erosion. Given the planned use of construction BMPs, actual soil losses from water or wind are expected to be negligible. The proposed Project will tie into existing sanitary wastewater facilities so onsite septic systems will not be required.

Environmental investigations were conducted on the Chevron Richmond Refinery site for subsurface soils beneath the proposed hydrogen plant site and the cogeneration plant site (SAIC, 2006a; 2006b). These studies indicated that samples of these media had been impacted with constituents of potential concern (COPCs) associated with historical industrial activities such as total petroleum hydrocarbons (TPH) in the gasoline and diesel ranges and metals (mercury and lead). These studies indicated that some of the soils at both facilities exceeded federal and/or state criteria for hazardous waste, which will require special handling and prevent the re-use of those soils during construction.

At the proposed hydrogen facility, it was also noted that shallow groundwater (1 to 4 feet below ground surface) had free-phase liquid hydrocarbon at nearly half of the 63 sample

locations that were investigated and had several groundwater samples among five locations where the maximum allowable contaminant limits (MACLs) established for the Refinery were exceeded (SAIC, 2006a). The results of these investigations indicate that plans will have to be developed to protect future construction and site workers from exposures to COPCs and to properly handle affected environmental media (i.e., soil and groundwater).

8.8.4.2.3 Operational Impacts

The Project operation will not result in impacts to the soil from erosion or compaction. Routine vehicle traffic during Project operation will be limited to existing roads, most of which will be paved or covered with gravel. Standard operating activities will not routinely involve the disruption of soil. Anticipated impacts to soil resources from Project operations will be less-than-significant.

8.8.4.2.4 Effects of Generating Facility Emissions on Soil-Vegetation Systems

There is a concern in some areas that emissions from the generating facility, principally nitrogen oxides (NO_x) from the combustors or drift from the cooling towers, would have an adverse effect on soil-vegetation systems in the Project vicinity. This is principally a concern where environments that are highly sensitive to nutrients or salts, such as serpentine habitats, are downwind of the Project.

In this case, the dominant land use around the Project is urban and the serpentine habitats in the Project area are all developed for industrial, commercial, or residential uses. The addition of small amounts of nitrogen to the industrial and commercial areas would be insignificant because of the paucity of vegetation in these areas. Within the more vegetated residential areas, the addition of small amounts of nitrogen would be insignificant within the context of fertilizers, herbicides, and pesticides typically used by homeowners. It should also be noted that the proposed cogeneration unit is designed to control NO_x emissions. For these reasons, the operations of the cogeneration unit is not expected to have any effect on soil or agricultural resources in the Project vicinity.

8.8.4.3 Summary of Impacts

There are no lands currently used for agricultural purposes that would be affected by the proposed Project or transmission line. The proposed Project features all occur within the Chevron Richmond Refinery Facility limits in an area currently zoned for heavy industrial use. No impacts to agricultural resources will occur due to construction or operations of the Project facilities.

Use of BMPs during construction will reduce the potential for soil erosion to a less-than-significant level. Pavement or gravel covering exposed portions of the Refinery site will reduce the potential for soil erosion after Project completion to a less-than-significant level. Emissions of NO_x during the Project operations are expected to have a less-than-significant impact.

8.8.4.4 Cumulative Impacts

The current City of Richmond General Plan (1994) designates the proposed Project site and vicinity for current and future heavy industrial purposes, which is consistent with the proposed Project. Because the Project will not affect any agricultural resources, and will have limited impacts in already disturbed industrial areas, the Project is not expected to have any cumulative impacts to agricultural or soil resources in Contra Costa County.

8.8.5 Mitigation Measures

Erosion control measures would be required during construction to help maintain water quality, protect property from erosion damage, and prevent accelerated soil erosion or dust generation that destroys soil productivity and soil capacity. Temporary erosion control measures could be installed before construction begins, would be maintained and evaluated during construction, and would be removed from the site after the completion of construction.

8.8.5.1 Temporary Erosion Control Measures

Temporary erosion control measures would be implemented before construction begins, and would be evaluated and maintained during construction. These measures typically include physical stabilization, dust suppression, berms, ditches, and sediment barriers. Disturbed areas would be paved or covered with gravel as soon as possible after construction.

During construction of the Project and the related linear facilities, dust erosion control measures would be implemented to minimize the wind-blown erosion of soil from the site. Water of a quality equal to or better than either existing surface runoff or irrigation water would be sprayed on the soil in construction areas to control dust.

Because of the potential for contaminated soil and groundwater beneath proposed Project structures, it will be necessary to develop plans to protect future construction and site workers from exposures to COPCs and to properly handle affected environmental media.

Sediment barriers, such as straw bales, sand bags, or silt fences, will slow runoff and trap sediment. Sediment barriers are generally placed below disturbed areas, at the base of exposed slopes, and along streets and property lines below the disturbed area. Sediment barriers are often placed around sensitive areas, such as creeks or storm drains, to prevent contamination by sediment-laden water.

The site will be constructed on relatively level ground; therefore, it is not considered necessary to place barriers around the property boundary. Some barriers, however, would be placed in locations where offsite drainage could occur to prevent sediment from leaving the site. Barriers and other sedimentation control measures would be used to prevent runoff into irrigation ditches or water bodies located near the site. If used, straw bales would be properly installed (staked and keyed), then removed or used as mulch after construction. Runoff detention basins, drainage diversions, and other large-scale sediment traps are not considered necessary due to the level topography and surrounding paved areas. Any soil stockpiles would be stabilized and covered if left onsite for long periods of time, including placement of sediment barriers around the base of the stockpile.

8.8.5.2 Permanent Erosion Control Measures

After construction is complete, all exposed areas are planned to be paved or covered with gravel, representing the permanent erosion control measures for the site.

8.8.6 Permits and Agency Contacts

Permits required for the Project, the responsible agencies, and proposed schedule are shown in Table 8.8-4.

TABLE 8.8-4
Permits and Agency Contacts for Agriculture and Soils

Permit or Approval	Schedule	Agency Contact	Applicability
City Approval of Grading Plan	1 to 3 months prior to construction	Jayant Gandhi, Associate Civil Engineer Building Regulations Department City of Richmond 1401 Marina Way South Richmond, CA 94804 (510) 620-6540	Excavations or grading of site surface
City Approval of Site Location and Design Issues	2 to 3 months prior to construction	Janet Harbin, Principal Planner Planning Department City of Richmond 1401 Marina Way South Richmond, CA 94804 (510) 620-6708	General project review
Construction Activity, Stormwater and NPDES Permit	3 to 4 months prior to construction	San Francisco Bay RWQCB Dale Bowyer Program Coordinator 1515 Clay St. Suite 1400 Oakland, CA 94612 (510) 622-2323	Regulation of stormwater discharge from site and linear facilities during construction

8.8.7 References

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LEGEND

-  Plant
-  Laydown
-  Soil Map Unit Boundary
-  1 Mile Buffer
-  Transmission Lines



SOIL LEGEND

Cc - Clear Lake clay
 CeB - Conejo clay loam, 2 to 5 percent slopes
 LeG - Los Gatos loam, 50 to 70 percent slopes
 MeG - Millsholm loam, 50 to 70 percent slopes
 Qa - Quarry
 Ra - Reyes Silty Clay
 So - Sycamore silty clay loam
 Sp - Sycamore silty clay loam, clay substratum
 Ub - Urban Land
 w - Water
 Source: NRCS, 1977

FIGURE 8.8-1 SOILS MAP

CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA

CH2MHILL



LEGEND

-  Plant Area
-  Laydown Area
-  Transmission Line
-  1 Mile Buffer



MAP LEGEND

-  Urban and Built-up Land
-  Water
-  Unique Farmland
-  Other land

Source: FMMP, 2004

FIGURE 8.8-2
IMPORTANT FARMLANDS MAP
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA

CH2MHILL

8.9 Traffic and Transportation

This section of the Small Power Plan Exemption (SPPE) Application discusses potential impacts of the proposed Chevron Richmond Refinery Power Plant Replacement Project (PPRP, or the Project) on the existing transportation system. This includes any necessary modifications to the transportation system and increase in traffic from construction and operation of the proposed Project. Descriptions of the existing transportation system and Levels of Service (LOS) are presented, along with an analysis of potential impacts and related mitigation measures.

Section 8.9.1 presents a summary description of the PPRP; Section 8.9.2 describes the affected environment; Section 8.9.3 discusses the environmental consequences of construction and subsequent operation; Section 8.9.4 presents applicable laws, ordinances, regulations and standards (LORS); Section 8.9.5 provides a list of required permits and a schedule for obtaining them; Section 8.9.6 provides a list of involved agencies and agency contacts, and Section 8.9.7 provides reference information on the works cited in this section.

8.9.1 Introduction

Chevron is proposing the PPRP to add an additional 60 megawatts (MW) net generation to its existing refinery electrical generation located within Chevron's Richmond Refinery in the City of Richmond (see Figure 1.2-1) in Contra Costa County, California. The proposed PPRP will be integrated into Chevron's plans to meet its growing refinery electrical load, and produce steam to replace an existing boiler plant that is approaching its end of life. The PPRP is a subset of the larger Richmond Refinery Renewal Project that is concurrently undergoing California Environmental Quality Act (CEQA) review by the City of Richmond. The California Energy Commission (CEC) has jurisdiction for only the PPRP portion of the Renewal Project that is the subject of this application.

The PPRP will consist of the following components:

- A nominal 43-MW net, natural gas- or liquid petroleum gas (butane)-fired cogeneration train consisting of one combustion turbine generator (CTG), a refinery fuel gas-fired heat recovery steam generator, 13.8-kV switchgear and ancillary equipment.
- Shutdown of the existing No. 1 power plant refinery steam boilers currently providing steam to the Refinery.
- A 17-MW net extraction, condensing steam turbine generator (STG), an associated cooling tower, and 12-kV switchgear installed as part of the new hydrogen production facility (the remainder of the hydrogen plant is under CEQA review as part of the Renewal Project). The new hydrogen plant will be a net generator of steam for both the STG and the Refinery steam system.
- Reconductoring of approximately 4,000 feet of existing onsite double-circuit overhead 115-kV transmission line to upgrade its ampacity. The reconductoring will reuse existing transmission line structures.

- Adjacent onsite service connections for fuel, reclaimed water, water, wastewater, steam, and electricity to existing piperacks, with the exception of the reconductoring noted above.

The Cogen 3000 portion of the PPRP will occupy approximately 0.5 acre within an existing 5.2-acre cogeneration facility, and the STG and associated equipment (H₂-STG) will occupy approximately 0.5 acre within a new 7.9-acre hydrogen plant that will be built as part of the Richmond Refinery Renewal Project. The PPRP will be located well within the heart of the existing 2,900-acre Richmond Refinery. Temporary construction laydown and parking for the PPRP will be provided in various existing laydown areas within the Refinery that are currently used for ongoing maintenance and project laydown. A complete description of the PPRP is provided in Section 2.0.

8.9.2 Affected Environment

The proposed PPRP is located within the existing Chevron Richmond Refinery boundaries, along the western edge of the City of Richmond, in Contra Costa County, California, at 841 Chevron Way. The approximately 2,900-acre existing 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 main portion of the Refinery lies within the City's M-3, Heavy Industrial Zoning District.

The Refinery is located west of Castro Street and mostly to the north of Interstate 580 (I-580). All construction would take place within the Refinery boundaries. Any required parking, staging, fabrication, or laydown areas would also be within Refinery boundaries.

This section describes the existing regional and local roadways. Figure 8.9-1 illustrates the major roads, potential access roads, and highways in the PPRP vicinity.

8.9.2.1 Surrounding Roadway Network

The PPRP employees and construction workers commuting during the construction of the Project may affect the roadways in the vicinity of the Project site. Regional access to the PPRP site is provided via I-580, which connects to I-80. Local access to the PPRP site is provided via Castro Street and Richmond Parkway. The affected roadways are described below.

- I-580 is a generally east-west freeway that connects I-80 to the east and Highway 101 in Marin County to the west, via the Richmond-San Rafael Bridge. In the vicinity of the Project site, I-580 is a six-lane freeway. The PPRP can be accessed via the interchange at Castro Street. I-580 is a designated Route of Regional Significance in the City of Richmond General Plan (City of Richmond, 2006) and other regional planning documents.
- I-80 is an east-west freeway that connects Sacramento to the east and the San Francisco Bay Area to the south and west. In the vicinity of the Project site, I-80 is an eight-lane freeway with one HOV lane in each direction. The PPRP can be accessed via an interchange at Richmond Parkway. I-80 is a designated Route of Regional Significance in the City of Richmond General Plan and other regional planning documents.

- Richmond Parkway is a major four- to six-lane divided roadway, which connects I-580 and I-80. Before connecting with I-580, Richmond Parkway splits into two parallel segments, Castro Street and Garrard Boulevard. Richmond Parkway is the only parkway in the City of Richmond, and it is a designated Route of Regional Significance in the City of Richmond General Plan and other regional planning documents.
- Castro Street is a four-lane divided secondary thoroughfare that provides direct access to I-580 to the south, and connects to Richmond Parkway to the north. Refinery Access Gate 31 (Mills Street) and Gate 91 (General Chemical Access), which would be used during Project construction, are located on Castro Street. Castro Street is also a designated Route of Regional Significance.
- Other roadways in the Project vicinity are mostly two- to four-lane local roadways that provide access to a residential area south of I-580 and to industrial sites surrounding the PPRP.

Table 8.9-1 provides characteristics of roadways in the Project vicinity, including annual average daily traffic (AADT), annual average peak hour traffic, and percent of truck traffic. Existing daily average and peak volumes on selected roadway segments were obtained from Caltrans (2006) and the City of Richmond (2006).

TABLE 8.9-1
Characteristics of Roadways in the Project Area

Roadway Segment	Between	Road Class	Median	Number of Lanes	AADT	Peak Hour	Truck Percentage
I-580	Western Drive and Harbour Way	Freeway (RRS)	Divided	6	54,000	4,200	4%
I-80	Appian Way and Hilltop Drive	Freeway (RRS)	Divided	8	190,000	11,900	6%
Richmond Parkway	I-80 and Castro Street	Parkway (RRS)	Divided	4	32,800	N/A	N/A
Castro Street	Richmond Parkway and I-580	Secondary Thoroughfare	Divided	4	27,200	N/A	N/A

Notes:

AADT = Average Annual Daily Traffic

RRS = Route of Regional Significance

N/A = not available

Freeways are roadways whose principal function is to serve regional and inter-city trips.

Parkways are highways that provide movement of through traffic at speeds exceeding those acceptable on other surface streets. Access is controlled and at-grade crossings are permitted.

Secondary Thoroughfares are roadways that serve as a connection between major land use areas and facilities and between major circulation elements such as freeways, major thoroughfares and transit stations.

Sources: Caltrans, 2006; City of Richmond, 2006.

8.9.2.2 Existing Traffic Conditions

Table 8.9-2 lists the existing AADT, design capacities, volume-to-capacity (V/C) ratios, and LOS on the roadway segments that may be affected by the Project during construction and

operation. Freeway capacities were based on 24,000 vehicles/lane/day, and Richmond Parkway and Castro Street capacities were based on 12,000 vehicles/lane/day.

TABLE 8.9-2
Existing Roadway Segment Traffic Conditions in the Project Area

Roadway Segment	Between	AADT	Roadway Capacity	V/C	LOS
I-580	Western Drive and Harbour Way	54,000	144,000	0.38	A
I-80	Appian Way and Hilltop Drive	190,000	192,000	0.99	E
Richmond Parkway	I-80 and Castro Street	32,800	48,000	0.57	A
Castro Street	Richmond Parkway and I-580	27,200	48,000	0.68	B

Notes:

AADT = Average Annual Daily Traffic

V/C = Volume-to-Capacity Ratio

LOS = Level of Service

LOS Criteria for Urban Streets, Highway Capacity Model (Transportation Research Board, 2000):

A 0.00 – 0.60 Free flow; insignificant delays

B 0.61 – 0.70 Stable operation; minimal delays

C 0.71 – 0.80 Stable operation; acceptable delays

D 0.81 – 0.90 Approaching unstable; queues develop rapidly but no excessive delays

E 0.91 – 1.00 Unstable operation; significant delays

F > 1.00 Forced flow; jammed conditions

Sources: Caltrans, 2006; City of Richmond, 2006.

The Countywide Comprehensive Transportation Plan and the West Contra Costa Action Plan set Traffic Service Objectives (TSOs) for the Routes of Regional Significance. TSOs relevant to the PPRP are to achieve LOS E or better on all segments of I-580, to maintain LOS E on all segments of I-80, and to maintain LOS D or better on all segments of Richmond Parkway. Currently, all Routes of Regional Significance potentially affected by the PPRP meet the applicable TSOs. Castro Street operates at LOS B, which is acceptable stable operation with minimal delays.

To provide a more detailed assessment of the potential impacts of PPRP employees and construction workers, the following eleven intersections were evaluated:

- Chevron Way/Marine Street
- Castro Street/Tewksbury Avenue
- Marine Street/I-580 Eastbound Off-Ramps
- Castro Street/I-580 Eastbound Ramps
- Castro Street/Chevron Way
- Castro Street/ I-580 Westbound Ramps (Gate 14)
- Castro Street/Mills Street (Gate 31)
- Castro Street/General Chemical Access (Gate 91)
- Castro Street/Hensley Street
- Richmond Parkway/Hensley Street
- Richmond Parkway/Gertrude Avenue

Existing morning and afternoon peak-hour turning movement volumes for the adjacent street system at these intersections were obtained from the City of Richmond. Traffic volumes for the study intersections were collected in May 2005. Existing intersection configurations are illustrated in Figure 8.9-2. Existing morning and afternoon peak-hour turning movement counts are presented in Figure 8.9-3.

The City of Richmond uses the intersection LOS analysis method from the Highway Capacity Manual (Transportation Research Board, 2000). The LOS rating ranges from LOS A, which represents free-flow conditions, to LOS F, which represents long delays, as shown in Table 8.9-3. For signalized and four-way stop controlled intersections, LOS is 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).

TABLE 8.9-3
Definition for Intersection Level of Service

LOS	Delay (seconds per vehicle)	Description
Unsignalized Intersections		
A	≤ 10.0	Little or no delays
B	10.1 to 15.0	Short traffic delays
C	15.1 to 25.0	Average traffic delays
D	25.1 to 35.0	Long traffic delays
E	35.1 to 50.0	Very long traffic delays
F	> 50.0	Extreme traffic delays with intersection capacity exceeded
Signalized Intersections		
A	< 10.0	Progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
B	> 10.0 to 20.0	Progression is good, cycle lengths are short, or both. More vehicles stop than with LOS A, causing higher levels of average delay.
C	> 20.0 to 35.0	Higher congestion may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level, though many vehicles still pass through the intersection without stopping.
D	> 35.0 to 55.0	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, and/or high volume-to-capacity (V/C) ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	> 55.0 to 80.0	This level is considered by many agencies to be the limit of acceptable delay. High delay values generally indicate poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.
F	> 80.0	This level is considered unacceptable with oversaturation, which is when arrival flow rates exceed the capacity of the intersection. This level may also occur at high V/C ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be contributing factors to such delay levels.

Sources: City of Richmond, 2006; Contra Costa County Transportation Authority, 2006.

The Chevron Way/Marine Avenue intersection is side-street stop controlled and the Castro Street/Tewksbury Avenue intersection is all-way stop controlled. All other intersections are signalized. Table 8.9-4 presents the results of the intersection LOS analysis for the morning (7:00 AM to 9:00 AM) and evening (4:00 PM to 6:00 PM) peak periods. The City of Richmond General Plan Circulation Element and Contra Costa County classify intersection operating conditions as acceptable if at LOS D or better. During the weekday morning peak hour all intersections operate at an acceptable LOS (LOS A to LOS D). During the weekday afternoon peak hour all intersections operate at an acceptable LOS except for the Castro Street / I-580 Westbound Ramps intersection, which operates at LOS E.

TABLE 8.9-4
Existing Intersection Level of Service

Intersection	Traffic Control ^a	AM Delay ^b	AM LOS	PM Delay ^b	PM LOS
Chevron Way/Marine Street	SSSC	10.0	B	10.5	B
Castro Street/Tewksbury Avenue	AWSC	8.8	A	9.1	A
Marine Street/I-580 Eastbound Off-Ramps	Signal	12.1	B	18.2	B
Castro Street/I-580 Eastbound Ramps	Signal	12.8	B	30.5	C
Castro Street/Chevron Way	Signal	0.1	A	0.1	A
Castro Street/ I-580 Westbound Ramps (Gate 14)	Signal	31.5	C	60.7	E
Castro Street/Mills Street (Gate 31)	Signal	2.7	A	22.1	C
Castro Street/General Chemical Access (Gate 91)	Signal	6.6	A	31.4	C
Castro Street/Hensley Street	Signal	3.2	A	5.8	A
Richmond Parkway/Hensley Street	Signal	16.6	B	16.8	B
Richmond Parkway/Gertrude Avenue	Signal	38.6	D	42.7	D

Notes:

^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 highest-delay movement/approach reported for side-street stop-controlled intersections.

Bold text – Unacceptable LOS

Source: Wilbur Smith Associates, 2007.

Existing peak-hour traffic volumes collected in May 2005. Review on more recent traffic volume data indicates that the 2005 volumes remain valid for the analysis presented.

8.9.2.3 Public Transportation

Public transit service in the City of Richmond includes Bay Area Rapid Transit (BART), bus services and passenger rail. Figure 8.9-4 shows public transit in the vicinity of the PPRP site.

BART is the commuter rail system in the San Francisco Bay Area, which operates two lines, Richmond-Fremont and Richmond-Daly City/Colma, in the City of Richmond. The Richmond and El Cerrito del Norte stations are located approximately 1.5 and 3.5 miles east of the Project site, respectively. In general, both lines provide service at least every 15 minutes.

Alameda-Contra Costa Transit District (AC Transit) serves 13 cities and adjacent unincorporated areas in Alameda County and Contra Costa County. AC Transit operates nine local routes in Richmond. Bus Line 72M runs between the Richmond and El Cerrito del Norte BART stations and terminates at Castro Street and Tewksbury Avenue in the immediate vicinity of the Project site. Bus Line 72M runs approximately every 30 minutes. Two Golden Gate Transit bus lines also provide service in the City of Richmond. Line 40 and Line 42 connect the Richmond and El Cerrito del Norte BART stations and San Rafael via the Richmond-San Rafael Bridge. The nearest bus stop to the Project site is at Castro Street and Tewksbury Avenue and the service is provided approximately every 30 minutes.

Amtrak's Capitol Corridor and San Joaquin routes provide intercity rail service between Richmond, Sacramento, San Jose, Stockton, Fresno and Bakersfield. The nearest Amtrak station is located adjacent to the Richmond BART station. Approximately 24 passenger trains serve Richmond on a typical weekday.

8.9.2.4 Bicycle Facilities

The City of Richmond Redevelopment Department (City of Richmond, 2006) and Contra Costa Countywide Bicycle and Pedestrian Plan (CCTA, 2003) identify existing bicycle facilities throughout the city. Existing off-street and on-street bicycle path runs along

Garrard Boulevard, approximately one-quarter of a mile southwest of Castro Street and the Project site. This bicycle path is a segment of the San Francisco Bay Trail, a planned 400-mile bicycle network around San Francisco Bay and San Pablo Bay.

8.9.2.5 Railway Operations

The City of Richmond is served by Burlington Northern Santa Fe (BNSF), Union Pacific (UP) and Richmond Pacific (RP) railroads.

BNSF operates about 20 trains on a typical weekday with train lengths varying from 10 to 100 cars. Trains travel up to 55 miles per hour (mph) on tracks north of Garrard Boulevard and 10 mph south of Garrard Boulevard.

UP operates about 43 trains per day. UP owns the Capitol Corridor tracks that passenger trains use on a daily basis. The tracks run parallel to Carlson Boulevard and Rumrill Boulevard toward Point Pinole. Amtrak passenger trains travel up to 70 mph and the UP freight trains travel up to 55 mph.

RP operates two trains per day with 10 to 20 cars on the tracks between Richmond Parkway and Rumrill Boulevard and up to 32 trains per day with 2 to 20 cars on the tracks between South 4th Street and Regatta Boulevard.

8.9.2.6 Truck Traffic

Castro Street and Richmond Parkway are two out of 28 designated truck routes in the City of Richmond. Several of these routes are located in the Project vicinity and/or serve the existing Chevron facility. Many routes are located south of I-580 with a convenient access to port terminals on the Richmond Harbor. The routes also extend to other parts of Richmond, including I-580, I-80, Hilltop Mall area, and Richmond Parkway.

All operators of trucks exceeding the maximum allowable weight load and size standards (as specified in Section 8.9.4, Laws, Ordinances, Regulations, and Standards) are required to obtain applicable permits prior to operating vehicles on state and local roadways.

8.9.2.7 Site Access

The proposed route for access to the PPRP site for construction and operational activities and for truck routes will be from I-580 to Castro Street (at the Castro Street/Marine Street interchange) and from I-80 to Richmond Parkway (at the Richmond Parkway/Fitzgerald Drive interchange) and Castro Street. Project access will be primarily at Gate 91 on Castro Street.

8.9.2.8 Other Development Projects

Other planned and approved development projects in the City of Richmond are expected to generate traffic in the year 2008. The volumes were developed using the Contra Costa County Transportation Authority travel demand model (CCTA model). Table 8.9-5 summarizes the key information about the planned and approved development projects to be constructed from year 2005 to 2008. A complete list of the development projects can be found in the Appendix 8.9-A (Table 8.9-A1).

TABLE 8.9-5
List of Planned and Approved Projects in the City of Richmond

Item	Date	Land Use	Unit	Rate	ADT	Description
1	1/20/2005	warehouse	8,405 SF	5	42	Florida Avenue (100) - Construction of two new industrial warehouse buildings (4,625 SF & 3,780 SF)
2	2/10/2005	single family	1	9.57	10	2112 Rheem Av - Construction of a new 510 SF detached second dwelling unit
3	2/16/2005	office	1	9.57	10	465 2nd St - Construction of a 1,735 SF two-story, live/work unit on a 2,950 SF parcel
4	2/16/2005	single family	1	9.57	10	Florida Av (3100) Construct new residence (infill housing initiative)
5	3/3/2005	single family	1	9.57	10	11 Dipper Ct - Construction of a new 3,900 SF single-family residence
6	3/3/2005	single family	1	9.57	10	9 Dipper Ct - Construction of a new 3,212 SF single-family residence
7	3/3/2005	single family	1	9.57	10	4103 Nevin Av - Construction of a new 630 SF single-story second dwelling unit
8	3/14/2005	single family	1	9.57	10	1328 Pelican Wy - Construct new residence
9	3/15/2005	single family	1	9.57	10	Filbert St (1300) - Construct new residence
10	3/23/2005	single family	1	9.57	10	32nd St (400) - Construct new residence
11	3/24/2005	single family	1	9.57	10	2543 Clinton Av - Construct new residence
12	5/17/2005	single family	1	9.57	10	Willard Av (200) - Construct new residence
13	5/17/2005	single family	1	9.57	10	153 Harbour Wy S - Construct new single-family home of 1,918 SF
14	5/26/2005	single family	1	9.57	10	239 17th St - Construct new residence

TABLE 8.9-5
List of Planned and Approved Projects in the City of Richmond

Item	Date	Land Use	Unit	Rate	ADT	Description
15	5/27/2005	single family	1	9.57	10	1525 Hayes St - Construction of a new 577 SF single-story second dwelling unit
16	6/1/2005	single family	1	9.57	10	Garvin Av (2300) - Construct a new duplex
17	6/3/2005	single family	1	9.57	10	S 5th St - Construct new residence
18	6/6/2005	single family	1	9.57	10	366 S 50th St - Construct new residence
19	6/15/2005	single family	1	9.57	10	384 S 34th St - Construct new residence
20	6/24/2005	apartment	6	6.72	40	Cutting Bl (2000) - Construct a 3 story apartment building consisting of 6 units
21	6/30/2005	single family	1	9.75	10	1324 Pelican Wy - Construct new residence
22	7/8/2005	single family	1	9.75	10	236 1st St - Construct new residence
23	8/15/2005	single family	1	9.57	10	1226 Filbert St - Construct new residence
24	9/13/2005	single family	2	9.57	19	Maine Av - Construct 2 single-family residences
25	11/18/2005	single family	1	9.75	10	414 Ripley Av - Construct new residence
26	12/12/2005	single family	1	9.75	10	9th St - Construct new residence
27	12/12/2005	single family	1	9.75	10	425 Bissell Av - Construct new residence
28	12/16/2005	single family	1	9.57	10	6333 Jerilynn Av - Construct a new 7,042 SF single-family residence including garage, carport and interior second dwelling unit
29	12/27/2005	single family	2	9.57	19	253 S 3rd St - Construct 2 1,903 SF single-family dwellings on a 5,625 SF vacant lot, including 3 bedrooms, 2.5 baths, a kitchen, living room, dining room and single car garage
30	1/4/2006	single family	1	9.57	10	124 4th St - Construct a 2,096 SF 2 story single family dwelling
31	1/24/2006	single family	1	9.57	10	8th St - Construct a new 1,600 SF single-family residence
32	2/3/2006	single family	1	9.57	10	1317 Garvin Av - Construct a new duplex residence
33	2/22/2006	townhome	11	5.86	64	Nevin Av - Approval of 11 townhomes situated on a 14,450 SF lot
34	3/17/2006	retail/senior house	2,000 SF, 66 units	11.1/3.71	267	300 Macdonald Av - Construct 2 buildings consisting of one 35,582 SF building containing 2,000 SF of retail space, 39 senior housing units and a 28,151 SF building providing 27 senior housing units
35	5/3/2006	single family	1	9.57	10	325 Willard Av - Construct new residence
36	5/3/2006	single family	1	9.57	10	4401 Jenkins Wy - Construct new residence
37	5/3/2006	single family	1	9.57	10	414 Willard Av - Construct new residence
38	5/5/2006	single family	1	9.57	10	326 332nd St - Construct new residence
39	5/24/2006	warehouse	7,200 SF	4.96	36	235 S 1st St - Construct a 72,000 SF warehouse building, parking and landscaping and remove 2 metal buildings

TABLE 8.9-5
List of Planned and Approved Projects in the City of Richmond

Item	Date	Land Use	Unit	Rate	ADT	Description
40	5/24/2006	single family	1	9.57	10	1603 Garvin Av - Construct a new single-family residence on a substandard lot
41	6/1/2006	condominiums	237	5.86	1,389	1029, 1305 Macdonald Av - Construct a mixed-use development for 237 condominium units and 24,000 SF of commercial space on 2 city blocks, includes a request for a Density Bonus with City concessions
42	6/22/2006	office	4,968 SF	11.1	55	761 23rd St - Construct a 2-story office building with four individual commercial office spaces totaling 4,968 SF
43	8/14/2006	apartment + medical	27 units, 9,575 SF	6.72/36.13	527	100 Macdonald Av - Construct a 3-story, 35-foot high mixed-use development consisting of 27 low-income residential units, common rooms, and a 9,575 SF medical office building
44	8/18/2006	single family	1	9.57	10	2000 Visalia Av - Construct a single-story 639 SF second dwelling unit
45	10/19/2006	retail/office	2,112 SF	11.1	23	807 23rd St - Construct a new 2,112 SF single-story retail/office building on an existing vacant infill lot

Notes:

After examination of the forecast growth rates in the CCTA model, it has been determined that the growth forecasts accurately included all of the above projects. A growth factor has then been applied to existing traffic volumes to develop future (Year 2008) traffic volumes.

ADT = Average Daily Trips

SF = square feet

ADT has been obtained by multiplying the number of units by the trip generation rate ('rate' here, in trips per day per unit)

Source: Wilbur Smith Associates, 2007.

8.9.2.9 Public Safety

Railroad crossings are the roadway features in the vicinity of the Project that could affect public safety. Figure 8.9-5 shows the railroad crossings that may have an increase in traffic from Project construction or operation. The crossings at Hensley Street and two crossings on Castro Street have full crossing protection with gates and red signaling lights. Crossing at Mills Street is not protected. All four crossings are at grade.

8.9.3 Environmental Consequences

The impact of the Project is measured by the potential change in the LOS of surrounding roadway segments and intersections caused by the Project. Traffic generated by the Project is added to the existing volumes, and the resulting impacts are assessed.

8.9.3.1 Significance Criteria

The proposed Project would result in significant transportation impacts if it:

- Worsens intersection operating conditions to LOS E or F.
- Results in projected parking demand that would exceed the proposed parking supply on a regular and frequent basis.
- Results in potential conflicts for pedestrians or bicyclists.
- Increases transit demand above the levels provided by local transit operators or agencies.
- Causes substantial damage or wear of public roadways by increased movements of heavy vehicles.

8.9.3.2 Traffic Impact Analysis Methodology

The revised Administrative Draft Environmental Impact Report (ADEIR) of March 2007 (ESA, 2007) presents the traffic impact analysis of the Chevron Energy and Hydrogen Renewal Project, of which the PPRP is a part. Its trip generation/distribution has been incorporated to the present discussion, since potential mitigation measures cannot be applied solely to the PPRP's portion of the trips, while ignoring the remainder.

Trip Generation

Three primary sources of traffic generation at the Chevron facility have been identified over the 60-month construction period of the proposed Project:

- Construction of the proposed Project (2008).
- Construction traffic from other ongoing projects at the site.
- Major turnarounds associated with usual periodic Refinery maintenance.

The peak construction period will be the first quarter of 2008, so the year of interest for the study will be 2008. This will ensure that the worst-case scenario has been analyzed. The two other sources of traffic will be used in the 2008 cumulative impacts analysis. In 2025, the Refinery is expected to be fully operational. Therefore, the following scenarios have been delineated:

- 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.

Table 8.9-6 presents the estimated increase in peak daily traffic during the entire construction period.

TABLE 8.9-6

Chevron Richmond Refinery Renewal Project, Other Projects, Major Turnarounds, and Refinery Operations Estimated Daily Trip Generation by Quarter

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	x4 ^b	x4 ^b	x4 ^b
Worker Vehicles^a																			
<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^a																			
<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 Passenger Car Equivalent (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

TABLE 8.9-6

Chevron Richmond Refinery Renewal Project, Other Projects, Major Turnarounds, and Refinery Operations Estimated Daily Trip Generation by Quarter

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	x4 ^b	x4 ^b	x4 ^b
Proposed Project Operation^g																			
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
<i>Total Truck one-way PCE per day</i>	<i>80</i>	<i>40</i>	<i>524</i>	<i>154</i>	<i>220</i>	<i>170</i>	<i>462</i>	<i>356</i>	<i>102</i>	<i>92</i>	<i>68</i>	<i>92</i>	<i>64</i>	<i>46</i>	<i>16</i>	<i>36</i>	<i>116</i>	<i>120</i>	<i>108</i>
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	<u>1,767</u>	1,678	1,362	814	750	754	750	750	167	82	82	82	82	0	0
Total Volumes	947	402	1,184	1,826	<u>2,283</u>	1,959	1,903	1,344	1,390	964	848	818	980	718	180	291	845	500	459

Notes:

^a All vehicle and truck trips are shown as one-way trips per day. A round trip equals two trips.^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 Passenger Car Equivalent [PCE]) equals ONLY Renewal Project traffic. This is the basis for traffic impact evaluations and is underlined 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. One trip per day represents one truck about every other day.^h PCE factor represents the number of passenger cars displaced by each truck in the traffic stream. One truck is the equivalent of two passenger cars in this analysis, per HCM 2000.

Source: Wilbur Smith Associates, 2007.

Table 8.9-7 presents the AM and PM peak hour traffic generation estimate for the various sources of traffic during peak construction activity. The construction of the Renewal Project is anticipated to generate a maximum of 485 AM peak hour and 399 PM peak hour trips.

TABLE 8.9-7
Traffic Generation Estimates – 1st Quarter of 2008

Project	Type	Daily (ADT)	AM Peak Hour (Veh/Hour)		PM Peak Hour (Veh/Hour)	
			In	Out	In	Out
Construction	Vehicle	1,595	399	0	0	399
	Trucks	172	86	0	0	0
	<i>Subtotal</i>	<i>1,767</i>	<i>485</i>	<i>0</i>	<i>0</i>	<i>399</i>
Other Projects	Vehicle	119	30	0	0	30
	Trucks	24	12	0	0	0
	<i>Subtotal</i>	<i>143</i>	<i>42</i>	<i>0</i>	<i>0</i>	<i>30</i>
Major Refinery Turnaround	Vehicle	349	87	0	0	87
	Trucks	24	12	0	0	0
	<i>Subtotal</i>	<i>373</i>	<i>99</i>	<i>0</i>	<i>0</i>	<i>87</i>
TOTAL		2,283	626	0	0	516

Notes:

ADT = Average Daily Traffic

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.

Source: Wilbur Smith Associates, 2007.

Trip Distribution

The trip distribution of the construction vehicle-related trips was based on the existing directional split of the vehicles currently entering/leaving Gate 91 from/to north and south. A previous study for the Chevron Refinery, the Cleaner Fuels Project Circulation Analysis (Wilbur Smith Associates, 1993) was used to identify the trip distribution of the construction-related trucks. The trip distribution is shown in Table 8.9-8.

TABLE 8.9-8
Trip Distribution

Trips	North	South
Vehicle	80%	20%
Truck	20%	80%

Sources: Wilbur Smith Associates, 1993; Wilbur Smith Associates, 2007.

Trip Assignment

The AM and PM peak-hour construction volumes were assigned to the road network according to the patterns described in Table 8.9-8, and assigned to Gates 91, 31 and 67, with the majority of the trips oriented to/from Gate 91.

8.9.3.3 Traffic Study Results

2008 Baseline Conditions

Table 8.9-4 includes a summary of the intersection operations analysis for the weekday AM and PM peak hours under Year 2008 conditions. All intersections except one will operate at LOS D or better. The intersection at Castro Street/I-580 westbound ramps will operate at LOS E during the PM peak.

2008 Baseline Plus Project Conditions

The assigned Project trips were added to 2008 Baseline AM and PM peak-hour volumes to derive the 2008 with-Project traffic volumes and to determine Project-specific impacts to study area intersections. Figure 8.9-6 shows the turning movement volumes for the eleven study intersections under Year 2008 plus Project construction conditions.

Table 8.9-9 presents the results of the intersection operations analysis for the AM and PM peak hours under the 2008 construction conditions.

TABLE 8.9-9
Intersection Peak Hour Operations – Year 2008 Plus Construction Traffic Conditions

Intersection	Control ^a	AM Delay		PM Delay	
		sec/veh ^b	LOS	sec/veh ^b	LOS
Chevron Way/Marine Avenue	TWSC	10	B	10.6	B
Castro Street/Tewksbury Avenue	AWSC	9.3	A	10	A
Marine Avenue/I-580 EB Off-Ramps	Signal	15.9	B	18.6	B
Castro Street/I-580 EB Ramps	Signal	13.8	B	36.7	D
Castro Street/Chevron Way	Signal	0.1	A	0.1	A
Castro Street/I-580 WB Ramps	Signal	47.1	D	63.2	E
Castro Street/Mills Street	Signal	13.4	B	23.4	C
Castro Street/General Chemical Access	Signal	17.8	B	272.9	F
Castro Street/Hensley Street	Signal	4.5	A	7.3	A
Richmond Parkway/Hensley Street	Signal	18	B	16.6	B
Richmond Parkway/Gertrude Avenue	Signal	98.7	F	95.2	F

Notes:

^a AWSC = all-way stop controlled intersection; Signal = traffic signal-controlled intersection; TWSC = two-way stop controlled intersection.

^b Average overall intersection control delay (seconds per vehicle) reported for signalized and all-way stop-controlled intersections. Average delay on highest-delay movement/approach reported for side-street stop-controlled intersections.

Bold text - Unacceptable LOS

Source: Wilbur Smith Associates, 2007.

Existing peak-hour traffic volumes collected in May 2005. Review on more recent traffic volume data indicates that the 2005 volumes remain valid for the analysis presented.

For the AM peak under construction conditions, one intersection is projected to operate at an unacceptable LOS. Richmond Parkway at Gertrude Avenue is projected to operate at LOS F.

During the PM peak, three intersections will not operate at an acceptable LOS:

- Castro Street at I-580 westbound ramps (operating at LOS E)
- Castro Street at General Chemical Access (operating at LOS F)
- Richmond Parkway at Gertrude Avenue (operating at LOS F)

The first intersection (Castro Street/I-580 westbound ramps) does not change from existing conditions.

Cumulative Impacts

2008 Baseline Plus Project Plus Other Projects Conditions

Traffic generated by the other projects occurring during the peak construction period at the Chevron facility were added to the Year 2008 plus construction traffic volumes. Figure 8.9-7 shows the turning movement volumes for the eleven study intersections under Year 2008 plus Project plus Other Projects conditions.

Table 8.9-10 presents the results of the intersection operations analysis for the AM and PM peak periods under Year 2008 Baseline plus Project plus Other Projects conditions.

No new intersections will operate at an unacceptable LOS for the Year 2008 plus Construction plus Other Projects scenario. The intersections that will operate at LOS E or LOS F are the same as the Year 2008 plus Construction scenario.

TABLE 8.9-10

Intersection Peak Hour Operations – Year 2008 Plus Construction Plus Other Projects Traffic Conditions

Intersection	Control ^a	AM Delay		PM Delay	
		sec/veh ^b	LOS	sec/veh ^b	LOS
Chevron Way/Marine Avenue	TWSC	10	B	10.6	B
Castro Street/Tewksbury Avenue	AWSC	9.3	A	10	A
Marine Avenue/I-580 EB Off-Ramps	Signal	16.4	B	18.6	B
Castro Street/I-580 EB Ramps	Signal	13.7	B	36.7	D
Castro Street/Chevron Way	Signal	0.1	A	0.1	A
Castro Street/I-580 WB Ramps	Signal	47.4	D	64	E
Castro Street/Mills Street	Signal	15	B	23.4	C
Castro Street/General Chemical Access	Signal	19.2	B	298.1	F
Castro Street/Hensley Street	Signal	4.5	A	7.7	A
Richmond Parkway/Hensley Street	Signal	18	B	16.6	B
Richmond Parkway/Gertrude Avenue	Signal	102.9	F	98.8	F

Notes:

^a AWSC = all-way stop controlled intersection; Signal = traffic signal-controlled intersection; TWSC = two-way stop controlled intersection.

^b Average overall intersection control delay (seconds per vehicle) reported for signalized and all-way stop-controlled intersections. Average delay on highest-delay movement/approach reported for side-street stop-controlled intersections.

Bold text - Unacceptable LOS

Source: Wilbur Smith Associates, 2007.

Existing peak-hour traffic volumes collected in May 2005. Review on more recent traffic volume data indicates that the 2005 volumes remain valid for the analysis presented.

2008 Baseline Plus Project Plus Other Projects Plus Major Refinery Turnaround Conditions

Figure 8.9-8 shows the turning movement volumes for the eleven study intersections under Year 2008 plus Project plus Other Projects plus Major Refinery Turnaround conditions.

Table 8.9-11 presents the results of the intersection operations analysis for the AM and PM peak periods under Year 2008 Baseline plus Project plus Other Projects plus Major Refinery Turnaround conditions.

TABLE 8.9-11

Intersection Peak Hour Operations – Year 2008 Plus Construction Plus Other Project Plus Major Refinery Turnaround Traffic Conditions

Intersection	Control ^a	AM Delay		PM Delay	
		sec/veh ^b	LOS	sec/veh ^b	LOS
Chevron Way/Marine Avenue	TWSC	10	B	10.6	B
Castro Street/Tewksbury Avenue	AWSC	9.3	A	10	A
Marine Avenue/I-580 EB Off-Ramps	Signal	17	B	18.6	B
Castro Street/I-580 EB Ramps	Signal	13.7	B	36.7	D
Castro Street/Chevron Way	Signal	0.1	A	0.1	A
Castro Street/I-580 WB Ramps	Signal	47.7	D	66.5	E
Castro Street/Mills Street	Signal	16.5	B	23.1	C
Castro Street/General Chemical Access	Signal	25.2	C	387.2	F
Castro Street/Hensley Street	Signal	4.7	A	9.6	A
Richmond Parkway/Hensley Street	Signal	18	B	16.6	B
Richmond Parkway/Gertrude Avenue	Signal	114.6	F	109.4	F

Notes:

^a AWSC = all-way stop controlled intersection; Signal = traffic signal-controlled intersection; TWSC = two-way stop controlled intersection.

^b Average overall intersection control delay (seconds per vehicle) reported for signalized and all-way stop-controlled intersections. Average delay on highest-delay movement/approach reported for side-street stop-controlled intersections.

Bold text - Unacceptable LOS

Source: Wilbur Smith Associates, 2007.

Existing peak-hour traffic volumes collected in May 2005. Review on more recent traffic volume data indicates that the 2005 volumes remain valid for the analysis presented.

No new intersections will operate at an unacceptable LOS for the Year 2008 plus Construction plus Other Projects plus Major Turnaround scenario. The intersections that will operate at LOS E or LOS F are the same as the other Year 2008 scenarios.

Future 2025 Conditions

The 2004 Contra Costa Transportation Authority *Travel Demand Forecasting Model* (CCTA Model) was used to model 2025 conditions. It includes the most recent 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 (ABAG, 2000 and 2002) for demographic information. Operation of the Refinery following Project construction would generate 34 new daily one-way truck trips because of increased import and export of materials to and from the Refinery. However, the Refinery's employment levels would remain unchanged.

Figure 8.9-9 shows the turning movement volumes for the eleven study intersections under Year 2008 plus Project plus Other Projects plus Major Refinery Turnaround conditions.

Table 8.9-12 presents the results of the intersection operations analysis for the AM and PM peak periods under Year 2008 Baseline plus Project plus Other Projects plus Major Refinery Turnaround conditions.

Under Year 2025 AM peak hour conditions, two intersections will operate at an unacceptable LOS: Castro Street/I-580 westbound ramps (LOS F) and Richmond Parkway/Gertrude Avenue (also LOS F).

During the PM peak period, four intersections will operate at LOS E or worse:

- Castro Street at I-580 Eastbound Ramps (LOS F)
- Castro Street at I-580 Westbound Ramps (LOS F)
- Castro Street at Mills Street (LOS E)
- Richmond Parkway at Gertrude Avenue (LOS F)

All of these represent degradations in operations from 2008.

TABLE 8.9-12
Intersection Peak Hour Operations – Year 2025 Traffic Conditions

Intersection	Control ^a	AM Delay		PM Delay	
		sec/veh ^b	LOS	sec/veh ^b	LOS
Chevron Way/Marine Avenue	TWSC	10	B	10.5	B
Castro Street/Tewksbury Avenue	AWSC	14.9	B	10.3	A
Marine Avenue/I-580 EB Off-Ramps	Signal	12.3	B	37.7	C
Castro Street/I-580 EB Ramps	Signal	17	B	>80	F
Castro Street/Chevron Way	Signal	0.2	A	0	A
Castro Street/I-580 WB Ramps	Signal	>80	F	>80	F
Castro Street/Mills Street	Signal	3.6	A	77.4	E
Castro Street/General Chemical Access	Signal	8.9	A	52.8	D
Castro Street/Hensley Street	Signal	5	A	8.3	A
Richmond Parkway/Hensley Street	Signal	18.1	B	17.1	B
Richmond Parkway/Gertrude Avenue	Signal	>80	F	>80	F

Notes:

^a AWSC = all-way stop controlled intersection; Signal = traffic signal-controlled intersection; TWSC = two-way stop controlled.

^b Average overall intersection control delay (seconds per vehicle) reported for signalized and all-way stop-controlled intersections. Average delay on highest-delay movement/approach reported for side-street stop-controlled intersections.

Bold text - Unacceptable LOS

Source: Wilbur Smith Associates, 2007.

Existing peak-hour traffic volumes collected in May 2005. Review on more recent traffic volume data indicates that the 2005 volumes remain valid for the analysis presented.

The Renewal Project construction is expected to end in 2011, and the only ongoing impacts would be the 34 trucks per day associated with normal Refinery operations. Therefore, any traffic impacts identified under Year 2025 conditions will not be the direct or cumulative result of the Chevron Renewal Project, and will not be subject to mitigation.

8.9.3.4 Project Impacts and Mitigation Measures

The significance criteria listed in Section 8.9.3.1 were used to evaluate potential impacts. Because any impacts associated with the PPRP alone will be subsets of the impacts of the Chevron Renewal Project, study of the larger project's impacts is conservative. Since mitigation measures proposed as part of the Renewal Project will reduce impacts to less than significant levels, no additional measures are needed for the PPRP alone.

Standard: Will the Project worsen intersection operating conditions to LOS E or F?

The potential impacts identified are:

Impact 8.9-1. Year 2008 Project construction traffic would affect the Richmond Parkway/Gertrude Avenue intersection during the AM peak period.

Analysis: Significant.

The operating conditions at this intersection would change from LOS D to LOS F.

Mitigation: Two mitigation measures are proposed:

- Implement temporary traffic control changes at the southbound approach to provide one through lane, one shared left-through lane, and one shared right-through lane (convert exclusive left turn lane to shared left-through lane).
- Implement an alternate signal timing plan during peak arrival and departure times to facilitate traffic flow. The specific change would be to use a permitted left-turn phase instead of protected on the northbound and southbound approaches. Possible implementation plans include:
 - Posting a technician at the intersection location during peak hours to manually operate signal controls (e.g., using the police key feature of standard traffic signal controllers).
 - Programming an alternate signal timing plan that would be in operation during specified peak commute periods.
 - Posting traffic control officers at the intersection to manually control traffic movements.

Analysis after Mitigation: Less than Significant. The expected LOS at the intersection after mitigation would be B (with a delay of 14.4 seconds).

Impact 8.9-2. Year 2008 Project construction traffic would affect the Castro Street/General Chemical Access and Richmond Parkway/Gertrude Avenue intersections during the PM peak period.

Analysis: Significant.

The operating conditions at these intersections would change from LOS C to LOS F (Castro Street / General Chemical Access) and LOS D to LOS F (Richmond Parkway / Gertrude Avenue).

Mitigation: At the Castro Street/General Chemical intersection, the proposed mitigation measures are as follows:

- Widen the eastbound approach to provide two exclusive left turn lanes and one exclusive right turn lane (this improvement would be permanent).
- Modify peak hour traffic signal operations via manual traffic control during peak arrival and departure times to facilitate traffic flow. The specific change would be to optimize the cycle length from 75 to 150 seconds.
- Implement an alternate signal timing plan during peak arrival and departure times to facilitate traffic flow. The specific change would be to use a permitted left-turn phase instead of protected on the northbound and southbound approaches. Possible implementation plans include:
 - Posting a technician at the intersection location during peak hours to manually operate signal controls (e.g., using the police key feature of standard traffic signal controllers).
 - Programming an alternate signal timing plan that would be in operation during specified peak commute periods.
 - Posting traffic control officers at the intersection to manually control traffic movements.

Analysis after Mitigation: Less than Significant. The expected LOS at the intersection after mitigation would be D (with a delay of 54.3 seconds).

The mitigation measure at Richmond Parkway/Gertrude Avenue is to implement an alternate signal timing plan during peak arrival and departure times to facilitate traffic flow. The specific change would be to use a permitted left-turn phase instead of protected on the northbound and southbound approaches. The possible implementation plans are described under Impact 8.9-1.

Analysis after Mitigation: Less than Significant. The expected LOS at the intersection after mitigation would be C (with a delay of 30.2 seconds).

(Cumulative) Impact 8.9-3. Year 2008 Project construction plus Other Project traffic would affect the Richmond Parkway/Gertrude Avenue intersection during the AM peak period.

Analysis: Significant.

The operating conditions at this intersection would change from LOS D to LOS F.

Mitigation: The mitigation measures for Impact 8.9-1 would apply for this impact.

Analysis after Mitigation: Less than Significant. The expected LOS at the intersection after mitigation would be B (with a delay of 14.8 seconds).

(Cumulative) Impact 8.9-4. Year 2008 Project construction plus Other Project traffic would affect the Castro Street /General Chemical Access and Richmond Parkway/Gertrude Avenue intersections during the PM peak period.

Analysis: Significant.

The operating conditions at these intersections would change from LOS C to LOS F (Castro Street /General Chemical Access) and LOS D to LOS F (Richmond Parkway/Gertrude Avenue).

Mitigation: The mitigation measures for Impact 8.9-2 would apply for this impact.

Analysis after Mitigation: Less than Significant. The expected LOS at the intersection after mitigation would be D (with a delay of 39.4 seconds) at Castro Street/General Chemical intersection and D at Richmond Parkway/Gertrude Avenue (with a delay of 53.4 seconds).

(Cumulative) Impact 8.9-5. Year 2008 Project construction plus Other Project traffic plus Major Turnaround would affect the Richmond Parkway/Gertrude Avenue intersection during the AM peak period.

Analysis: Significant.

The operating conditions at this intersection would change from LOS D to LOS F.

Mitigation: The mitigation measures for Impact 8.9-1 would apply for this impact.

Analysis after Mitigation: Less than Significant. The expected LOS at the intersection after mitigation would be B (with a delay of 15.9 seconds).

(Cumulative) Impact 8.9-6. Year 2008 Project construction plus Other Project plus Major Turnaround traffic would affect the Castro Street/General Chemical Access and Richmond Parkway/Gertrude Avenue intersections during the PM peak period.

Analysis: Significant.

The operating conditions at these intersections would change from LOS C to LOS F (Castro Street/General Chemical Access) and LOS D to LOS F (Richmond Parkway/Gertrude Avenue).

Mitigation: The mitigation measures for Impact 8.9-2 would apply for this impact.

Analysis after Mitigation: Less than Significant. The expected LOS at the intersection after mitigation would be D (with a delay of 47.9 seconds) at Castro Street/General Chemical intersection and D at Richmond Parkway/Gertrude Avenue (with a delay of 43.9 seconds).

Standard: Will the Project result in projected parking demand that would exceed the proposed parking supply on a regular and frequent basis?

No significant impact. Parking demand generated by Project construction workers would be accommodated via permanent and temporary onsite lots.

Standard: Will the Project result in potential conflicts for pedestrians or bicyclists?

No significant impact. Project-generated traffic increases would occur on regional access roads (I-580 and I-80) and local access roads (Castro Street and Richmond Parkway), which are roads with little if any pedestrian and bicycle traffic.

Standard: Will the Project increase transit demand above the levels provided by local transit operators or agencies?

No significant impact. Project construction workers are expected to commute to and from the site in automobiles (a combination of drive-alone and carpool travel modes), and would not generate demand for public transit. Any workers using transit would be served by existing transit (especially BART) that have capacity in the vicinity of the Project.

Standard: Will the Project cause substantial damage or wear of public roadways by increased movement of heavy vehicles?

Impact 8.9-7. The use of heavy trucks to transport equipment and material to and from the Project work sites could affect road conditions in the designated haul routes by increasing the rate of road wear.

Analysis: Potentially Significant.

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 road wear due to Project construction trucks, measures to mitigate this potentially significant impact are provided.

Mitigation: Prior to Project construction, the 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 and the post-construction requirements of a rehabilitation program. Roads damaged by construction would be repaired to a structural condition equal to that which existed prior to construction activity.

Analysis after Mitigation: Less than Significant.

8.9.3.5 Threshold Analysis

The following section identifies the traffic volume threshold for the triggering of significant impacts and for the failure of recommended mitigation improvements. These threshold amounts correspond to the maximum traffic volume generation for the Chevron facility before mitigation would be required and before the required mitigation measures would be no longer sufficient.

Castro Street/General Chemical Access Intersection Mitigation

Table 8.9-13 summarizes the thresholds for implementing the mitigation measure for the improvements at the eastbound approach at the Castro Street/General Chemical Access intersection.

The key findings are:

- a. 46 vehicles (Passenger Car Equivalent [PCE]) could be added to the eastbound left-turn movement (above forecast Year 2008 volumes for the PM peak) before mitigation is required.
- b. 284 total daily vehicles (PCE) could be generated by Chevron before mitigation is required.
- c. 394 vehicles (PCE) could be added to the eastbound left-turn movement (above forecast Year 2008 volumes for the PM peak) before the specified mitigation fails.
- d. 2,433 total daily vehicles (PCE) could be generated by Chevron before the mitigation fails.

TABLE 8.9-13
Threshold Analysis for Eastbound Left-Turn Movement - PM Peak

	Peak Hour Volume (vph)
2008 PM - EBL Movement ^a	166
Volume Threshold ^b	212
<i>Threshold Added to EBL Movement</i>	46
2008+Construction PM - EBL Movement ^c	447
Construction Added ^d	281
Threshold to Exceed Mitigation ^e	560
<i>Threshold Added to EBL Movement</i>	113
Total Added Above 2008 PM - EBL Movement^f	394

Notes:

EBL = Eastbound Left-Turn; vph = vehicles per hour

^a Forecast Year 2008 volume for the specific movement (no additional traffic from Chevron added).

^b Maximum volume of the specified movement that results in no significant impact.

^c Forecast Year 2008 column for specified movement with the addition of Chevron Renewal Project construction traffic.

^d Volume added to specified movement above forecast Year 2008.

^e Maximum volume of the specified movement for which specified mitigation measure reduced impact(s) to a level of non-significance.

^f Maximum volume that can be added to the specified movement for which specified mitigation measure reduced impact(s) to a level of non-significance.

Source: Wilbur Smith Associates, 2007.

Richmond Parkway/Gertrude Avenue Intersection Mitigation (Northbound Approach)

Table 8.9-14 summarizes the thresholds for implementing the mitigation measure for the improvements at the northbound approach to the Richmond Parkway/Gertrude Avenue intersection.

The key findings are:

- a. 38 vehicles (PCE) could be added to the northbound through movement (above forecast Year 2008 volumes for the PM peak) before mitigation is required.

- b. 206 total daily vehicles (PCE) could be generated by Chevron before mitigation is required.
- c. 539 total vehicles (PCE) could be added to the northbound through movement (above forecast Year 2008 volumes for the PM peak before the mitigation fails).
- d. 2,934 total daily vehicles (PCE) could be generated by Chevron before the mitigation fails.

TABLE 8.9-14
Threshold Analysis for Northbound Through Movement - PM Peak

	Peak Hour Volume (vph)
2008 PM - NBT Movement ^a	2,451
Volume Threshold ^b	2,489
<i>Threshold Added to NBT Movement</i>	38
2008+Construction PM - NBT Movement ^c	2,770
Construction Added ^d	319
Threshold to Exceed Mitigation ^e	2,990
<i>Threshold Added to NBT Movement</i>	190
Total Added Above 2008 PM - NBT Movement^f	539

Notes:

NBT = Northbound Through; vph = vehicles per hour

^a Forecast Year 2008 volume for the specific movement (no additional traffic from Chevron added).

^b Maximum volume of the specified movement that results in no significant impact.

^c Forecast Year 2008 column for specified movement with the addition of Chevron renewal Project Construction traffic.

^d Volume added to specified movement above forecast Year 2008.

^e Maximum volume of the specified movement for which specified mitigation measure reduced impact(s) to a level of non-significance.

^f Maximum volume that can be added to the specified movement for which specified mitigation measure reduced impact(s) to a level of non-significance.

Source: Wilbur Smith Associates, 2007.

Richmond Parkway/Gertrude Avenue Intersection Mitigation Measure (Southbound Approach)

Table 8.9-15 summarizes the thresholds for implementing the mitigation measure for the proposed improvements at the southbound approach to the Richmond Parkway/Gertrude Avenue intersection.

The key findings are:

- a. 49 vehicles (PCE) could be added to the southbound through movement (above forecast Year 2008 volumes for the AM peak) before mitigation is required.
- b. 263 total daily vehicles (PCE) could be generated by Chevron before mitigation is required.

- c. 1,050 total vehicles (PCE) could be added to the southbound through movement (above forecast Year 2008 volumes for the AM peak) before the mitigation fails.
- d. 5,630 total daily vehicles (PCE) could be generated by Chevron before the mitigation fails.

TABLE 8.9-15
Threshold Analysis for Southbound Through Movement - AM Peak

	Peak Hour Volume (vph)
2008 AM - SBT Movement ^a	2,250
Volume Threshold ^b	2,299
<i>Threshold Added to SBT Movement</i>	<i>49</i>
2008+Construction PM - SBT Movement ^c	2,586
Construction Added ^d	336
Threshold to Exceed Mitigation ^e	3,300
<i>Threshold Added to SBT Movement</i>	<i>714</i>
Total Added Above 2008 AM - SBT Movement^f	1,050

Notes:

SBT = Southbound through; vph = vehicles per hour

- a Forecast Year 2008 volume for the specific movement (no additional traffic from Chevron added).
- b Maximum volume of the specified movement that results in no significant impact.
- c Forecast Year 2008 column for specified movement with the addition of Chevron renewal Project Construction traffic.
- d Volume added to specified movement above forecast Year 2008.
- e Maximum volume of the specified movement for which specified mitigation measure reduced impact(s) to a level of non-significance.
- f Maximum volume that can be added to the specified movement for which specified mitigation measure reduced impact(s) to a level of non-significance.

8.9.4 Laws, Ordinances, Regulations, and Standards

LORS related to traffic and transportation are summarized in the following sections.

8.9.4.1 Federal

The federal laws that apply to the Project are:

- Title 49, Code of Federal Regulations (CFR), Sections 171-177, govern the transportation of hazardous materials, the types of materials defined as hazardous, and the marking of the transportation vehicles. The Project will conform to this law by requiring that shippers of hazardous materials use the required markings on their transportation vehicles.
- Title 49 CFR, Sections 350-399, and Appendices A-G, Federal Motor Carrier Safety Regulations, address safety considerations for the transport of goods, materials, and substances over public highways. The Project will comply with all standards for the transportation of goods, materials, and substances over public highways.

- Title 49 CFR, Section 397.9, the Hazardous Materials Transportation Act of 1974, directs the United States Department of Transportation to establish criteria and regulations for the safe transportation of hazardous materials. The Project will comply with all standards for the transportation of hazardous materials.
- Title 14, CFR, Section 77.13(2)(i), requires an applicant to notify the Federal Aviation Administration (FAA) of the construction of structures within 20,000 feet of the nearest point of the nearest runway of an airport with at least one runway longer than 3,200 feet. No airports are within 20,000 feet of the PPRP site; therefore, this requirement is not applicable.

The proposed PPRP facility would cause no traffic or transportation impacts that would be inconsistent with federal LORS.

8.9.4.2 State

State laws that apply to this Project include the following:

- California Vehicle Code, Sections 13369, 15275, and 15278, address the licensing of drivers and classifications of licenses required to operate particular types of vehicles. In addition, certificates permitting the operation of vehicles transporting hazardous materials are addressed. The Project will conform to this law by requiring shippers to obtain required licenses and certificates.
- California Vehicle Code, Sections 25160 et seq., address the safe transport of hazardous materials. The Project will comply with these safety requirements.
- California Vehicle Code, Sections 2500-2505, authorize the issuance of licenses by the Commissioner of the California Highway Patrol (CHP) to transport hazardous materials, including explosives. The Project will comply with these license requirements.
- California Vehicle Code, Section 31303, requires that hazardous materials be transported on the state or interstate highway that offers the shortest overall transit time possible. The Project will conform to this law by requiring shippers of hazardous materials to use the shortest route feasible to and from the Project site.
- California Vehicle Code, Sections 31600-31620 regulate the transportation of explosive materials. The Project will comply with these regulations.
- California Vehicle Code, Sections 32100-32109, establish special requirements for the transportation of substances presenting inhalation hazards and poisonous gases. California Vehicle Code, Section 32105 requires that shippers of inhalation hazardous or explosive materials contact the CHP and apply for a Hazardous Material Transportation License. The Project will conform to this law by requiring shippers of these types of material to obtain the Hazardous Material Transportation License.
- California Vehicle Code, Sections 34000-34121, establish special requirements for transporting flammable and combustible liquids over public roads and highways. The Project will comply with these requirements.

- California Vehicle Code, Sections 34500, 34501, 34501.2, 34501.3, 34501.4, 34501.10, 34505.5-7, 34506, 34507.5, and 34510-11, regulate the safe operation of vehicles, including those used to transport hazardous materials. The Project will comply with these regulations.
- California Vehicle Code, Sections 35100-35559, specify limits for vehicle width, height, length, and gross weight. Specifically, Section 35550 states: “The gross weight imposed upon the highway by the wheels on any one axle of a vehicle shall not exceed 20,000 pounds and the gross weight upon any one wheel, or wheels, supporting one end of an axle, and resting upon the roadway, shall not exceed 10,500 pounds.” The Project will comply with these requirements by limiting vehicle sizes and gross weights to the specified limits or by obtaining a Single-Trip Transportation Permit for oversized or excessive loads over state highways, as described in the next paragraph.
- California Vehicle Code, Section 35780, requires a Single-Trip Transportation Permit to transport oversized or excessive loads over state highways. The permit can be acquired through the California Department of Transportation. This law is enforced by the CHP. The Project will conform to this law by requiring that shippers obtain a Single-Trip Transportation Permit for oversized loads for each vehicle.
- The California Streets and Highways Code, Sections 660, 670, 1450, 1460 et seq. 1470, require encroachment permits for projects involving excavation in city streets. This law is generally enforced at the local level. The Project will comply with this requirement by obtaining an encroachment permit from the City of Richmond Public Works Department.
- California State Planning Law, Government Code Section 65302, requires each city and county to adopt a General Plan consisting of seven mandatory elements to guide its physical development. Section 65302(b) requires that a circulation element be one of the mandatory elements. The scope of a circulation element consists of the “general location and extent of existing and proposed major thoroughfares, transportation routes, terminals, and other local public utilities and facilities, all correlated with the land use element of the plan.” The City has prepared a General Plan; therefore, no action is required by the Applicant.
- California Department of Transportation Manual on Uniform Traffic Control Devices specifies standards for construction in the public right-of-way. It also requires that a temporary traffic control plan be provided for “continuity of function (movement of traffic, pedestrians, bicyclists, transit operations), and access to property/utilities” during any time the normal function of a roadway is suspended. All construction in the public right-of-way will comply with the specified standards.

The proposed PPRP facility will cause no traffic or transportation impacts that would be inconsistent with state LORS.

8.9.4.3 Local

The transportation elements of local plans that are applicable to the PPRP are summarized in this section.

- The City of Richmond requires an Encroachment Permit for any work performed within the public right-of-way. The public right-of-way is generally defined as areas of the roadway and the sidewalk between the property lines measured from one side of the street to the property lines on the other side of the street. The Project will comply with these requirements by obtaining the permit from the City of Richmond Engineering Division before performing any work within the public right-of-way.
- The City of Richmond requires an Oversized/Overweight Load Permit before moving any extralegal vehicles or loads over public streets. The Project will comply with these requirements by obtaining the permit from the City of Richmond Engineering Division before operating any oversize and/or overweight vehicles within the City.
- The City of Richmond requires a Sidewalk Permit for any work performed on the sidewalk, driveway approach or curb and gutter. The Project will comply with these requirements by obtaining the permit from the City of Richmond Engineering Division before performing any work on the sidewalk, driveway approach or curb and gutter within the City.
- The City of Richmond General Plan Circulation Element and Growth Management Element establishes Traffic Level of Service standards for intersections. The minimum acceptable LOS for intersections in the Project area is LOS D. The mitigation measures for the PPRP will reduce impacts to nearby roads to insignificant levels to conform to this goal.
- The City of Richmond General Plan complies with the Contra Costa County General Plan, and the Contra Costa Transportation Authority Comprehensive Transportation Plan and Congestion Management Program, which set the same LOS standards for regional roadways.

8.9.4.4 Compliance with Laws, Ordinances, Regulations, and Standards

Table 8.9-16 lists the federal, state, and local LORS that apply to traffic and transportation.

TABLE 8.9-16
LORS Applicable to Traffic and Transportation

LORS		Applicability	Conformance (Section)
Federal			
49 CFR 171-177		Governs the transportation of hazardous materials, including the marking of the transportation vehicles.	8.9.4.1
49 CFR 350-399 and Appendices A-G		Addresses safety considerations for the transport of goods, materials, and substances over public highways.	8.9.4.1
49 CFR 397.9		Establishes criteria and regulations for the safe transportation of hazardous materials.	8.9.4.1

TABLE 8.9-16
LORS Applicable to Traffic and Transportation

LORS	Applicability	Conformance (Section)
14 CFR 77.13(2)(i)	Requires applicants to notify Federal Aviation Administration (FAA) of construction, within 20,000 feet of an airport, of greater height than an imaginary surface as defined by the FAA.	8.9.4.1
State		
California Vehicle Code, Sections 13369, 15275, and 15278	Addresses the licensing of drivers and classifications of licenses required to operate particular types of vehicles, including certificates permitting the operation of vehicles transporting hazardous materials.	8.9.4.2
California Vehicle Code, Sections 25160 et seq.	Addresses the safe transport of hazardous materials.	8.9.4.2
California Vehicle Code, Sections 2500-2505	Authorizes the issuance of licenses by the Commissioner of the California Highway Patrol (CHP) to transport hazardous materials, including explosives.	8.9.4.2
California Vehicle Code, Section 31303	Requires transporters of hazardous materials to use the shortest route possible.	8.9.4.2
California Vehicle Code, Sections 31600-31620	Regulates the transportation of explosive materials.	8.9.4.2
California Vehicle Code, Sections 32100-32109	Requires transporters of inhalation hazardous materials or explosive materials to obtain a Hazardous Materials Transportation License.	8.9.4.2
California Vehicle Code, Sections 34000-34121	Establishes special requirements for transporting flammable and combustible liquids over public roads and highways.	8.9.4.2
California Vehicle Code, Sections 34500, 34501, 34505, 34506, 34507, and 34510	Regulates the safe operation of vehicles, including those used to transport hazardous materials.	8.9.4.2
California Vehicle Code, Section 35100 et seq.	Specifies limits for vehicle width.	8.9.4.2
California Vehicle Code, Section 35250 et seq.	Specifies limits for vehicle height.	8.9.4.2
California Vehicle Code, Section 35400 et seq.	Specifies limits for vehicle length.	8.9.4.2
California Vehicle Code, Section 35780	Requires a Single-Trip Transportation Permit to transport oversized or excessive loads over state highways.	8.9.4.2
The California Streets and Highways Code, Sections 660, 670, 1450, 1460 et seq. 1470	Requires encroachment permits for projects involving excavation in city streets.	8.9.4.2
California State Planning Law, Government Code Section 65302	Requires each city and county to adopt a General Plan consisting of seven mandatory elements to guide its physical development, including a circulation element.	8.9.4.2
California Department of Transportation Manual on Uniform Traffic Control Devices	Specifies standards for construction in the public right-of-way.	8.9.4.2

TABLE 8.9-16
LORS Applicable to Traffic and Transportation

LORS	Applicability	Conformance (Section)
Local		
Encroachment Permit	The City of Richmond requires a permit for any work performed within the public right-of-way.	8.9.4.3
Oversized/Overweight Load Permit	The City of Richmond requires a permit before moving any extralegal vehicles or loads over public streets.	8.9.4.3
Sidewalk Permit	The City of Richmond requires a permit for any work performed on the sidewalk, driveway approach or curb and gutter.	8.9.4.3
The City of Richmond General Plan	The plan establishes LOS standards for intersections in compliance with the Contra Costa County General Plan, the Contra Costa Transportation Authority Comprehensive Transportation Plan and Congestion Management Program.	8.9.4.3

8.9.5 Permits Required

Table 8.9-17 provides a list of permits and approximate timeframe to obtain them.

TABLE 8.9-17
Permit Schedule for Traffic and Transportation

Permit	Schedule
Transport oversized or excessive loads over state highways from State Agency	Obtain when necessary, 2-hour processing time (single trip) to 2 weeks (annual trip).
Transportation permit for oversized vehicles from State Agency	Obtain when necessary, same day processing.
Encroachment Permit for work performed within the public right-of-way from City of Richmond	Obtain when necessary, same day approval by Engineering Division
Oversized/Overweight Load Permit for moving any extralegal vehicles or loads over public streets from City of Richmond	Obtain when necessary, same day approval by Engineering Division
Sidewalk Permit for work performed on the sidewalk, driveway approach or curb and gutter from City of Richmond	Obtain when necessary, same day approval by Engineering Division

8.9.6 Involved Agencies and Agency Contacts

Table 8.9-18 provides a list of involved agencies and agency contacts.

TABLE 8.9-18
Involved Agencies and Contacts

Issue	Contact	Title	Telephone
Single-Trip Transportation Permit for Oversized Loads	Caltrans North Region Transportation Permits Office 1823 14th Street Sacramento, CA 95814	Staff	(909) 383-4637
Hazardous Material Transportation License	California Highway Patrol Accounting Section (HM Licensing Program) P.O. Box 942902 Sacramento, CA 94298-2902	Staff	(916) 327-5039
Encroachment Permit	City of Richmond, Engineering Division 1401 Marina Way South Richmond, CA 94804	Staff	(510) 307-8091
Oversized/Overweight Load Permit	City of Richmond, Engineering Division 1401 Marina Way South Richmond, CA 94804	Staff	(510) 307-8091
Sidewalk Permit	City of Richmond, Engineering Division 1401 Marina Way South Richmond, CA 94804	Staff	(510) 307-8091

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Image courtesy of Google Earth, Image ©2007 TerraMetrics

 Project Boundary

FIGURE 8.9-1
MAJOR ROADS, POTENTIAL ACCESS
ROADS IN PROJECT VICINITY
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA

CH2MHILL

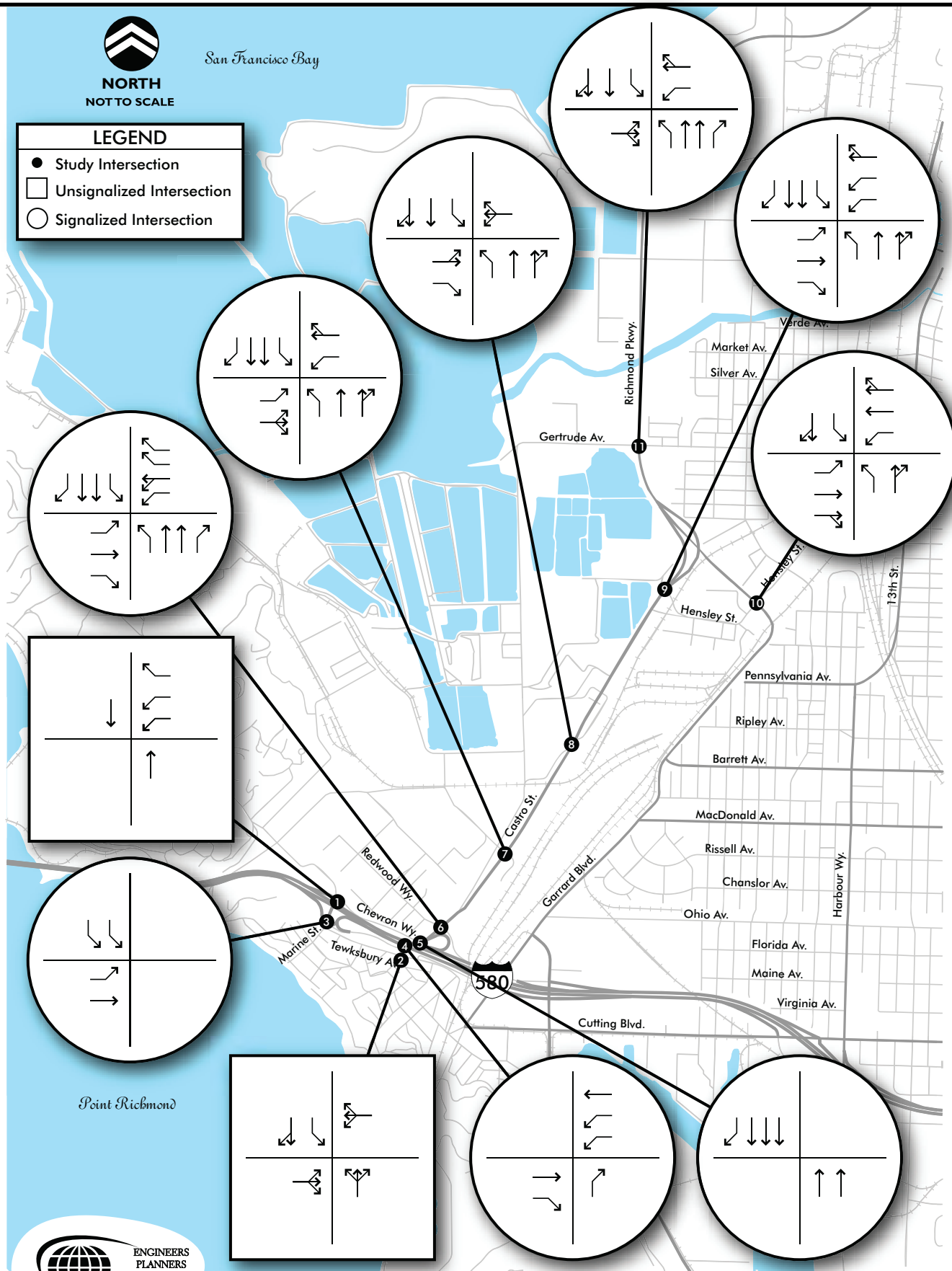


NORTH
NOT TO SCALE

San Francisco Bay

LEGEND

- Study Intersection
- Unsignalized Intersection
- Signalized Intersection



Point Richmond



ENGINEERS
PLANNERS
ECONOMISTS

Wilbur Smith Associates

FIGURE 8.9-2 EXISTING INTERSECTION CONFIGURATIONS

CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA

CH2MHILL



NORTH
NOT TO SCALE

San Francisco Bay

LEGEND

- Study Intersection
- Unsignalized Intersection
- Signalized Intersection
- #/# AM/PM Volumes

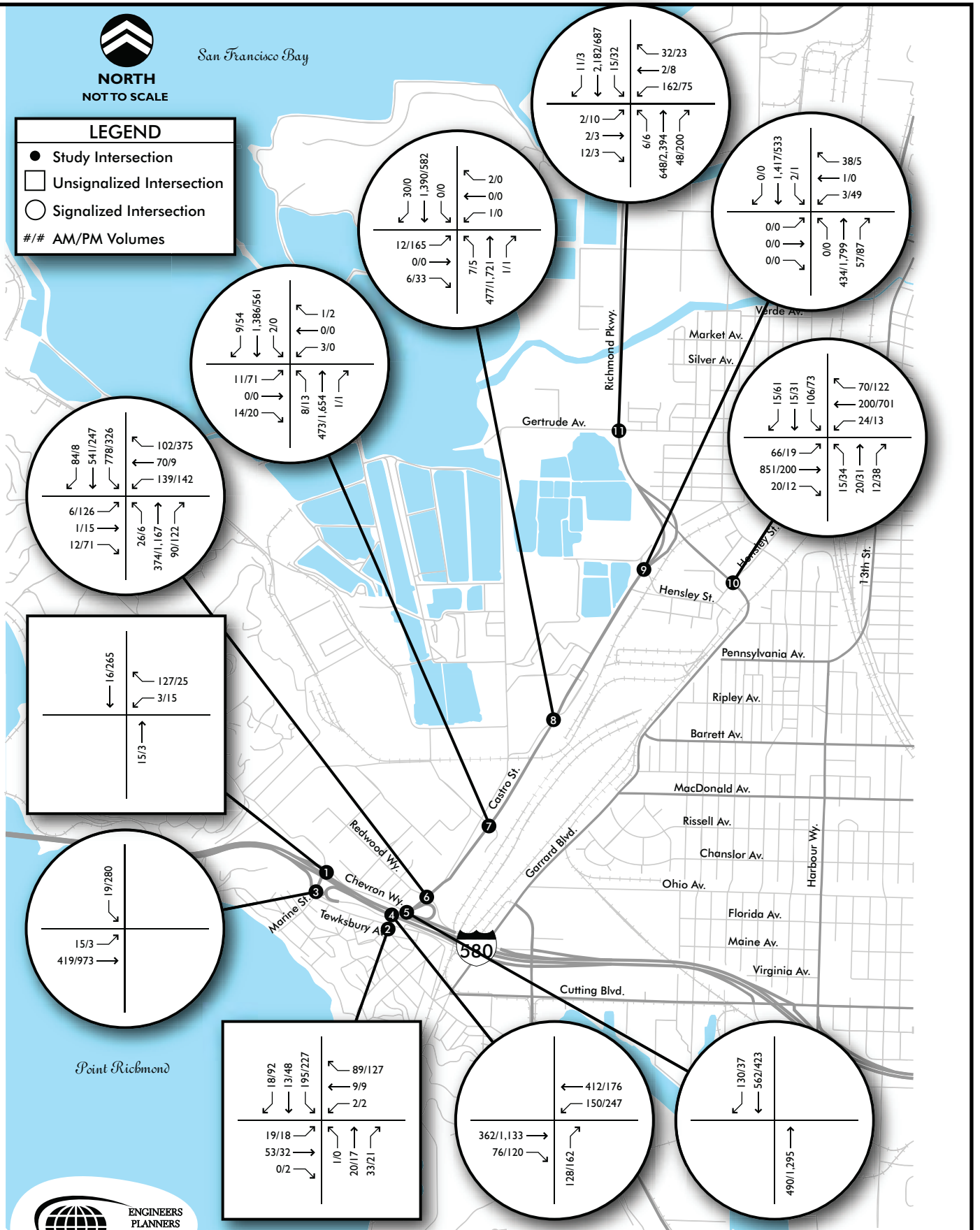


FIGURE 8.9-3
EXISTING PEAK HOUR
INTERSECTION VOLUMES - AM/PM
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA



Project Boundary



BART Richmond/Fremont
and Richmond/Daly City Lines



AC Transit Line 72M



Golden Gate Transit Lines 40/42



Amtrak Capitol Corridor
and San Joaquin Lines

FIGURE 8.9-4
PUBLIC TRANSIT SERVICE IN
PROJECT VICINITY
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA



Image courtesy of Google Earth, Image ©2007 TerraMetrics

-  Project Boundary
-  Railroad Crossing

FIGURE 8.9-5
RAILROAD CROSSING IN
PROJECT VICINITY
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA

CH2MHILL



NORTH
NOT TO SCALE

San Francisco Bay

LEGEND

- Study Intersection
- Unsignalized Intersection
- Signalized Intersection
- #/# AM/PM Volumes

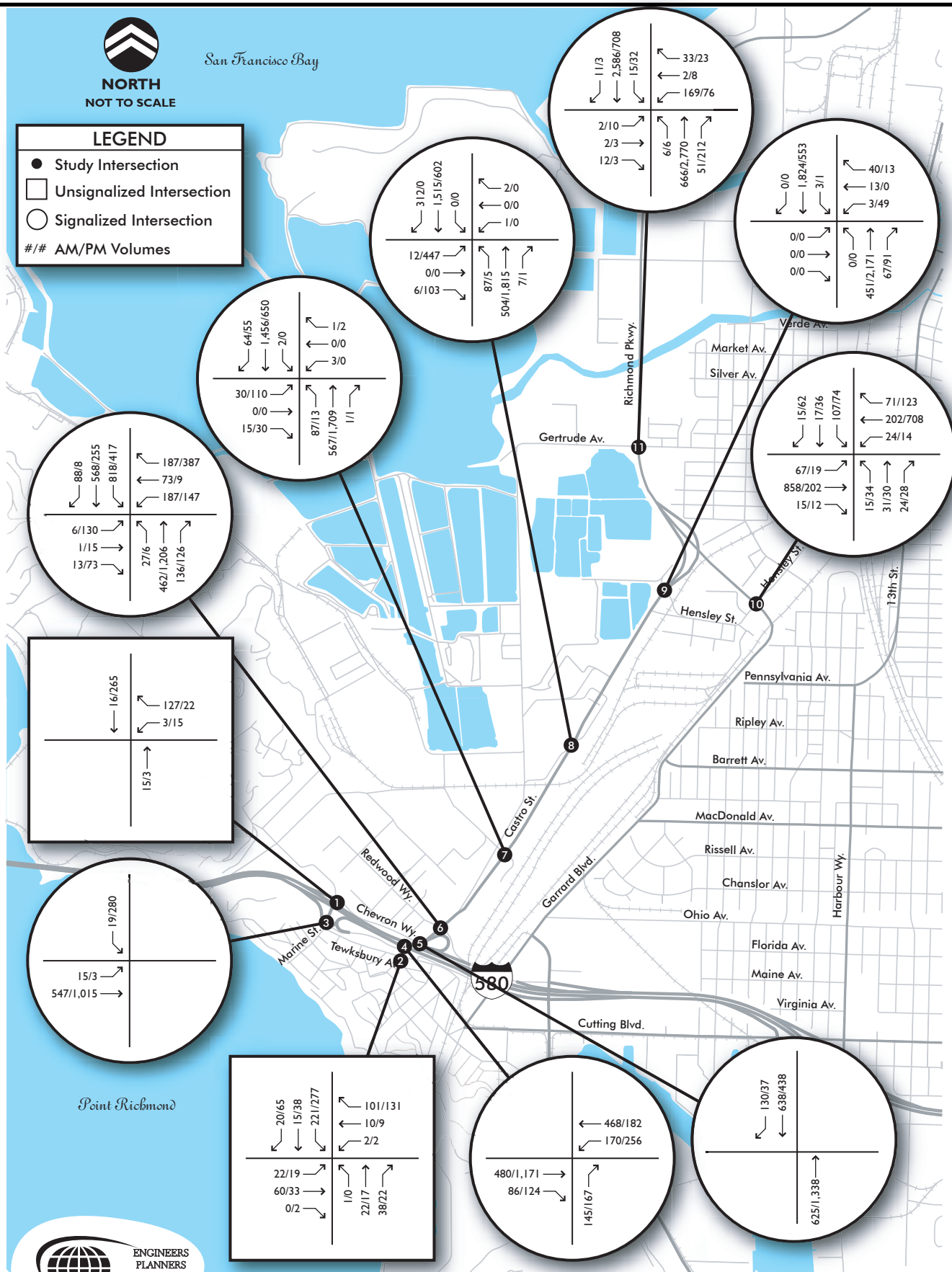


FIGURE 8.9-6
YEAR 2008 PLUS CONSTRUCTION TRAFFIC
PEAK HOUR INTERSECTION VOLUMES - AM/PM
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA



NORTH
NOT TO SCALE

San Francisco Bay

LEGEND

- Study Intersection
- Unsignalized Intersection
- Signalized Intersection
- #/# AM/PM Volumes

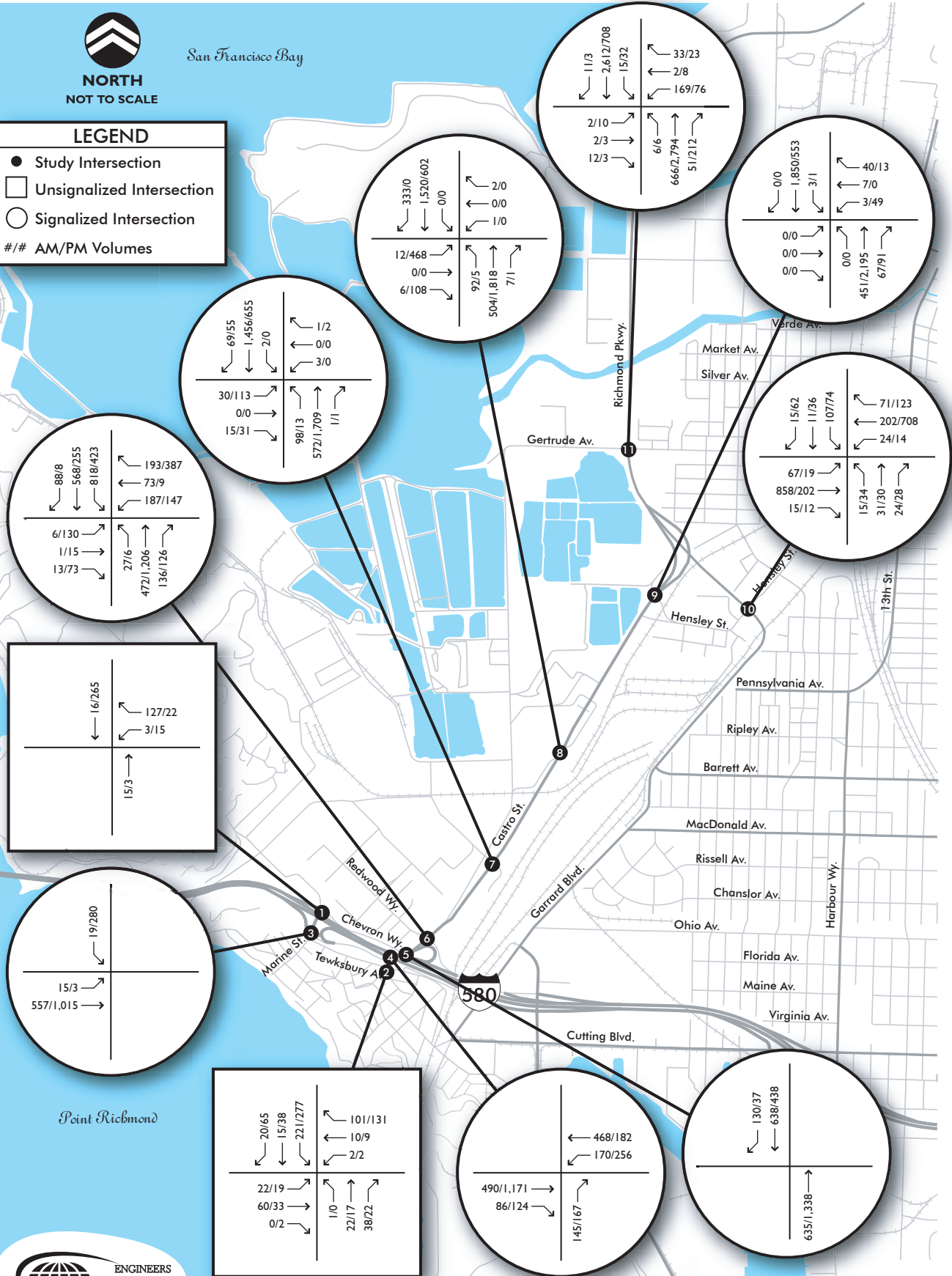


FIGURE 8.9-7
YEAR 2008 PLUS CONSTRUCTION PLUS
OTHER PROJECTS TRAFFIC PEAK HOUR
INTERSECTION VOLUMES - AM/PM
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA

CH2MHILL



NORTH
NOT TO SCALE

LEGEND

- Study Intersection
- Unsignalized Intersection
- Signalized Intersection
- #/# AM/PM Volumes

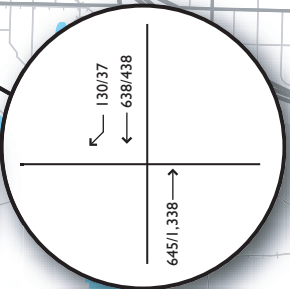
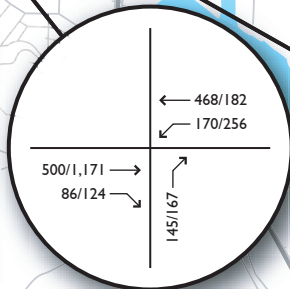
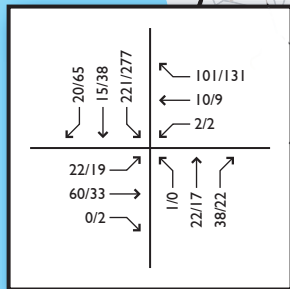
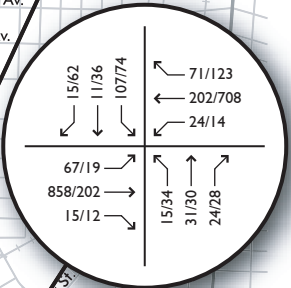
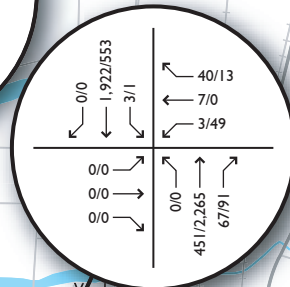
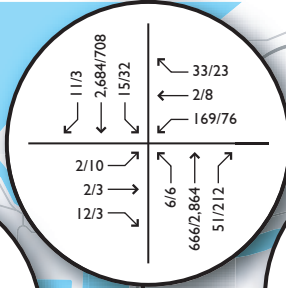
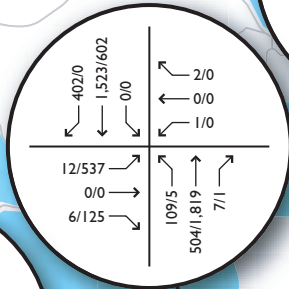
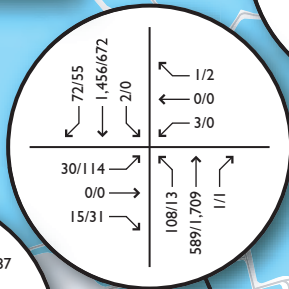
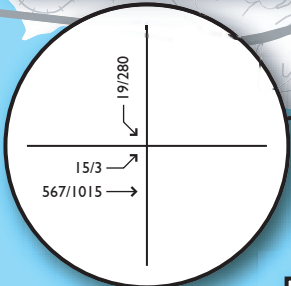
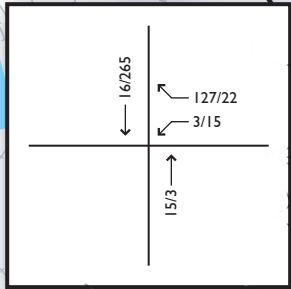
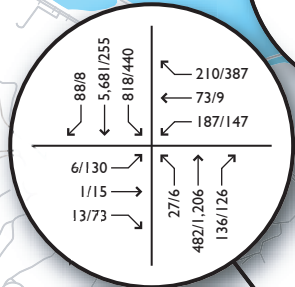


FIGURE 8.9-8
YEAR 2008 PLUS CONSTRUCTION PLUS OTHER
PROJECTS PLUS TURNAROUND TRAFFIC PEAK
HOUR INTERSECTION VOLUMES - AM/PM
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA



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NORTH
NOT TO SCALE

San Francisco Bay

LEGEND

- Study Intersection
- Unsignalized Intersection
- Signalized Intersection
- #/# AM/PM Volumes

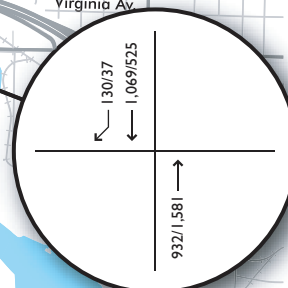
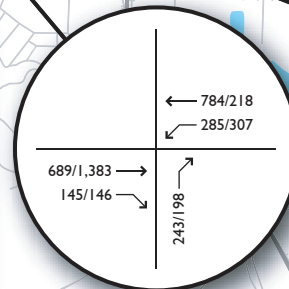
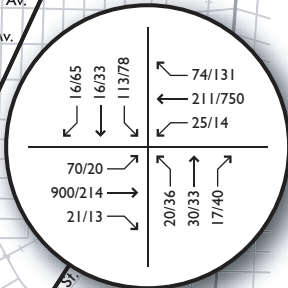
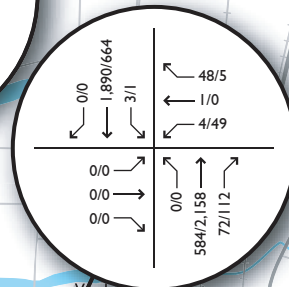
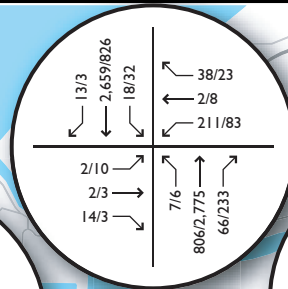
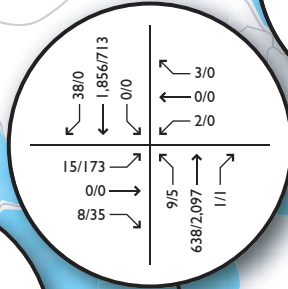
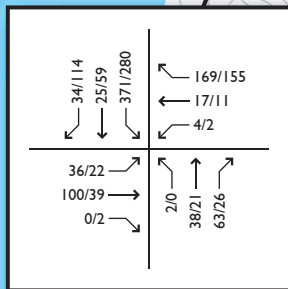
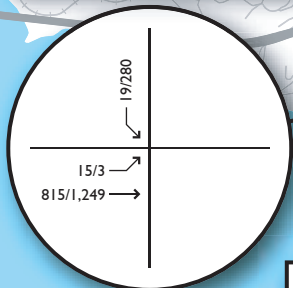
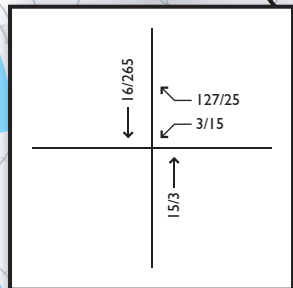
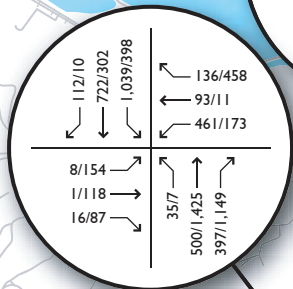


FIGURE 8.9-9
YEAR 2025 PEAK HOUR
INTERSECTION VOLUMES - AM/PM
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA



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8.10 Visual Resources

Visual resources are the natural and man-made features of the environment that can be seen and that contribute to the public's appreciative enjoyment of the environment. Visual resource impacts are generally defined in terms of a project's physical characteristics and potential visibility, and the extent that the project's presence would change the visual character and quality of the environment in which it would be located.

This analysis focuses on whether construction and operation of the Chevron Richmond Refinery Power Plant Replacement Project (PPRP, or the Project) would cause significant impacts to visual resources in the vicinity of the Project, and whether the Project would be in compliance with applicable laws, ordinances, regulations, and standards (LORS). This analysis complies with the California Environmental Quality Act (CEQA), which requires that government agencies make a determination of the potential for visual impacts resulting from a proposed project.

This analysis is organized as follows:

- Section 8.10.1 provides a description of the proposed PPRP.
- Section 8.10.2 presents a description of analysis methodology.
- Section 8.10.3 discusses the applicable LORS.
- Section 8.10.4 provides an assessment of the visual setting of the proposed power plant site and linear facility routes.
- Section 8.10.5 provides an evaluation of the visual impacts of the proposed Project on the existing setting.
- Section 8.10.6 provides an evaluation of the Project's compliance with applicable LORS.
- Section 8.10.7 identifies measures needed to mitigate any potential significant adverse impacts of the proposed Project and/or to achieve compliance with applicable LORS
- Section 8.10.8 lists the source materials referenced in writing this section.

8.10.1 Introduction

Chevron is proposing the PPRP to add an additional 60 megawatts (MW) net generation to its existing refinery electrical generation located within Chevron's Richmond Refinery in the City of Richmond (see Figure 1.2-1) in Contra Costa County, California. The proposed PPRP will be integrated into Chevron's plans to meet its growing refinery electrical load, and produce steam to replace an existing boiler plant that is approaching its end of life. The PPRP is a subset of the larger Richmond Refinery Renewal Project that is concurrently undergoing CEQA review by the City of Richmond. The CEC has jurisdiction for only the PPRP portion of the Renewal Project that is the subject of this application.

The PPRP will consist of the following components:

- A nominal 43-MW net, natural gas- or liquid petroleum gas (butane)-fired cogeneration train consisting of one combustion turbine generator (CTG), a refinery fuel gas-fired heat recovery steam generator, 13.8-kV switchgear and ancillary equipment.
- Shutdown of the existing No. 1 power plant refinery steam boilers currently providing steam to the Refinery.
- A 17-MW net extraction, condensing steam turbine generator (STG), an associated cooling tower, and 12-kV switchgear installed as part of the new hydrogen production facility (the remainder of the hydrogen plant is under CEQA review as part of the Renewal Project). The new hydrogen plant will be a net generator of steam for both the STG and the Refinery steam system.
- Reconductoring of approximately 4,000 feet of existing onsite double-circuit overhead 115-kV transmission line to upgrade its ampacity. The reconductoring will reuse existing transmission line structures.
- Adjacent onsite service connections for fuel, reclaimed water, water, wastewater, steam, and electricity to existing piperacks, with the exception of the reconductoring noted above.

The Cogen 3000 portion of the PPRP will occupy approximately 0.5 acre within an existing 5.2-acre cogeneration facility, and the STG and associated equipment (H₂-STG) will occupy approximately 0.5 acre within a new 7.9-acre hydrogen plant that will be built as part of the Richmond Refinery Renewal Project. Temporary construction laydown and parking for the PPRP will be provided in various existing laydown areas within the Refinery that are currently used for ongoing maintenance and project laydown. A complete description of the PPRP is provided in Section 2.0.

The locations of the power plant sites, the transmission line that will be reconducted, and the laydown areas are indicated on Figure 8.10-1. As review of this figure indicates, the PPRP will be located well within the existing 2,900-acre Refinery property.

8.10.2 Analysis Methodology

This assessment of the proposed Project's potential effects on visual resources was conducted by applying the systematic method for evaluating the potential aesthetic effects of proposed power plant projects that has been adopted by the staff of the CEC. This methodology, which the CEC first applied in its evaluation of the impacts of the Project, is summarized in Appendix 8.10-A.

8.10.2.1 Significance Criteria

The following criteria from the CEQA Guidelines were considered in determining whether a visual impact would be significant.

The CEQA Guidelines define a "significant effect" on the environment to mean a "substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including... objects of historic or aesthetic significance" (C.C.R. tit.14, § 15382).

Appendix G of the CEQA Guidelines, under Aesthetics, lists the following four questions to be addressed regarding whether the potential impacts of a project are significant:

Would the project have a substantial adverse effect on a scenic vista?

Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State Scenic Highway?

Would the project substantially degrade the existing visual character or quality of the site and its surroundings?

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

8.10.2.2 Evaluation Process

As an initial step in the evaluation process, planning documents (including City of Richmond documents) applicable to the Project area were reviewed to gain insight as to the type of land uses intended for the area, and the guidelines given for the protection or preservation of visual resources. Consideration was then given to the existing visual setting within the Project viewshed, which is defined as the geographical area in which the Project can be seen. Then, an assessment was made of the visual changes that the Project would cause to determine impact significance, following the four CEQA Guidelines checklist questions listed above. Please refer to Appendix 8.10-A for a more complete description of the visual resources evaluation process that was followed.

Potential Project impacts were evaluated using a Key Observation Point (KOP) analysis, among other tools and information sources. Figure 8.10-1 provides a general location map depicting the locations of photographic views of the existing setting. Figures 8.10-2 through 8.10-5 depict existing views of the proposed PPRP site. A single KOP was selected to be representative of the most sensitive locations from which the project would be seen. This KOP is located at an elevated area in Point Richmond, located 0.85 mile from the closest portion of the Project site and 0.3 mile from the Project laydown area. This KOP represents views from the residential area that is closest to the Project site, and from which the site will be most visible because of the neighborhood's elevated location. For this KOP, a photograph documenting existing visual conditions is provided in Figure 8.10-6, along with a photo simulation of the same view as it would appear after Project development.

Once all potential impacts were examined, a determination was made as to whether any impacts would reach a level that would be significant under CEQA's standards, and thus require mitigation beyond that proposed as a part of the initial Project design. Under CEQA, any required mitigation must be specific to an identified impact, and must be feasible.

8.10.3 Laws, Ordinances, Regulations, and Standards

8.10.3.1 Federal

The proposed Project is not located on federally administered public lands and therefore is not subject to federal regulations pertaining to visual resources.

8.10.3.2 State

There are no State Scenic Highways within the Project viewshed. Therefore, no state regulations pertaining to scenic resources are applicable to the Project.

8.10.3.3 Local

The proposed power plant and associated linear facilities (recycled water and natural gas supply pipelines, electrical transmission lines, and storm water outfall) are located within the City of Richmond. Therefore, the Project would be subject to local LORS pertaining to the protection and maintenance of visual resources, which are found in the City of Richmond General Plan and Community Development Guidelines. The Project's consistency with specific local goals, policies and guidelines pertaining to visual resources is discussed later in this analysis.

8.10.4 Existing Setting

8.10.4.1 Regional Setting

The proposed Project will be developed within the 2,900-acre Chevron Refinery property, which is located in the City of Richmond, along the northeastern shore of San Francisco Bay and the southern shore of San Pablo Bay. The Refinery occupies an expanse of the bay plain that includes marsh and mud flat areas as well as dry lands that have been developed with Refinery facilities. It also encompasses much of the Point San Pablo Peninsula that consists of a northwesterly trending ridge that extends into San Pablo Bay.

The Refinery is part of a corridor of heavy industrial development emphasizing petroleum refining that extends along the eastern shores of San Francisco and San Pablo Bays from Richmond north to Crockett, and along the Carquinez Straits from Crockett eastwards to Benicia and Martinez. In this region, the landscape is characterized by a series of large refinery complexes on bay plain and hillside lands adjacent to the bays and strait. Interspersed in the areas between the refineries are open, natural-appearing wetlands and hillside lands, areas devoted to rail and highway corridors, suburban density housing, and commercial development.

8.10.4.2 Project Site and Vicinity

The areas that will be occupied by the proposed STG, cogeneration facilities, reconducted transmission line, and Project laydown areas are indicated on Figure 8.10-1. These areas all lie well within the Refinery property. The areas where the power generation and laydown facilities will be located consist of flat, bay plain lands that have been previously used for Refinery activities and which are now vacant. They are surrounded by existing Refinery facilities. Photo 1 on Figure 8.10-2 is a view looking eastward across the site of the proposed hydrogen plant site where the STG, cooling tower, and switchgear that are part of the PPRP will be located. Photo 2 on Figure 8.10-3 is a view looking southeastward over the site of the proposed cogeneration facility. Neither of these sites contains features of scenic significance; the existing landscape character is industrial, and the level of visual quality is low. Photo 3 on Figure 8.10-4 is a view looking north toward the existing transmission line that will be reconducted as a part of the Project. It crosses dry lands used for Refinery operations, as well as a portion of the Refinery wastewater impound area termed the San Pablo Canal that is used for aeration of Refinery wastewaters. Although the presence of the

open waters of the impound aeration pond creates a level of visual interest, overall, the character of this view is industrial. As photos 1, 2, and 3 indicate, the Project facilities will be located in the context of an area now dominated by exposed pipelines, large tanks, tall stacks, and other large-scale Refinery structures. Because access to the Refinery is highly restricted, none of the areas that will be used for Project facilities will be seen at close range by the public.

At nighttime, the Refinery is well lit, with flood lighting used to illuminate general and non-process areas, and focused or spot lighting used in operations areas where higher light intensities are required. Under some circumstances, 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, the relative importance of glare related to Refinery features is diminished because in many views it is seen in the context of the glare off of the waters of the adjacent bays.

Safety relief valves are used on the Refinery equipment to prevent gas pressures from exceeding equipment design tolerances. Under most circumstances, the gases released through these valves are recovered. In some situations, these gases are routed to one of the Refinery's two flare stacks where they are burned to provide for safe disposal. The extent to which the flares created by these burning gases are visible to the public outside the Refinery varies depending on the size of the flare plume released, the time of day or night the flaring occurs, and the atmospheric conditions at the time.

Because steam is generated and used in many processes at the Refinery, visible steam plumes can sometimes be seen emanating from process stacks and cooling towers. The extent to which these steam plumes are visible depends on air temperature, wind speed and atmospheric humidity, as well as variations in Refinery operations. When plumes are visible, they appear either directly emanating from a process unit stack or cooling tower, or forming a slight distance away from it. These plumes are generally white in color and are composed mostly of small, condensed water droplets. The plume can 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 on the meteorological and process unit conditions at the time. Plume formation/dissipation is a continuous process of creation, movement, and destruction and is typically of short duration.

8.10.4.3 Viewing Areas and Key Observation Points

Potential Project Visibility from Areas Surrounding the Refinery. Because the proposed Project facilities will be located well within the Chevron Refinery property, and will be screened to a large degree by existing Refinery facilities, the areas from which the Project will be visible to the general public will be somewhat limited. The stacks and other taller elements of the proposed facilities have the greatest potential to be visible from higher elevation areas of Point Richmond, a residential neighborhood located approximately 0.75 mile south of the area where the closest Project facilities will be located. A point along Golden Gate Avenue at the top of the ridge on which the Point Richmond neighborhood is located was selected as KOP 1 to serve as the location of the view used to serve as the basis for evaluation of the

Project's potential visual impacts (Figure 8.10-6). The Project's taller elements will also have the potential to be seen from the elevated segment of Interstate 580 located along the southern edge of the Refinery property. Although this segment of the interstate is slightly closer to the Project sites than KOP 1 in Point Richmond, the Project facilities will be somewhat less visible than from KOP 1 because the freeway is located at a lower elevation that provides a lower angle of view in which more of the proposed power plant's features have the potential to be screened.

Near the northeastern corner of the Refinery property, a spur of the Bay Trail extends westward along Wildcat Creek to an observation area near the Refinery's boundary. The view from this area, which is represented by Photo 4 on Figure 8.10-5, extends across open wetlands toward the built-up portion of the Refinery and the sites where the proposed Project facilities would be located. The locations of this trail spur and the Photo 4 viewpoint are indicated on Figure 8.10-1. As Photo 4 (Figure 8.10-5) indicates, although the foreground zone of this view is open and somewhat natural in appearance, the large-scale and industrial-appearing Refinery facilities dominate the middleground and background areas of the view. The areas in which the Project facilities would be located are substantially screened by existing Refinery facilities.

To some degree, the Project facilities will also be visible from Garrard Boulevard and Richmond Parkway, which border the railroad corridor located to the east of the Refinery property, at distances varying from 1.0 to 1.4 miles from the closest of the proposed facilities. These roadways also serve as the alignment of the Bay Trail through this portion of Richmond. The views from these roadways and this segment of the Bay Trail are represented by Photo 5 on Figure 8.10-5. As this photo indicates, the existing view is of a highly industrialized setting, and the views toward the areas where the Project facilities would be located are substantially screened by rail cars and Refinery equipment. Downtown Richmond and surrounding residential neighborhoods are located to the east of Garrard Boulevard and Richmond Parkway. From these areas, there will be essentially no views toward the proposed Project facilities because of the low angle of view and the screening created by the intervening buildings and trees.

From San Francisco Bay, the Richmond-San Rafael Bridge, and other areas to the west, views toward the Project facilities will be completely screened by the ridge which runs southeast-northwest along the Point San Pablo peninsula.

KOP 1 – Golden Gate Avenue at Clarence Street in Point Richmond. As indicated above, KOP 1 is a viewpoint selected to represent views toward the Project sites from the residential area that is closest to them and from which they would have the greatest degree of potential visibility. This viewpoint is located at the top of the small ridge on which the Point Richmond residential neighborhood is located. This viewpoint is 0.85 mile south of the cogeneration site, on Golden Gate Avenue at the intersection of Clarence Street, at an elevation of 130 feet above mean sea level (msl), which places it 118 to 123 feet higher than the cogeneration plant (located at 7 feet above msl) and steam turbine generator (12 feet above msl) sites. This viewpoint is located on the street in front of a vacant lot, which provides an open vista toward the Refinery in the direction of the areas in which the Project sites are located. This view is generally representative of the views toward the Project sites seen from the residences located along the top of the ridge. In views from residences located further down on the northeastern slope of the ridge, the views would be somewhat similar,

but because of the lower elevations of the vantage points, views toward the areas where the Project facilities would be located would be screened to a greater degree by intervening features in the immediate neighborhood and on the Refinery property. From the portions of the Point Richmond neighborhood located on the southwest slopes of the ridge, Project facilities would not be visible.

The existing view from this location is represented by Photo A in Figure 8.10-6. As this photo indicates, the view from this area is a panorama that encompasses the Refinery in the middleground and the artificial slopes of the large landfill in the background. Visually dominant elements in the view include the large terra cotta colored tanks in the Refinery's Quarry Tank Farm; the large, white-colored 7-story Chevron Technology Center office building; and the Refinery process areas, which include numerous tall and narrow stacks and spherical tanks. In general, the Refinery appears as an intensively developed industrial lowland framed by near and more distant hillsides that have been substantially altered. The level of visual quality of this view is low to moderately low, reflecting low levels of visual intactness and unity, and a moderately low level of vividness.

8.10.5 Impacts

The following discussion of Project impacts is organized around the four questions in the Environmental Checklist (Appendix G of the CEQA Guidelines).

8.10.5.1 Scenic Vistas

The first checklist question is: "Would the project have a substantial adverse effect on a scenic vista?" No scenic vistas were identified in proximity to the Project sites and within the Project viewshed. The Project would have no impact under this criterion.

8.10.5.2 Scenic Resources in a Scenic Highway

The second checklist asks: "Would the project substantially damage scenic resources, including, but not limited to trees, rock outcroppings, and historic buildings within a State Scenic Highway corridor?" Because the Project sites are not within a Scenic Highway corridor or within view of a Scenic Highway, the Project would have no impact under this criterion.

8.10.5.3 Visual Character or Quality

The third CEQA checklist question is: "Would the project substantially degrade the existing character or quality of the site and its surroundings?" The Project aspects that were evaluated under this criterion include Project construction, the power plant structures, the changes to the existing transmission line that would take place as a part of the Project, and visible water vapor plumes.

Project Construction. Construction of the proposed power plant and associated facilities would create temporary visual changes related to the presence of equipment, materials, and workforce. Construction would involve the use of cranes, heavy construction equipment, temporary storage and office facilities, and temporary laydown/staging areas. Areas to the south of the site (indicated on Figure 8.10-1) would be used during construction for storage of equipment and materials and for parking by construction workers. Construction of the Project is expected to last for 15 months.

The visual impacts of construction of the power plant and associated facilities would be minimal because much of the construction-related activity would not be visible from areas outside the Refinery property. For example, from KOP 1 and from other areas to the south of the Refinery, the laydown areas and the construction-related activities taking place on them will not be visible because the views toward the laydown areas are blocked by the 7-story Chevron Technology Center office building. From the east and north, views toward the laydown areas will be screened by intervening Refinery facilities. Construction activities occurring on the sites of the hydrogen steam plant generator and cogeneration facility will not be generally visible to the public because views toward the surfaces of these sites from outside the Refinery are largely blocked by existing Refinery structures. To the extent that any of the construction activity could be visible to viewers outside the Refinery, the visual impacts would be minimal because the degree of visibility would be attenuated by distance, and because the construction activities would be a minor element in the existing scene, which is complex and highly industrial in character.

Impacts of Power Plant Structures and Linear Facilities During the Operational Period. The proposed Project structures are identified and described in Section 8.10.1, and in Section 2.0, Project Description. The proposed site plan and elevation drawings for the cogeneration facility is provided in Figures 2.1-1 through 2.1-3. The most visually prominent elements of the cogeneration facility would be the gas turbine and heat recovery steam generator, which would be approximately 16 feet wide, 200 feet long, and would vary in height from 31 feet to approximately 71 feet high, and which would have an exhaust stack that would be approximately 11 feet in diameter and 138.5 feet high. Because the modification of the transmission line serving the site will entail only replacement of the existing conductors with slightly larger sized conductors, the visual change to the transmission system will not be readily apparent to the average viewer. The site plan and elevation views of the hydrogen plant STG and associated equipment are presented on Figure 2.1-7. An analysis of the visual impacts of the power plant and transmission line changes as they would appear during the operational period as seen from KOP 1 is presented below.

KOP 1 – Golden Gate Avenue at Clarence Street in Point Richmond. Figure 8.10-6 presents a photo of the existing view toward the Project sites from the crest of the ridge in the Point Richmond (Photo A) and a simulation of the view as it would appear during the Project's operational period (Photo B). Comparison of the two images indicates that when the proposed Project is in place, the change to the view will be relatively subtle. In the area to the right of the center of the view, the top portion of the cogeneration plant's CTG will be visible amidst the cluster of stacks that can be seen to the left of the tree located in the foreground of the view. In addition, the CTG's stack will join the cluster of three medium-height stacks now visible in this area. At the hydrogen plant STG generator site, which is visible to the left of the center of the view, the only Project feature that will have any degree of visibility will be the cooling tower. This tower is visible as the grey rectangle to the right of the white, spherical tanks. Because all of the Project features visible from this viewpoint will be in scale with the existing structures in the Refinery, and will be similar in appearance to them, there will be no detectable change to the character of this view. In addition, because these new features do not remove any valued elements of the view, do not block views of valued features in the background, and do not substantially change the composition of this view, there will be essentially no change to the view's existing levels of vividness, unity, and

intactness, and overall level of visual quality. As a consequence, the level of visual impact to this view will be minimal and less than significant.

Impacts of Plumes. The Project would have a limited effect on the overall pattern of steam plumes now visible at the Refinery. At times when atmospheric conditions are conducive to plume formation, new plumes would be created by the cooling tower associated with the condensing STG that would be developed in conjunction with the proposed Hydrogen Plant. In addition, under some circumstances, small steam plumes would emanate from the stack of the proposed CTG. Because the plumes associated with the operation of the proposed Project would occur in the context of the plumes created by other Refinery operations and would constitute a relatively small part of the Refinery's overall plume-scape, and because of the distance of these plumes from viewers located outside of the Refinery, the effects of these plumes on the character and quality of the public's views toward the Refinery would be minor and less than significant.

8.10.5.4 Light and Glare

The fourth CEQA checklist question is: "Would the project create a new source of substantial light and glare that would adversely affect day or nighttime views in the area?"

During periods when nighttime construction activities take place, illumination that meets state and federal worker safety regulations would be required. To the extent possible, the nighttime construction lighting would be erected pointing toward the center of the site where activities are occurring, and would be shielded. Task-specific lighting would be used to the extent practical while complying with worker safety regulations.

The proposed power plant's operation would require onsite nighttime lighting for safety and security. To reduce offsite lighting impacts, lighting at the facility would be restricted to areas required for safety, security, and operation. Exterior lights would be hooded, and lights would be directed onsite so that significant light or glare would be minimized. For areas where lighting is not required for normal operation, safety, or security, switched lighting circuits would be provided, thus allowing these areas to remain unilluminated (dark) at most times, minimizing the amount of lighting potentially visible offsite.

Because the lighting associated with the Project will be designed to limit off-site light spill, and because the Project site is located well within the Refinery property and relatively far from residential areas, the Project will have no effect on ambient lighting conditions in areas of potential sensitivity surrounding the Refinery and would not subject these areas to nighttime glare. For the same reasons, the Project will have very little effect on nighttime views toward the Project site from KOP 1 or other areas outside the Refinery. To the extent that lights associated with the Project will be visible, they will be seen in the context of the extensive nighttime lighting that already characterizes the Refinery, further minimizing the potential of the Project-related lighting to create impacts that occur regularly.

The Project structures would not include large areas of highly reflective material that would produce glare. Therefore, the proposed Project would not affect the amount of daytime glare in the area.

For these reasons, the Project would not create light or glare impacts that could be considered to be significant.

8.10.5.5 Cumulative Impacts

The CEQA Guidelines (Section 15355) define cumulative impacts as “two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts.”

The CEQA Guidelines further note that:

The cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor, but collectively significant, projects taking place over a period of time.

As discussed in the Draft EIR for the Refinery Renewal Project (ESA, 2006), other projects planned at Richmond Refinery include upgrades to existing processing units, electrical infrastructure improvements, a new firehouse, an analysis of two LPG spheres, and recycled water programs. With the possible exception of the EBMUD Richmond Advanced Recycle Expansion (RARE) Water Project (see Section 5.2.3.1.5), 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 project facilities, including the building housing the processing equipment and the storage tanks, will be visible from some viewpoints as noted in the Draft EIR; 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.

The construction of other non-Refinery cumulative projects, together with all of the reasonably foreseeable projects at the Refinery, would expand the industrial appearance of the overall complex and the northwest portion of the City of Richmond. The development of the other, non-Refinery cumulative projects, such as planned residential and commercial projects in the City of Richmond noted in the Draft EIR including future development according to the 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 intensify the already industrialized appearance of the Refinery property and northwest Richmond. While noticeable, these visual changes would be dispersed throughout the immediate region, and 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 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 projects would be expected to produce a less than significant cumulative visual quality impact.

Other non-Refinery cumulative projects, together with the Refinery Renewal Project (including the PPRP), would combine to alter the general appearance of the northwestern portion of the City of Richmond. However, none of the changes would be considered to substantially impact visual resources. As such, the cumulative projects would be expected to produce a less-than-significant visual impact.

8.10.6 Compliance With Laws, Ordinances, Regulations and Standards

8.10.6.1 Introduction

This section described the LORS relevant to the visual issues associated with the Project. There are no federal, state, or regional visual resources LORS that are applicable to this Project. However, visual resource and urban design concerns applicable to the Project are addressed in the City of Richmond General Plan (City of Richmond, 1994) and City of Richmond Zoning Ordinance (City of Richmond, 2006).

8.10.6.2 City of Richmond General Plan

The facilities that make up the Power Plant Replacement Project would all be located within the existing Chevron Refinery within the city limits of the City of Richmond, and would therefore be subject to the provisions of the City of Richmond General Plan (City of Richmond, 1994). The General Plan designates the area in which these facilities would be located as Heavy Industry, a category that “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.”

The provisions of the City of Richmond’s General Plan that touch on issues related to the Project’s potential visual effects are summarized and evaluated for Project conformity in Table 8.10-1.

TABLE 8.10-1
Conformity of the PPRP with the City of Richmond General Plan

Provision	Conformity?
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.	Yes. The PPRP will be located well within the boundaries of the Chevron Richmond Refinery, a facility for which a series of measures have been undertaken to improve its appearance.
Policy LU-A.1: Evaluate project proposals for their contribution to improving Richmond’s aesthetic and economic values	Yes. The Project is a new use taking place well within the boundaries of an existing facility. The Project will have no detectable adverse impacts on Richmond’s aesthetic values, and will be taking place within the larger Refinery facility which through tank painting, landscaping, and other efforts, has undertaken measures to improve its appearance.
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.	Yes. The Project is located well within the Refinery facility and is thus well buffered from residential and recreational areas.

Source: City of Richmond, 1994

8.10.6.3 City of Richmond Zoning Ordinance

The area in which the PPRP facilities would be developed is zoned M-3 (Heavy Industrial) (see Figure 8.4-2: Zoning Districts: Refinery and Vicinity). The Zoning Ordinance indicates that this 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).

The provisions of the City of Richmond's Zoning Ordinance that touch on issues related to the Project's potential visual effects are summarized and evaluated for Project conformity in Table 8.10-2.

TABLE 8.10-2
Conformity of the PPRP with the City of Richmond Zoning Ordinances

Provision	Conformity?
Section 15.04.330.050 Development Standards for M-3 Heavy Industrial Districts	
Building Heights and Setbacks	
The maximum building height in this district is set at 75 feet, with 30 additional feet permitted for appurtenances. The ordinance specifies that the height limits do not apply to processing equipment and structures.	Yes. None of the features of the proposed Project would exceed 75 feet in height. The tallest feature of the proposed facilities is the HRSG exhaust stack, which would be 138 feet tall (processing equipment). Because the HRSG stack would be considered to be part of processing equipment, the height limits would not apply to the HRSG stack in any case.
Setbacks are established from adjacent streets and abutting residential properties and recreational amenities.	Yes. Because the locations of the Project features are sited well within the boundaries of the Chevron Refinery, they are far from public streets, residential properties and recreational amenities, and thus the standard setback requirements are not applicable to them.
Section 15.04.820.010 Fencing and Landscaping Standards	
Section 15.04.820.013 Requirements Applicable to Commercial and Industrial Properties	
Requirements for fencing and landscaping are established for the setback areas required in Section 15.04.330.050.	Yes. Because the standard setback areas would not be required for this Project, no fencing or landscaping would be necessary.
Section 15.04.930 Design Review	
The zoning ordinance establishes a Design Review Board, which "... shall review and/or approve, as the case may be, the design of exterior construction or modifications for which a building permit, zoning permit, certificate, or discretionary planning approval is required..."	Yes. Because the project is under the jurisdiction of the California Energy Commission rather than the City of Richmond, compliance with this and other provisions of the Richmond Zoning Ordinance are not necessarily required. However, the Applicant will submit all of the required materials to the City of Richmond for Design Review in compliance with the provisions of Section 15.04.930.
The applicant is required to submit to the Design Review Board a package that includes:	
a. Topographic survey including, but not limited to, all existing conditions on and surrounding the project site including uses, buildings, fences, grades, landscaping, streets, sidewalks, fire hydrants, and drainage.	

TABLE 8.10-2
Conformity of the PPRP with the City of Richmond Zoning Ordinances

Provision	Conformity?
b. Site plan indicating location and configuration of all buildings and proposed uses, parking spaces and circulation, fencing, street improvements, fire hydrants, refuse and waste areas, proposed grading and drainage, and other significant site features. The site plan shall include computations on the number and types of parking spaces provided, amounts of us developments shall include floor area ratio (FAR) calculations, net and gross lot area, and identify the square footage and location of all easements on the project site.	
c. Project summary including a complete description of all activities proposed for the site, the assessor's parcel number(s), general plan designation, zoning district, land area, building area, floor area ratio, building coverage, open space calculations, parking calculations.	
d. Landscaping plan indicating the location of all existing and proposed landscape plant materials including a plant list showing quantities, sizes, common and botanical names; design details for such items as walls, fences, lighting, paving, arbors, benches, and other site features; and preliminary irrigation plans including basic location, types, sizes, and quantities of fixtures. The removal and/or replacement of existing vegetation shall be clearly shown either on the submitted landscape plan or on a separate tree removal map.	
e. Building floor plan(s) of sufficient clarity to indicate the nature and extent of the proposal and to illustrate in detail that it will conform to the provisions of all relevant laws, codes, ordinances, rules, and regulations. Sloping lots exceeding 15% grade shall include finished floor elevations.	
f. Building elevations of sufficient clarity to indicate the nature of the exterior appearance of the proposal and its relationship to its surroundings.	
g. Typical building cross sections indicating the general nature of the method of construction along with screening of any roof-top mechanical equipment.	
h. Color and material samples securely fastened to an exhibit board showing samples of all proposed materials and colors of the exterior elevations.	

Source: City of Richmond, 2006

8.10.6.4 Summary of Project's Conformity with Applicable LORS

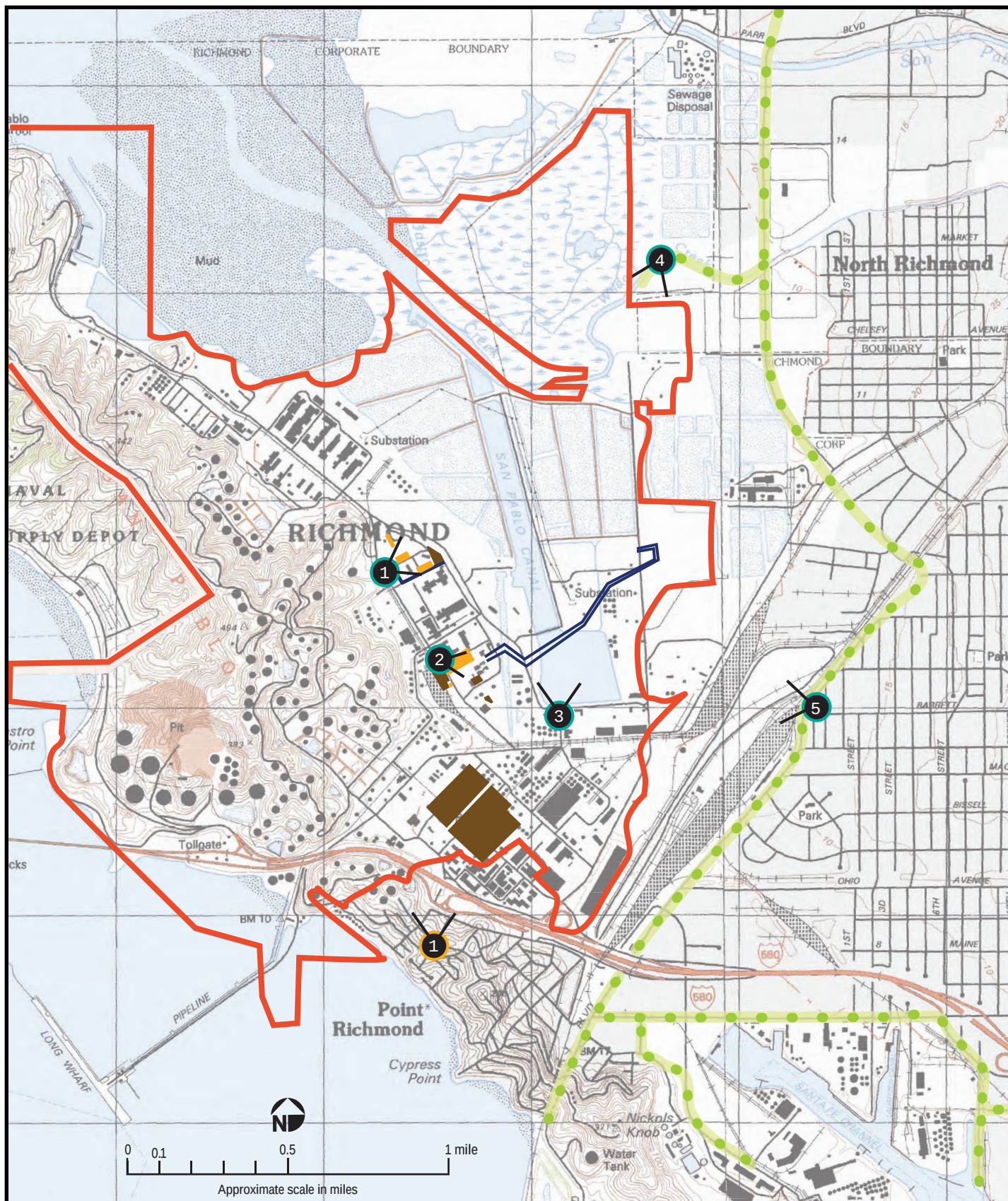
The Project is consistent with applicable LORS related to visual resources issues.

8.10.7 Mitigation

This analysis has documented the fact that no significant visual impacts would result from implementation of the proposed Project. Therefore, no mitigation measures are proposed.

8.10.8 References

- California Energy Commission. 2004. *Final Staff Assessment for the Roseville Energy Park Project* – Visual Resources chapter.
- City of Richmond. 1994. *Richmond General Plan: Goals, Policies, Guidelines, Standards, and Implementation Programs*. Volume One. Includes revisions through May 1998. City of Richmond Planning Department. August 1994. Available online: <http://www.ci.richmond.ca.us/index.asp?NID=684>
- _____. 2006. City of Richmond Zoning Ordinance.
- ESA Associates, Inc. (ESA). 2006. *Administrative Draft: Chevron Energy and Hydrogen Renewal Project Environmental Impact Report*. State Clearinghouse Number 2005072117, City of Richmond Project NO. 1101974. Prepared for City of Richmond. October.
- Federal Highway Administration (FHWA). Undated. *Visual Impact Assessment for Highway Projects*. U.S. Department of Transportation. Publication No. FHWA-HI-88-054.
- Smardon, Richard C., James E. Palmer, and John P. Felleman. 1986. *Foundations for Visual Project Analysis*. John Wiley & Sons. New York.
- U.S. Department of Agriculture (USDA) Forest Service. 1973. *National Forest Landscape Management Volume 1*. Washington D.C.: Superintendent of Documents.



LEGEND

— Boundaries of Chevron Richmond Refinery	 Photo Viewpoints
— Project Transmission Lines	 Key Observation Point
■ Locations of Project Facilities	●●● Bay Trail (improved & unimproved)
■ Laydown Area	

FIGURE 8.10-1
LOCATIONS OF PROJECT
FACILITIES AND VIEWPOINTS
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA



Photo 1: Existing view looking eastward across the site of the proposed hydrogen plant where the steam turbine generator, cooling tower, and switchgear that are part of the PPRP will be located.

FIGURE 8.10-2
EXISTING CONDITIONS - PHOTO 1: VIEW
EAST TOWARDS PROPOSED HYDROGEN
PLANT STG SITE
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA



Photo 2: Existing view looking southeastward across the site of the proposed cogeneration facility.

FIGURE 8.10-3
EXISTING CONDITIONS - PHOTO 2:VIEW
SOUTHEAST TOWARDS PROPOSED
COGENERATION PLANT SITE
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA



Photo 3: Existing view looking toward the transmission line that will be reconducted as a part of the proposed Project.

FIGURE 8.10-4
EXISTING CONDITIONS - PHOTO 3: VIEW
NORTH TOWARDS PROPOSED
RECONDUCTED TRANSMISSION LINE
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA



Photo 4: Existing view looking southward toward the Refinery and Project site from the Bay Trail observation area along Wildcat Creek.



Photo 5: Existing view looking west toward the Refinery and Project site from Barrett Avenue at Garrard Boulevard.

FIGURE 8.10-5
EXISTING CONDITIONS - PHOTOS 4 AND 5: VIEWS
SOUTH FROM WILDCAT CREEK AND WEST TOWARDS
NARRETT/GARRARD INTERSECTION
 CHEVRON POWER PLANT REPLACEMENT PROJECT
 RICHMOND, CA



A. Existing view looking northward toward the Refinery and Project site from KOP 1, a viewpoint overlooking a vacant lot on Golden Gate Avenue at Clarence Street at the crest of the ridge in Point Richmond.



B. Simulation depicting the view from KOP 1 as it would appear after development of the proposed Project.

FIGURE 8.10-6
KOP 1
 CHEVRON RICHMOND REFINERY POWER
 PLANT REPLACEMENT PROJECT
 RICHMOND, CALIFORNIA
CH2MHILL

8.11 Hazardous Materials and Waste

This section describes the proposed hazardous materials and waste management system for the proposed Power Plant Replacement Project (PPRP, or the Project) at the Chevron Richmond Refinery.

Section 8.11.1, Introduction, briefly describes the proposed Project. Section 8.11.2, Affected Environment, describes the hazardous materials that will be used at the Project site and the wastes that will be generated. Section 8.11.3.1 presents a checklist of possible environmental impacts related to hazardous materials use and waste generation and details the specific impacts posed by the proposed Project. The applicable local, state, and federal laws, ordinances, regulations, and standards (LORS) are described in Section 8.11.6. Regulatory agency contacts are identified in Section 8.11.8.

8.11.1 Introduction

Chevron is proposing the PPRP to add an additional 60 megawatts (MW) net generation to its existing refinery electrical generation located within Chevron's Richmond Refinery in the City of Richmond (see Figure 1.2-1) in Contra Costa County, California. The proposed PPRP will be integrated into Chevron's plans to meet its growing refinery electrical load, and produce steam to replace an existing boiler plant that is approaching its end of life. The PPRP is a subset of the larger Richmond Refinery Renewal Project that is concurrently undergoing California Environmental Quality Act (CEQA) review by the City of Richmond. The California Energy Commission (CEC) has jurisdiction for only the PPRP portion of the Renewal Project that is the subject of this application.

The PPRP will consist of the following components:

- A nominal 43-MW net, natural gas- or liquid petroleum gas (butane)-fired cogeneration train consisting of one combustion turbine generator (CTG), a refinery fuel gas-fired heat recovery steam generator, 13.8-kV switchgear and ancillary equipment.
- Shutdown of the existing No. 1 power plant refinery steam boilers currently providing steam to the Refinery.
- A 17-MW net extraction, condensing steam turbine generator (STG), an associated cooling tower, and 12-kV switchgear installed as part of the new hydrogen production facility (the remainder of the hydrogen plant is under CEQA review as part of the Renewal Project). The new hydrogen plant will be a net generator of steam for both the STG and the refinery steam system.
- Reconductoring of approximately 4,000 feet of existing onsite double-circuit overhead 115-kV transmission line to upgrade its ampacity. The reconductoring will reuse existing transmission line structures.
- Adjacent onsite service connections for fuel, reclaimed water, water, wastewater, steam, and electricity to existing piperacks, with the exception of the reconductoring noted above.

The Cogen 3000 portion of the PPRP will occupy approximately 0.5 acre within an existing 5.2-acre cogeneration facility, and the STG and associated equipment (H₂-STG) will occupy approximately 0.5 acre within a new 7.9-acre hydrogen plant that will be built as part of the Richmond Refinery Renewal Project. The PPRP will be located well within the heart of the existing 2,900-acre Richmond Refinery. Temporary construction laydown and parking for the PPRP will be provided in various existing laydown areas within the Refinery that are currently used for ongoing maintenance and project laydown. A complete description of the PPRP is provided in Section 2.0.

8.11.2 Affected Environment

8.11.2.1 Hazardous Materials

The proposed Project will include the installation of approximately 300 feet of 2-inch and smaller piping for anhydrous ammonia. The combustion turbine will also contain hydraulic and lubricating oils. The Project will store small amounts of various water treatment chemicals in portable containers in chemical feed areas adjacent to equipment using these chemicals.

A list of hazardous materials to be used at the Project site is presented in Table 8.11-1.

TABLE 8.11-1
Hazardous Materials to be Used at the Proposed Project

Material Name	Chemical Composition	Use	Storage Location
Anhydrous Ammonia	Ammonium hydroxide	Control nitrogen oxide (NO _x) emissions through selective catalytic reduction (SCR)	West of and adjacent to the gas compressors
Synthetic lubrication oil	Oil	Lubricate rotating equipment (e.g., combustion turbine bearings)	Contained within equipment
Mineral insulating oil	Oil	Transformers	Contained within Generator Step Up Units and auxiliary transformers

8.11.2.2 Waste Generation

A summary of wastes produced at the Project site and the manner in which they will be handled is presented in Table 8.11-2.

TABLE 8.11-2
Wastes Produced and Waste Management Methods

Source of Waste	Waste Composition	Quantity	Disposal Method
Air pollution control devices	Spent SCR and carbon monoxide (CO) catalyst	6 to 7 tons every 3 to 5 yrs	Recycled to equipment manufacturer
Chemical feed and sampling systems	No waste routinely generated; occasional spills only	No waste routinely generated	Spills pumped from secondary containment into container and reclaimed or disposed of offsite
Construction waste	Wood, metal, concrete, etc.	0.5 cubic yards per month	Transported to offsite landfill
Cooling water for H ₂ -STG	Blowdown	105 gpm	Refinery wastewater treatment plant
Electrical transformers	Waste oil	No waste routinely generated	Pumped from transformer to 55-gallon drum
Lubricating oils	Waste oil	No waste routinely generated	Pumped from equipment to 55-gallon drum
Fuel gas system	Blowdown oils	30 gal/month	Blowdown from filters flows to oily/wastewater separator; oil pumped from separator into 55-gal drums and sent for recycling
Municipal Solid waste	Paper, food, plastic, etc.	2 cubic yards per month	Transported to offsite landfill

8.11.3 Environmental Consequences

8.11.3.1 Environmental Checklist

The checklist in Table 8.11-3 is used by the CEC in its assessment of potential impacts.

8.11.3.2 Hazardous Materials Impacts

The proposed Project will have a less-than-significant impact on the public or the environment through the routine transport and use of hazardous materials, because most of these materials are already in use at the existing Chevron Refinery and are consistently transported without incident. Therefore, the increased use of hazardous materials already onsite and a slight increase in frequency of deliveries will not represent a significant impact. These events will be managed in a similar manner to the Chevron Refinery's existing operations. Transport of hazardous materials will be done in vehicles that have been designed for such transport to minimize a release, should a transportation accident occur.

TABLE 8.11-3
CEC Hazardous Materials and Waste Impact Checklist

	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant	No Impact
HAZARDOUS MATERIALS AND WASTE—Would the Project:				
a) Create a significant hazard to the public or the environment through the routine transport or use of hazardous materials?			X	
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?			X	
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				X
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?				X
e) Result in a safety hazard for people residing or working in the Project area if 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?				X
f) Result in a safety hazard for people residing or working in the Project area if located within the vicinity of a private airstrip?				X
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				X
h) Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?				X

There will be no additional ammonia storage facilities constructed at the site. The Project will use the same ammonia storage tanks presently used by the Refinery.

The project will require approximately 300 feet of 2-inch and smaller piping to be installed to connect the existing cogen station ammonia supply to the new cogeneration train. This piping would contain approximately 250 pounds of ammonia.

Currently the Refinery stores approximately 220,000 pounds of facility-generated ammonia in three storage tanks; no new ammonia storage is required for the PPRP. The additional

amount of ammonia for this Project is a small percentage of the total amount currently stored onsite, and would require a small modification to the existing Risk Management Plan (RMP) for the Refinery. Therefore, there will be no significant increase in risk to the public or the environment.

Ammonia is currently generated during the refining process at the Refinery and would not need to be delivered to the site. Therefore, there will be no significant increase in risk of release from transport of hazardous materials.

All hazardous materials will be stored in containers or tanks approved by the U.S. Department of Transportation (DOT) and the local fire department. Incompatible materials will be stored separately. The existing emergency response plan for the Chevron Refinery will be updated to include the additional chemical storage units.

Any applicable permits and plans associated with hazardous materials use or waste generation at the PPRP site will be in place prior to operation of the facility. This will include an updated hazardous materials business plan and an emergency response plan. Emergency response procedures will be prepared and maintained at the site. It is anticipated that emergency planning and response procedures will not differ appreciably from those in place for the Refinery.

There are no schools or day-care centers located within one-quarter mile of the Project site. The schools and day-care centers located within 1.5 miles of the site are: Washington Elementary School at 565 Wine Street, which is located 1.25 miles from the Project site; Peres Elementary School at 719 5th Street and the YMCA at 485 Lucas Avenue, which are both located 1.4 miles from the site; and Lincoln Elementary School at 29 6th Street, located approximately 1.5 miles from the site.

The Project site is not included on the Cortese List (Government Code Section 65962.5) and therefore does not pose a significant hazard to the public or environment (DTSC, 2007).

The proposed Project is located approximately 14.5 miles southeast of the San Rafael Airport and 8.4 miles northwest of the Oakland International Airport. An onsite helipad is present at the Refinery; however the additional structures from the Project are no different in height than other structures currently present onsite. Therefore, no resulting safety hazard would be present to people residing or working in the Project area.

Implementation of the proposed Project would have no effect on emergency response or emergency evacuation plans. As described in Section 8.11.4, Mitigation Measures, the 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. Therefore, no additional safety hazards would be present to people working in the Project area.

The risk of the proposed Project contributing to wildland fires is very low, due to the industrial nature of the area surrounding the site.

8.11.3.3 Waste Management Impacts

Methods that will be used to handle waste generated by the proposed Project are described above in Table 8.11-2. In addition, during construction activities there will be other wastes

generated on a temporary basis, such as solvents, adhesives, and paints. These wastes will be handled appropriately by the construction contractors. Any hazardous waste produced will be transported by a licensed hazardous waste transporter and will be disposed of by a licensed hazardous waste disposal facility. Therefore, the impacts from waste management at the proposed Project site will be minimal.

Environmental investigations were conducted on the Refinery site for subsurface soils beneath the proposed hydrogen plant site and the cogeneration plant site (SAIC, 2006a and 2006b). Copies of each of these investigations are included as Appendix 8.11-A. These studies indicated that samples of these media had been impacted with constituents of potential concern (COPCs) associated with historical industrial activities such as total petroleum hydrocarbons (TPH) in the gasoline and diesel ranges and metals (mercury and lead). The studies indicated that some of the soils at both facilities exceeded federal and/or state criteria for hazardous waste, which will require special handling and preclude the re-use of those soils during construction.

At the proposed hydrogen facility, it was also noted that shallow groundwater (1 to 4 feet below ground surface) had free-phase liquid hydrocarbon at nearly half of the 63 sample locations that were investigated and had several groundwater samples among five locations in which the maximum allowable contaminant limits (MACLs) established for the Refinery were exceeded (SAIC, 2006a). The results of these investigations indicate that Chevron will need to develop plans to protect future construction and site workers from exposures to COPCs and to properly handle affected environmental media (i.e., soil and groundwater).

8.11.4 Cumulative Impacts

It is not anticipated that the proposed Project will result in significant cumulative impacts that could adversely affect public health and safety or the environment. Water treatment chemicals are expected to be delivered to the Project site once a month, likely by existing suppliers.

The primary potential cumulative impact from the use and storage of hazardous materials would be a simultaneous release from two or more sites of a chemical that will migrate offsite. Potentially, the two or more migrating releases could combine, thereby posing a greater threat to the offsite population than a single release by any single site. Hazardous materials that do not migrate, such as sulfuric acid, will not present a potential cumulative impact. The hazardous material with the most potential to migrate offsite from the proposed Project site is ammonia. Pure ammonia is a volatile, acutely hazardous chemical that is stored under pressure as a liquid and becomes toxic gas if released. The ammonia to be used for the proposed Project is anhydrous ammonia. If the anhydrous ammonia were to leak or spill, the ammonia would gradually evaporate as a gas to the atmosphere. At high concentrations, ammonia gas causes severe impacts, even death, at concentrations above 2,500 parts per million (ppm). However, the odor threshold of ammonia is only about 5 ppm and irritation of the nose and throat occur at 30 to 50 ppm. Therefore, any releases will be readily detectable at concentrations well below severe hazard levels. Facility workers will be provided with safety equipment and trained in hazardous materials handling and emergency response.

8.11.5 Mitigation Measures

The following subsections present measures that the Applicant would implement during Project construction and operation phases to mitigate risks in handling hazardous materials, particularly the risk of inadvertent spills or leaks that might pose a hazard to human health or the environment.

8.11.5.1 Construction Phase

During facility construction, hazardous materials stored onsite will include small quantities of paints, thinners, solvents, cleaners, sealants, lubricants, and 5-gallon emergency fuel containers. This subsection describes measures that will be taken to mitigate potential risks from hazardous material usage. Paints, thinners, solvents, cleaners, sealants, and lubricants will be stored in a locked utility building. These materials will be handled per the manufacturers' directions and will be replenished as needed. The emergency fuel containers will be DOT-approved, 5-gallon safety containers, secured to the construction equipment. The emergency fuel will be used only when regular vehicle fueling is unavailable.

Fuel, oil, and hydraulic fluids will be transferred directly from a service truck to construction equipment tanks and will not otherwise be stored onsite. Fueling will be performed by designated, trained service personnel either before or at the end of the workday. Service personnel will follow standard operating procedures (SOPs) for filling and servicing construction equipment and vehicles. The SOPs, which are designed to reduce the potential for incidents involving the hazardous materials, include the following:

- Refueling and maintenance of vehicles and equipment will occur in designated areas that are equipped with spill control features (e.g., berms, paved surfaces, spill response kits, etc.).
- Vehicle and equipment service and maintenance will be conducted by authorized personnel only.
- Refueling will be conducted only with approved pumps, hoses, and nozzles.
- Catch-pans will be placed under equipment to catch potential spills during servicing.
- All disconnected hoses will be placed in containers to collect residual fuel from the hose.
- Vehicle engines will be shut down during refueling.
- No smoking, open flames, or welding will be allowed in refueling or service areas.
- Refueling will be performed away from bodies of water to prevent contamination of water in the event of a leak or spill.
- When refueling is completed, the service truck will leave the Project site.
- Service trucks will be provided with fire extinguishers and spill containment equipment, such as absorbents.
- Should a spill contaminate soil, the soil will be put in containers for offsite disposal as a hazardous waste.

- All maintenance and refueling areas will be inspected monthly. Results of inspections will be recorded in a logbook that will be maintained onsite.

Small spills will be contained and cleaned up immediately by trained, onsite personnel. Larger spills will be reported via emergency phone numbers to obtain help from offsite containment and cleanup crews. Personnel working on the Project during the construction phase will be trained in handling of and the dangers associated with hazardous materials. An onsite health and safety person will be designated to implement health and safety guidelines and contact emergency response personnel and the local hospital, if necessary.

If a spill involves hazardous materials equal to or greater than the specific reportable quantity, all federal, state, and local reporting requirements will be followed. The California Water Code, Section 13272(f), establishes a reportable quantity of 42 gallons for spills of petroleum products in water bodies. In the event of a fire or injury, the Plant Protection Department of the Richmond Refinery operates as the Chevron 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.

8.11.5.2 Operation Phase

During Project operation, some hazardous materials will be stored onsite. Listed below are management and mitigation measures for minimizing the risks of hazardous material handling during facility operation.

8.11.5.2.1 Sulfuric Acid

Sulfuric acid will be fed into the circulating water system in proportion to makeup water flow for alkalinity reduction; this will be done to control the scaling tendency of the circulating water within an acceptable range. The acid feed equipment will consist of an acid storage tank and chemical metering pumps. A sulfuric acid storage tank will be located near the cooling tower circulating water pumps in a concrete containment area; the area will have sufficient capacity to contain the full tank contents plus accumulated rainfall for 24 hours during a 25-year storm.

8.11.5.2.2 Hydrogen

Hydrogen gas will be stored outdoors in compressed gas cylinders. It will be used for cooling the steam turbine generator. Because it is highly flammable and potentially explosive, it will be stored in a separate area away from sources of ignition and heat and from oxidizing materials.

8.11.5.2.3 Other Hazardous Materials

Of the other hazardous materials that are continuously used onsite, one merits additional discussion because of the quantity of material stored. Water treatment chemicals will be added to the circulating water. These systems will consist of a storage tank and chemical metering pumps. The tanks will be located above concrete containment areas with sufficient capacity to contain the largest tank contents plus accumulated rainfall for 24 hours during a 25-year storm.

All hazardous materials will be handled and stored in accordance with applicable codes and regulations. All containers used to store hazardous materials will be inspected regularly for signs of leaking or failure. Incompatible materials will be stored in separate storage and

containment areas. Areas susceptible to potential leaks and/or spills will be paved and bermed. Containment areas may drain to a collection area, such as an oil/water separator or a waste collection tank. Piping and tanks will be protected from potential traffic hazards by concrete or pipe-type traffic bollards and barriers.

If a spill involves hazardous materials equal to or greater than the specific reportable quantity, all federal, state, and local reporting requirements will be followed. The California Water Code, Section 13272(f), establishes a reportable quantity of 42 gallons for spills of petroleum products in water bodies.

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.

All plant personnel will be trained in emergency procedures, including plant evacuation and fire prevention. In addition, designated personnel will be trained as members of a plant hazardous material response team; team members will receive the first responder and hazardous material technical training. 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 Supervisor of Fire Protection, 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.

8.11.5.3 Transportation/Delivery of Hazardous Materials

Hazardous materials will be delivered periodically to the Project site. Transportation will comply with the applicable regulations for transporting hazardous materials, including DOT, U.S. Environmental Protection Agency (USEPA), California Department of Toxic Substances Control (DTSC), California Highway Patrol (CHP), and California State Fire Marshal. Under the California Vehicle Code, the CHP has the authority to adopt regulations for transporting hazardous materials in California. The CHP can issue permits and specify the route for hazardous material delivery.

8.11.5.4 Hazardous Materials Plans

Hazardous materials handling and storage, and training in the handling of hazardous materials, will be set forth in more detail in hazardous materials plans that will be developed by the Applicant.

8.11.5.4.1 Hazardous Materials Business Plan

A Hazardous Materials Business Plan (HMBP) is required by Title 19 California Code of Regulations (CCR) and the Health and Safety Code (Section 25504). The Chevron Refinery

already has an existing HMBP on file with the Contra Costa County Environmental Health Department which will be updated with the chemicals to be used by the Project.

8.11.5.4.2 Risk Management Plan

The requirements for an RMP are found in California's Accidental Release Prevention Program (CalARP) pursuant to Health and Safety Code Sections 25331 through 25543.3 and in CCR Title 19, Section 2735.1 et seq. The California program is similar to the federal RMP program. An RMP is required for regulated substances listed in 19 CCR 2770.5 that exceed designated threshold levels (known as Threshold Quantities or TQs). The Chevron Refinery already has an existing RMP on file with the Contra Costa County Environmental Health Department which will be updated with the chemicals to be used by the Project.

8.11.5.4.3 Spill Prevention Control and Countermeasure Plan

Federal and California regulations require a Spill Prevention, Control, and Countermeasures (SPCC) Plan if petroleum products above certain quantities are stored in aboveground storage tanks. Both federal and state laws apply only to petroleum products that might be discharged to navigable waters. If stored quantities are equal to or greater than 660 gallons for a single tank, or equal to or greater than 1,320 gallons total, an SPCC Plan must be prepared. The Chevron Richmond Refinery already has an existing SPCC plan onsite which will be updated with the chemicals to be used by the Project.

8.11.5.4.4 Proposition 65

The facility will use lubricating and turbine oils and diesel fuel. These materials are included in the State of California's Prop 65 list of chemicals known to the state to cause cancer. The site will be appropriately labeled for all chemicals on the Proposition 65 list.

8.11.5.5 Monitoring

An extensive monitoring program will not be required because environmental effects during the construction and operation phases of the facility are expected to be minimal. However, sufficient monitoring will be performed during the construction and operation phases to ensure that the proposed mitigation measures are satisfied and that they are effective in mitigating any potential environmental effects.

8.11.6 Laws, Ordinances, Regulations, and Standards

The storage and use of hazardous materials and the generation of wastes at the Project site are governed by federal, state, and local laws, ordinances, regulations and standards (LORS). The applicable LORS are summarized in Table 8.11-4.

TABLE 8.11-4

Federal and State Laws, Ordinances, Regulations, and Standards (LORS) Applicable to Hazardous Materials and Waste

LORS	Applicability
Federal	
Comprehensive Environmental Response, Compensation, and Liability Act/Superfund Amendment and Reauthorization Act (CERCLA/SARA) Section 302	Requires certain planning activities when Extremely Hazardous Substances (EHS) are present in excess of their Threshold Planning Quantity (TPQ). The Project will have sulfuric acid in excess of the TPQ of 1,000 pounds.
CERCLA/SARA Section 304	Requires notification when there is a release of hazardous material in excess of its Reportable Quantity (RQ).
CERCLA/SARA Section 311	Requires a Material Safety Data Sheet (MSDS) for every hazardous material to be kept onsite and submitted to the State Emergency Response Commission (SERC), Local Emergency Planning Committee (LEPC), and the local fire department.
CERCLA/SARA Section 313	Requires annual reporting of releases of hazardous materials.
Clean Air Act (CAA)	Requires a Risk Management Plan (RMP) if listed hazardous materials are stored at or above a Threshold Quantity (TQ).
Clean Water Act (CWA)	Requires preparation of a Spill Prevention Control and Countermeasures (SPCC) plan if oil is stored above certain quantities.
CWA	Controls discharge of wastewater to the surface waters of the U.S.
Resource Conservation and Recovery Act (RCRA) Subtitle C	Controls storage, treatment, and disposal of hazardous waste.
State	
Hazardous Materials Release Response Plans and Inventory Act (Health and Safety Code, Section 25500, et seq.)	Requires preparation of a Hazardous Materials Business Plan (HMBP) if hazardous materials are handled or stored in excess of threshold quantities
California Accidental Release Prevention (CalARP) Program. Health and Safety Code, Section 25531 through 25543.4	Requires registration with local Certified Unified Program Agency (CUPA) or lead agency and preparation of an RMP if acutely hazardous materials are handled or stored in excess of TPQs.
Aboveground Petroleum Storage Act	Requires entities that store petroleum in aboveground storage tanks (AST) in excess of certain quantities to prepare an SPCC Plan.
Safe Drinking Water and Toxics Enforcement Act (Proposition 65)	Requires warning to persons exposed to a list of carcinogenic and reproductive toxins and protection of drinking water from same toxins.
CA Hazardous Waste Control Law (HWCL)	Controls storage, treatment, and disposal of hazardous waste.
Porter-Cologne Water Quality Control Act	Controls discharge of wastewater to the surface and groundwaters of California. Will apply only if the facility discharges wastewater to surface or groundwater.
Local	
Uniform Fire Code	Controls storage of hazardous materials and wastes and the use and storage of flammable/combustible liquids.
Contra Costa County Code – Construction and Demolition Debris Recovery (418-14)	Requires owners of all construction or demolition projects that are 5,000 sq ft. in size or larger to demonstrate a 50% diversion for construction and demolition debris. Diversion could be either reuse or recycling.

TABLE 8.11-4

Federal and State Laws, Ordinances, Regulations, and Standards (LORS) Applicable to Hazardous Materials and Waste

LORS	Applicability
Contra Costa County Integrated Waste Management Plan and Source Reduction and Recycling Element	Establishes waste management goals, objectives and policies for solid waste disposal.
City of Richmond Municipal Code Article XV Zoning and Subdivisions, Commercial and Industrial Provisions, Hazardous Materials 15.04.820.020	Establishes a basis for the issuance of conditional use permits for projects and activities which could significantly and/or adversely affect public health or the environment and which generate, store, transport, treat or dispose of significant amounts of hazardous materials.
City of Richmond Industrial Safety Ordinance	Enacts measures to prevent and reduce the probability of accidental releases of regulated substances that have the potential to cause significant harm to the public health and increase participation by industry and the public to improve accident prevention. Measures include submission of a safety plan to the city, public review of the safety plan, an expansion of the list of regulated substances beyond those covered by the Federal and State Risk Management Program regulations and authorization for the City to expand audits and inspections to all units within the stationary source. In addition, a root cause analysis shall be required for all major chemical accidents or releases and a public outreach and information program shall be established.

8.11.7 Permits Required

For informational purposes, the list of applicable permits, including permits that would be required but for the CEC's exclusive siting jurisdiction, are shown in Table 8.11-5.

TABLE 8.11-5

Permits Required and Permit Schedule for Hazardous Material Handling

Permit	Schedule	Applicability	Agency Contact
Hazardous Materials Inventory and Emergency Business Plan	Update 30 days prior to start of operations.	Applies to all hazardous materials exceeding reporting thresholds	Contra Costa County Environmental Health Division 50 Douglas Drive Martinez, CA 94553
California Accidental Release Prevention (CalARP) Program (Risk Management Plan)	Update 90 days prior to start of operations.	Applies to aqueous ammonia because it will exceed the Threshold Quantity (TQ) of 500 pounds	Contra Costa County Environmental Health Division 50 Douglas Drive Martinez, CA 94553

8.11.8 Involved Agencies and Agency Contacts

Table 8.11-6 lists the local agencies involved in hazardous materials management for the Project and a contact person at each agency. The Contra Costa County Environmental Health Division (CCCEHD) is the Certified Unified Program Agency (CUPA) and administers the Hazardous Waste Generator Program. The CCCEHD administers the

Hazardous Materials Release Response Plan and Inventory Program (i.e., the Hazardous Materials Business Plan program) and CalARP.

TABLE 8.11-6
List of Hazardous Material Agency Contacts for the Proposed Project

Agency	Name/Title	Address	Phone Number
Contra Costa County Environmental Health Division	Richard Lee/Assistant Director	50 Douglas Drive Martinez, CA 94553	925-646-5225, ext. 200
Richmond Fire Department	Michael Banks, Fire Chief	Richmond City Hall 1401 Marina Way South, Richmond, CA 94804	510-307-8031

8.11.9 References

California Department of Toxic Substances Control (DTSC). 2007. DTSC's Hazardous Waste and Substances Site List - Site Cleanup (Cortese List):

http://www.dtsc.ca.gov/SiteCleanup/Cortese_List.cfm Referenced January 4, 2007.

Science Applications International Corporation (SAIC). 2006a. *Capital Projects: Hydrogen Plant Project Site Soil Pre-Characterization Results*. HW Job #: S2996. Chevron Richmond Refinery. April 28. See Appendix 8.11-A.

_____. 2006b. *Capital Projects: COGEN Project Site Soil Pre-Characterization Results*. HW Job #: S2997. Chevron Richmond Refinery. May 9. See Appendix 8.11-A.

8.12 Water Resources

This section describes the water resources features in the immediate Project area and evaluates the effect of the Chevron Richmond Refinery Power Plant Replacement Project (PPRP, or the Project) on water resources. Potential impacts to water resources are evaluated specifically with respect to significance thresholds established in the California Environmental Quality Act (CEQA) checklist.

8.12.1 Introduction

Chevron is proposing the PPRP to add an additional 60 megawatts (MW) net generation to its existing refinery electrical generation located within Chevron's Richmond Refinery in the City of Richmond (see Figure 1.2-1) in Contra Costa County, California. The proposed PPRP will be integrated into Chevron's plans to meet its growing refinery electrical load, and produce steam to replace an existing boiler plant that is approaching its end of life. The PPRP is a subset of the larger Richmond Refinery Renewal Project that is concurrently undergoing CEQA review by the City of Richmond. The California Energy Commission (CEC) has jurisdiction for only the PPRP portion of the Renewal Project that is the subject of this application.

The PPRP will consist of the following components:

- A nominal 43-MW net, natural gas- or liquid petroleum gas (butane)-fired cogeneration train consisting of one combustion turbine generator (CTG), a refinery fuel gas-fired heat recovery steam generator, 13.8-kV switchgear and ancillary equipment.
- Shutdown of the existing No. 1 power plant refinery steam boilers currently providing steam to the Refinery.
- A 17-MW net extraction, condensing steam turbine generator (STG), an associated cooling tower, and 12-kV switchgear installed as part of the new hydrogen production facility (the remainder of the hydrogen plant is under CEQA review as part of the Renewal Project). The new hydrogen plant will be a net generator of steam for both the STG and the Refinery steam system.
- Reconductoring of approximately 4,000 feet of existing onsite double-circuit overhead 115-kV transmission line to upgrade its ampacity. The reconductoring will reuse existing transmission line structures.
- Adjacent onsite service connections for fuel, reclaimed water, water, wastewater, steam, and electricity to existing piperacks, with the exception of the reconductoring noted above.

The Cogen 3000 portion of the PPRP will occupy approximately 0.5 acre within an existing 5.2-acre cogeneration facility, and the STG and associated equipment (H₂-STG) will occupy approximately 0.5 acre within a new 7.9-acre hydrogen plant that will be built as part of the Richmond Refinery Renewal Project. The PPRP will be located well within the heart of the existing 2,900-acre Richmond Refinery. Temporary construction laydown and parking for the PPRP will be provided in various existing laydown areas within the Refinery that are

currently used for ongoing maintenance and project laydown. A complete description of the PPRP is provided in Section 2.0.

8.12.2 Laws, Ordinances, Regulations, and Standards

Federal, state, county, and local laws, ordinances, regulations, and standards (LORS) applicable to water resources are discussed in this section and summarized in Table 8.12-1.

TABLE 8.12-1
Applicable Laws, Ordinances, Regulations, and Standards

LORS	Applicability	Conformance and Timing
Federal		
Clean Water Act/Water Pollution Control Act. P.L. 92-500, 1972; amended by Water Quality Act of 1987, P.L. 100-4 (33 USC 466 et seq.); National Pollutant Discharge Elimination System (NPDES) (CWA, Section 402).	Prohibits discharge of pollutants to receiving waters unless the discharge is in compliance with an NPDES permit. Applies to all point-source discharges, including industrial wastewater and stormwater runoff, during both construction and operation.	Compliance with NPDES permit requirements from the San Francisco Bay Water Board (see below under State) and local agencies (see below under Local).
State		
Porter-Cologne Water Quality Control Act	Specifies the responsibilities of the state with respect to protection of surface waters.	- Refinery process wastewater and stormwater is collected and managed in the existing wastewater treatment system that is regulated by the San Francisco Bay Regional Water Quality Control Board (RWQCB) under NPDES Permit CA0005134, Order No. R2-2006-0035. See Section 8.12.3.3 (Plant Wastewater). - Sanitary wastewater streams are conveyed to the Richmond Sewer District for treatment and disposal; discharges are regulated under NPDES Permit CA0038539, Order No. 94-014. See Section 8.12.3.3 (Plant Wastewater). - Stormwater discharges are regulated under an existing NPDES permit for municipal stormwater NPDES Permit CA0005134, Order No. R2-2006-0035)). See Section 8.12.4.2 (Municipal Stormwater). - Stormwater discharges during operation of power plants requires compliance with statewide program for industrial uses (NPDES Permit, Order No. 97-03-DWQ). See Section 8.12.4.2 (Industrial Stormwater). - Construction stormwater discharges on sites greater than 1 acre require compliance with statewide construction discharge permit (NPDES Permit CAS000002, Order No. 99-08-DWQ). See Section 8.12.4.2 (Construction Stormwater).

TABLE 8.12-1

Applicable Laws, Ordinances, Regulations, and Standards

LORS	Applicability	Conformance and Timing
California Water Code §461 and §13550, and SWRCB Resolution 75-58.	Encourages the conservation of water resources and the maximum reuse of wastewater.	The PPRP proposes to use potable water for process and cooling water. However, if sufficient recycled water becomes available, the project will use recycled water, and is therefore in conformance with these code sections and Resolution No. 75.58. See Section 8.12.3.2 (Water Supply and Use).
Bay Conservation and Development Commission	The Bay Conservation and Development Commission was created in response to broad public concern over the future of San Francisco Bay.	- Regulates new development within the first 100 feet inland from the Bay to ensure that maximum feasible public access to the Bay is provided. - Pursues an active planning program to study Bay issues so that Commission plans and policies are based upon the best available current information. - Administers 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. - Participates in California's oil spill prevention and response planning program.
Local		
Contra Costa County General Plan	Contra Costa County General Plan provides policies and goals to protect water resources.	<i>Goal 8-T:</i> 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. <i>Policy 8-74:</i> Preserve watersheds and groundwater recharge areas by avoiding the placement of potential pollution sources in areas with high percolation rates. <i>Policy 8-75:</i> Preserve and enhance the quality of surface and groundwater resources. <i>Policy 8-87:</i> 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. <i>Policy 8-91:</i> 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. <i>Policy 8-dd:</i> Require groundwater monitoring programs for all large-scale commercial and industrial facilities using wells.

TABLE 8.12-1

Applicable Laws, Ordinances, Regulations, and Standards

LORS	Applicability	Conformance and Timing
		<i>Policy 10-38:</i> 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. <i>Policy 10-60:</i> 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.
City of Richmond General Plan	The City of Richmond General Plan (1994) lists the following goals and policies to protect hydrology and water quality.	<i>OSC-J.1:</i> 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). <i>OSC-M.2:</i> Protect the City's waterways and the Bay from run-off containing high concentrations of pesticides and fertilizers, industrial wastes, or other contaminants. <i>Goal CF-H:</i> Provide and maintain a level of public infrastructure facilities that adequately serves the present and future needs of the community. <i>Policy CF-H.1:</i> 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. <i>Policy CF-H.3:</i> Encourage effective water conservation practices by residents and businesses including household water conservation and use of drought resistant landscaping and reclaimed wastewater. <i>Goal CF-H:</i> Provide and maintain a level of public infrastructure facilities that adequately serves the present and future needs of the community. <i>Policy CF-H.4:</i> 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 stormwater runoff. <i>Policy CF-H.5:</i> 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.

8.12.2.1 Federal

The Clean Water Act authorizes the U.S. Environmental Protection Agency (USEPA) to regulate discharges of wastewater and stormwater into surface waters by issuing National Pollutant Discharge Elimination System (NPDES) permits and setting pretreatment standards. In California, the Regional Water Quality Control Boards implement these permits at the state level, but USEPA may exercise its jurisdiction at its discretion. Relevant NPDES permits are discussed below under state LORS.

8.12.2.2 State

Municipal Stormwater NPDES Permit

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. The Clean Water Program includes all 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 Regional Water Quality Control Board (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 incorporated 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.

Industrial Stormwater NPDES Permit

The State Water Resources Control Board (SWRCB) implements regulations under the federal Clean Water Act requiring that point source discharges of stormwater (which is a flow of rainfall runoff in some kind of discrete conveyance such as a pipe, ditch, channel, or swale) associated with industrial activity that discharge either directly to surface waters or indirectly through municipal separate storm sewers must be regulated by an NPDES permit (RWQCB, 2006). The SWRCB has issued a statewide General Permit and Waste Discharge Requirements (WDRs) to dischargers of stormwater associated with industrial activities (such as the proposed Project), excluding construction activities (NPDES General Permit CAS000001, SWRCB Order 97-03-DWQ). The Stormwater Pollution Prevention Plans (SWPPPs) are required to specify management measures necessary to meet WDRs to ensure receiving water quality is protected. The SWRCB requires a Notice of Intent to be filed prior to any stormwater discharge from industrial activities, and that the SWPPP be prepared, implemented, and maintained at the facility. This statewide General NPDES Permit is currently undergoing a re-issuance process with the SWRCB; the Project will comply with the current General Permit and with any revisions to the General Permit.

Construction Stormwater NPDES Permit

The federal Clean Water Act effectively prohibits discharges of stormwater from most construction sites unless the discharge is in compliance with an NPDES permit. The SWRCB is the permitting authority in California and has adopted a statewide General Permit for Stormwater Discharges Associated with Construction Activity (NPDES Permit CAS000002, Order No. 99-08-DWQ) that applies to projects resulting in one or more acres of soil

disturbance. In accordance with the statewide General Permit, 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, consistent with implementing agencies' requirements.

California Water Code Sections 461 and 13550, and SWRCB Resolution No. 75-58

Water Code Section 461 states that the primary interest of the people of the state in the conservation of all available water resources required the maximum reuse of recycled water in the satisfaction of requirements for beneficial uses of water. In addition, Water Code section 13550 specifically encourages the conservation of potable water resources and the maximum reuse of wastewater for industrial uses (such as the PPRP) and other uses in areas where recycled water of adequate quality is available at reasonable cost. The PPRP is consistent with these sections of the Water Code because as sufficient recycled water becomes available, the Project will use recycled wastewater for cooling and process needs.

SWRCB Resolution No. 75-58 adopted the "Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Powerplant Cooling," which provides statewide water quality principles regarding power plants that depend upon inland waters for cooling. Resolution No. 75.58 included several guiding principles for cases where the SWRCB or any of the Regional Boards have permit authority over a power plant project, and specifically encouraged the use of wastewater for power plant cooling. The PPRP is consistent with Resolution No. 75.58 because it will use recycled wastewater for cooling when sufficient supplies become available.

Bay Conservation and Development Commission (BCDC)

The 27-member San Francisco Bay Conservation and Development Commission was created by the California Legislature in 1965 in response to broad public concern over the future of San Francisco Bay. The BCDC is made up of appointees from local governments and state/federal agencies. The BCDC, 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 BCDC 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 BCDC policies.
- Participating in California's oil spill prevention and response planning program.

8.12.2.3 Local

City of Richmond General Plan

The City of Richmond General Plan (City of Richmond, 1994) lists the following goals and policies applicable to hydrology and water quality for the proposed Project.

Hydrology and Water Quality Goals

- *Goal 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).
- *Goal 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.

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 stormwater 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.

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 Plan (County of Contra Costa, 2005). Applicable goals and policies of the County General 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

- *Policy 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.

8.12.3 Setting

8.12.3.1 Hydrologic Setting

Climate and Precipitation

The Project area is characterized as Mediterranean with cool, wet winters and relatively warmer, dry summers. Most of the precipitation falls between November and March. Monthly average rainfall in the City of Richmond is presented in Table 8.12-2. Total annual average rainfall is approximately 23 inches. Total annual average rainfall at the San Pablo/Potrero Hills is approximately 16 inches (Rantz, 1971).

TABLE 8.12-2
Average Monthly Rainfall Near Proposed Project Site (1950 to 2005)

Precipitation	Sum	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average	23.23	4.84	3.83	3.21	1.56	0.53	0.19	0.04	0.08	0.22	1.23	3.00	4.50
Maximum	-	11.68	16.40	12.24	4.98	3.74	1.46	1.41	1.10	1.65	4.57	10.55	9.71
Minimum	-	0.30	0.17	0.01	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00

Notes:

All measurements in inches.

Source: Western Regional Climate Center (WRCC), 2005.

Surface Water

The site is part of the Wildcat Creek drainage area that drains to San Pablo Bay. San Pablo Bay is part of the San Francisco Bay Estuary. Freshwater strongly influences environmental conditions in the San Francisco Bay Estuary. Over 90 percent of the estuary's fresh water

originates from the Sacramento-San Joaquin drainage basin and enters the northern reach. 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. Figure 8.12-1 shows the surface water features near the project site.

The major source of freshwater to San Pablo Bay is inflow from Sacramento-San Joaquin Delta, followed by surface water flow, surface stormwater runoff, and groundwater. The physical characteristics (i.e., salinity, temperature, and suspended solids) 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.

The RWQCB has identified impaired water bodies due to elevated levels of contaminants (RWQCB, 1995). Identified impaired water bodies for the San Francisco Bay Region include central San Francisco Bay, San Pablo Bay, and Wildcat Creek. The pollutants of concern in these impaired water bodies include chlordane, pesticides, dioxins, furans, mercury, PCBs, selenium, nickel, and diazinon. The sources of these pollutants include non-point sources from urban development, atmospheric deposition, ballast water (from ships), industrial and municipal point sources, agriculture, and natural sources. Other water quality stressors include introduction of exotic plant/animal species. Surface water bodies are used primarily for commercial and sport fishing, estuarine habitat, fish and wildlife habitat, recreation, rare species habitat, and industrial water supply.

Groundwater

The Chevron Richmond Refinery lies within the San Francisco Bay Area Hydrologic Region. The PPRP is located within the East Bay Plain Subbasin of the Santa Clara Valley Groundwater Basin (Figure 8.12-2) (California Department of Water Resources [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). These unconsolidated sediments can range up to 1,000 feet thick.

Flooding Potential

As shown on Figure 8.12-3, the Project is not located within a potential flood zone as mapped by the Federal Emergency Management Agency (FEMA). Although the property boundary includes areas that are within the 100-year floodplain, the majority of Chevron Richmond Refinery operations and the PPRP site are outside the 100-year floodplain (ESRI-FEMA, 2001).

8.12.3.2 Water Supply and Use

General Information

Potable water is supplied to the Chevron Richmond Refinery by EBMUD. EBMUD water supply and distribution system consist of six water treatment plants, which have a combined treatment capacity of over 375 million gallons per day (mgd). The Orinda Water Treatment Plant, which supplies potable water to the Richmond area and the Refinery, has a treatment capacity of 200 mgd and is currently operating at approximately 70 percent capacity (EBMUD, 2007).

In addition to supplying potable water, EBMUD has been supplying recycled water to the Refinery since September 1995. Recycled water is suitable for most industrial uses such as cooling. Recycled water also can be used for boiler feedwater, process water, and for washdown. Other uses of recycled water include dust control and soil compaction during construction, as well as landscape irrigation. Currently, a 16-inch recycled water pipeline takes processed effluent from the EBMUD's North Richmond Water Reclamation Plant and provides it to Chevron for use in one of its cooling towers. This has resulted in a 3.5 mgd reduction in Chevron's use of potable water.

The Chevron Richmond Refinery is proposing to increase its use of recycled water in cooperation with EBMUD, which is proposing to construct and operate the Richmond Advanced Recycled Expansion (RARE) water project near the southern boundary of the Chevron Richmond Refinery. The RARE project will treat effluent to recycled water standards and deliver it to the Refinery using an existing potable water supply pipeline to the Refinery's existing water treatment facilities (reverse osmosis [RO] plant). If the RARE project is constructed, all uses currently served by potable water from the RO plant would be served by recycled water, reducing potable water use at the Refinery by approximately 3 to 5 mgd. The public comment period for the RARE project's Environmental Impact Report has been completed and an Agency Scoping meeting was held on May 18, 2007. The on-stream date for the RARE project is not yet known, as the project's EIR was approved on May 8, 2007. Therefore, this water resources analysis assumes that the Project will use existing potable water supplies from EBMUD.

Project Information

Water will be used for the Cogen 3000 project, the H₂-STG project, and for potable use. On hot days (85°F), Cogen 3000 will require up to 8 gallons per minute (gpm) of water for the turbine inlet air evaporative cooling system makeup. Under average annual ambient conditions (60°F), Cogen 3000 will require approximately 3 gpm for the inlet air evaporative cooling system make-up. In addition, Cogen 3000 will require 532 gpm of RO water for steam cycle make-up. All of the water required for the Cogen 3000 facility will be provided by the existing RO plant (currently supplied by the EBMUD potable water system).

The H₂-STG will use up to 300 gpm of recycled water for cooling tower make-up. Total recycled water use by the cooling tower would be approximately 484 acre-feet per year. The recycled water will be delivered to the H₂-STG through an existing recycled water pipeline from the EBMUD North Richmond Water Reclamation Plant. The H₂-STG also will use a small amount (approximately 15 gpm) of cycle makeup water for gland seal leakage, which will be provided by the existing RO plant (currently supplied by the potable water system but may be supplied by the RARE project if constructed).

Potable water for drinking, safety shower, fire protection, and service water uses will be served from the existing EBMUD potable water system, using existing lines.

Figures 2.1-16 and 2.1-17 illustrate the expected water balance for Cogen 3000 at an average ambient temperature of 60°F and at maximum ambient temperature of 85°F. Average water balance for the STG is illustrated in Figure 2.1-18. Average daily and maximum water uses are presented in Table 2.2-1.

8.12.3.3 Wastewater Collection, Treatment, and Disposal

General Information

Numerous sources of discharge water emanate from the Refinery including treated process wastewater, stormwater, steam condensate, firewater, and groundwater. All of the effluent water is ultimately discharged into the San Pablo or San Francisco Bays.

The Refinery has its own wastewater treatment system. The system's capacity is approximately 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 existing cooling tower blowdown, condensed steam, plant wash-up water, and various other sources. During the winter months, in addition to the average 5.48 mgd process wastewater, large amounts of rainfall also enter the wastewater 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 stormwater from wastewater has resulted in only the wastewater flow being treated by the wastewater treatment system. The wastewater treating system was originally sized to handle the full flow of wastewater and stormwater, and as a result of the flow separation project, the wastewater treatment system now has excess capacity for treating wastewater.

The discharge of treated wastewater and stormwater from the Refinery is regulated and permitted by the RWQCB. The 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 flow from the process units in its respective area and routes the wastewater to one of three separate oil/water separators, then to a 165 million gallon biological treatment unit called a Bioreactor. The Bioreactor effluent can either be routed directly to the deepwater outfall sump for discharge to San Pablo Bay after passing through a granular activated carbon unit, or a portion may be routed through 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 in to the San Pablo Bay (approximately 2,000 feet offshore to the north of Point San Pablo).

Treatment of sanitary (domestic) wastewater from the Refinery is provided by the Richmond Sewer District. The Richmond Sewer District treatment plant 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.

Project Information

The wastewater collection system will collect process wastewater from all of the PPRP plant equipment, including the Heat Recovery Steam Generator (HRSG), cooling towers, and water treatment equipment. The water balance diagrams, presented in Section 2.0, show the expected wastewater streams and flow rates for the PPRP (also see Table 2.2-1). Waste streams include the following:

- Circulating water system blowdown from cooling towers will be discharged to the Refinery wastewater treatment system.
- General plant drains will collect containment area washdown, sample drains, and drainage from facility equipment drains. Water from these areas will be collected in a system of floor drains, hub drains, sumps, and piping and routed to the wastewater collection system. Drains that potentially could contain oil or grease will first be routed through an existing oil/water separator.
- Distillate from the existing Refinery RO system will be used as the feed water for the boiler cycle makeup treatment system.
- HRSG blowdown will ultimately be to flash tanks where the flash steam is sent to lower pressure Refinery steam systems and the condensate is cooled by cooling water in a heat exchanger. The cooled condensate will then be forwarded to one of the other Refinery process units for reuse in that process.

8.12.3.4 Stormwater Discharges

General Information

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 system. Most of the Refinery stormwater runoff is collected and managed in the existing stormwater system that is regulated by the RWQCB.

Project Information

The PPRP will be designed to minimize the need to remove existing soil during construction. Excavated soils will be managed in conformance with the Refinery's RWQCB-approved Soil Management Program.

Drainage systems required for the PPRP will be integrated into the Refinery's existing stormwater and process wastewater conveyance and treatment systems, regulated under an existing NPDES permit.

8.12.4 Impacts

Project impacts are evaluated with respect to the potential effect on surface and groundwater supplies, potential for erosion, water quality degradation, flooding, and consistency with existing LORS.

8.12.4.1 Environmental Checklist

Table 8.12-3 provides the CEQA Checklist questions that were used to assess the significance of potential impacts and to summarize the possible impacts to water resources from the PPRP.

TABLE 8.12-3
CEQA Checklist for Water Resources

	Potentially Significant Impact	Less than Significant w/Mitigation	Less than Significant	No Impact
Water Resources — Would the Project:				
a) Violate any water quality standards or waste discharge requirements?			X	
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?			X	
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation onsite or offsite?			X	
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding onsite or offsite?				X
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?			X	
f) Otherwise substantially degrade water quality?				X
g) Place housing within a 100-year flood hazard area as mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?				X
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?				X
i) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?				X
j) Inundation by seiche, tsunami, or mudflow?				X
k) Substantially deplete or degrade local or regional surface water supplies, particularly fresh water, or fail to implement reasonable alternatives for water conservation?				X

8.12.4.2 Discussion of Impacts

Water Supply

For cooling tower make-up and other uses, the Project will use potable water provided by EBMUD. EBMUD is making a significant investment to make recycled water available to users, which will help offset its dependence on surface water. The PPRP provides an important market for the use of recycled water and will use recycled water when sufficient supplies are available.

Potable water use for drinking, safety shower, fire protection, and plant services is very small and will be served from the existing EBMUD potable water system that currently serves the Refinery. If the EBMUD RARE project is approved and constructed, the PPRP's only uses of potable water will be limited to drinking, safety showers, and fire protection. Approximately 800 gpm (1,290 acre-feet per year) of potable water is currently used by the existing steam boilers at the Refinery. These facilities will be shut down after the PPRP is online. The proposed Project's maximum annual total water use is expected to be 1,486 acre-feet per year, resulting in a net increase of approximately 200 acre-feet per year. This increase is not expected to result in significant impacts to EBMUD's water supply system.

Wastewater

The anticipated wastewater discharge is well within the total capacity of the Refinery's wastewater treatment system. The wastewater stream separation system implemented recently by Chevron has resulted in only the process wastewater flow being treated by the system. As a result, the current system has excess capacity for treating wastewater; therefore, wastewater impacts for the PPRP will be less than significant. The increased volume of sanitary wastewater resulting from the PPRP would be considered a *de minimis* increase in demand on the sewer system and well within the capacity of the district.

Groundwater Use

The PPRP will use potable water (and if available recycled), which does not originate from groundwater sources; therefore, the Project will not cause significant impacts to potable groundwater supplies or uses.

Stormwater Runoff

Rainwater runoff from stockpiles of contaminated soils excavated during site preparation of the building sites for the H₂-STG could introduce additional contaminant loading into the waste stream. However, these stockpiled soils would be managed under the Refinery's RWQCB-approved Soil Management Program, which would mitigate the potential impact to less-than-significant levels.

The proposed Project would comply with the BMP conditions of a Construction Activity Stormwater permit and would have no offsite discharges from stormwater.

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 stormwater runoff is controlled by the existing wastewater treatment system. Potential water quality impacts associated with erosion and runoff during construction would also be managed by the existing wastewater treatment systems as well as standard construction methods and applicable regulations.

Cumulative Impacts

The PPRP will not cause or contribute to cumulative impacts on water resources. Good engineering practices and BMPs will be used in the Project design and operation. Stormwater discharge will adhere to a SWPPP and to state and local agency water quality standards. The Basin Plan is a regional program which documents approaches to implementing state and federal policies in the context of actual waste quality conditions. The PPRP's compliance with the Basin Plan constitutes compliance with a regional water quality program, further ensuring that cumulative impacts to local waterways are avoided. No significant impacts to surface water or groundwater quality are expected during construction or operation of the Project. In the future, if sufficient recycled water becomes available, the Project will contribute to water conservation by making use of recycled water for power plant and other process uses.

8.12.5 Mitigation Measures

Implementation of the PPRP as designed will have less-than-significant impacts. Mitigation is not required. As described in Section 8.12.2, rainwater runoff from stockpiles of contaminated soils excavated during site preparation of the building sites for the H₂-STG could introduce additional contaminant loading into the waste stream. However, these stockpiled soils would be managed under the Refinery's RWQCB-approved Soil Management Program, which would mitigate the potential impact to less-than-significant levels.

8.12.6 Permits Required

The RWQCB is responsible for administering water quality permitting for the Project. A tabular summary of required permits and involved agencies is provided in Table 8.12-4.

TABLE 8.12-4
Permitting Agencies for Water Resources Permits

Permit	Agency
Construction Activity Stormwater Permit	San Francisco Bay RWQCB Dale Bowyer Program Coordinator (510) 622-2323

8.12.7 Involved Agencies and Agency Contacts

Agency contacts are provided in Table 8.12-4.

8.12.8 References

California Department of Water Resources (DWR). 2003. *California's Groundwater, San Francisco Bay Hydrologic Region*. Bulletin 118.

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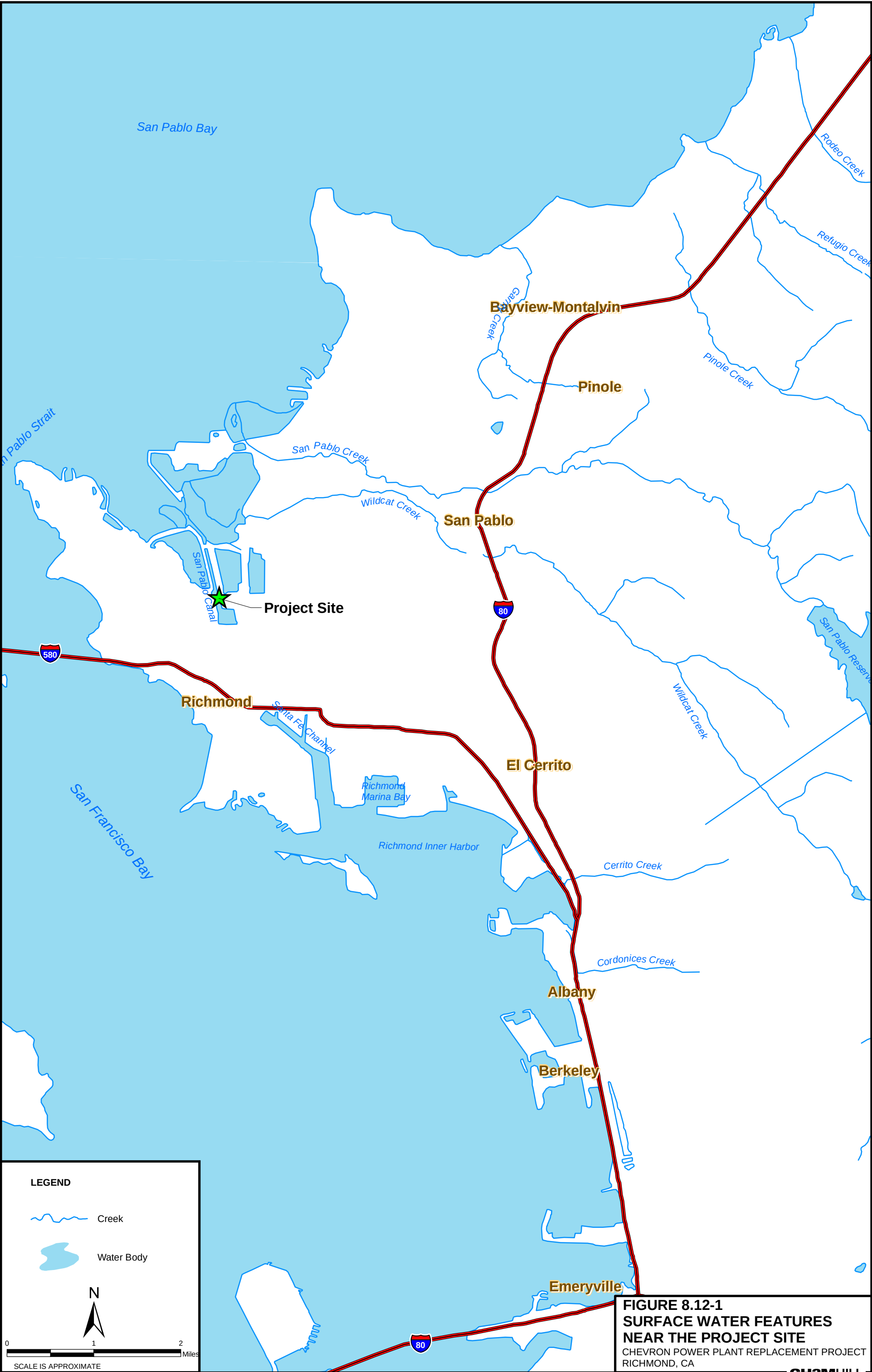
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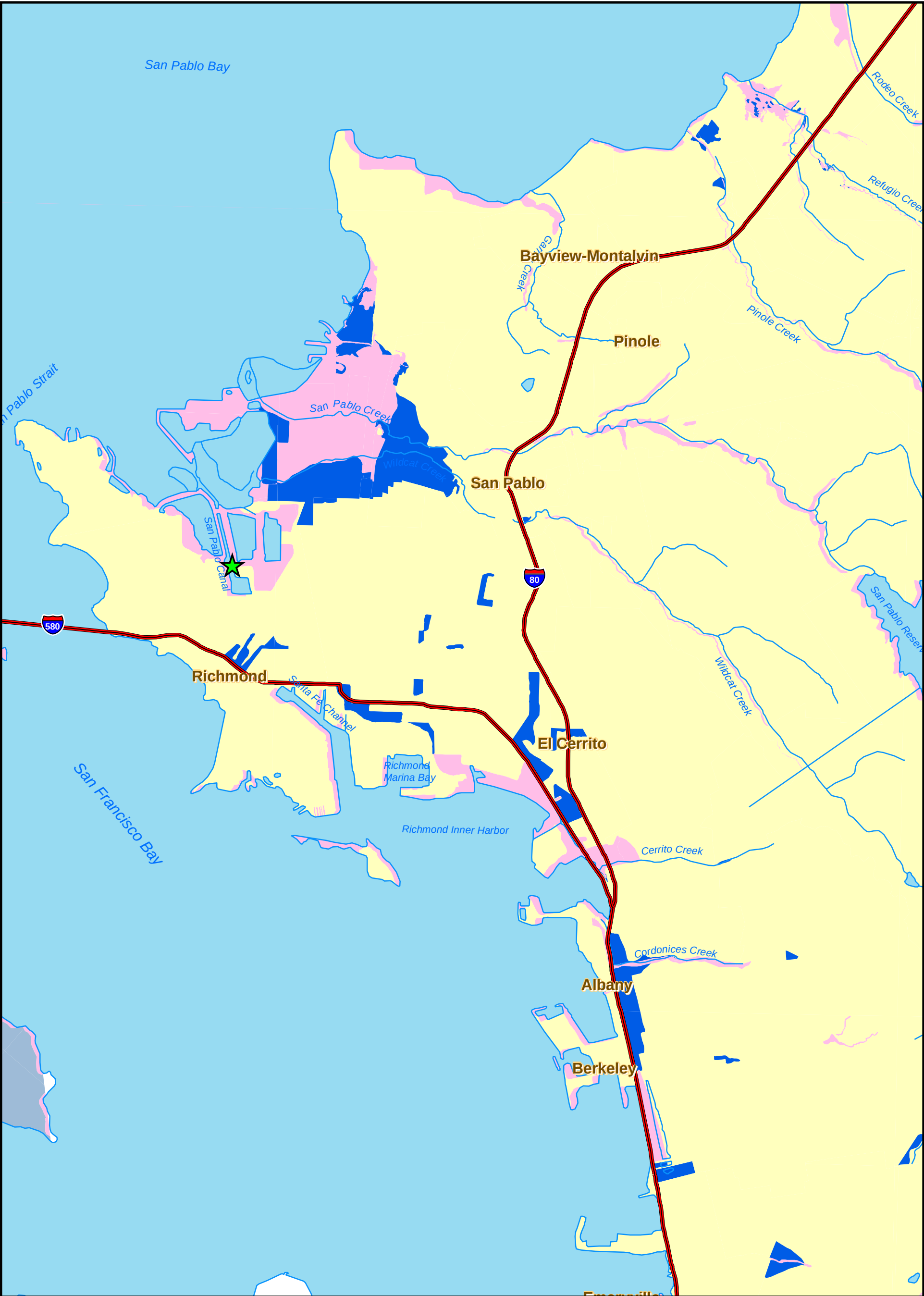
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LEGEND



Site Location



An area inundated by 100-year flooding, for which no Base Flood Elevations have been determined.



An area that is determined to be outside the 100- and 500-year floodplains



An area inundated by 500-year flooding; an area inundated by 100-year flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from the 100-year flooding.



An area of undetermined but possible flood hazards



Area Not Included



Undescribed



SCALE IS APPROXIMATE



FIGURE 8.12-3
FEMA FLOOD PLAIN MAP
CHEVRON POWER PLANT REPLACEMENT PROJECT
RICHMOND, CA

8.13 Geologic Resources and Hazards

This section evaluates the effect of geologic hazards and resources that might be encountered on the Chevron Richmond Refinery Power Plant Replacement Project (PPRP, or the Project). The objective of this analysis is to evaluate the potential for Project impacts from construction or during the operation of the Project. This section presents a summary of the relevant laws, ordinances, regulations, and standards (LORS), the Project setting, environmental impacts, and proposed mitigation measures affecting geological resources. In addition, required permits and permitting agencies are identified.

8.13.1 Introduction

Chevron is proposing the PPRP to add an additional 60 megawatts (MW) net generation to its existing refinery electrical generation located within Chevron's Richmond Refinery in the City of Richmond (see Figure 1.2-1) in Contra Costa County, California. The proposed PPRP will be integrated into Chevron's plans to meet its growing refinery electrical load, and produce steam to replace an existing boiler plant that is approaching its end of life. The PPRP is a subset of the larger Richmond Refinery Renewal Project that is concurrently undergoing California Environmental Quality Act (CEQA) review by the City of Richmond. The California Energy Commission (CEC) has jurisdiction for only the PPRP portion of the Renewal Project that is the subject of this application.

The PPRP will consist of the following components:

- A nominal 43-MW net, natural gas- or liquid petroleum gas (butane)-fired cogeneration train consisting of one combustion turbine generator (CTG), a refinery fuel gas-fired heat recovery steam generator, 13.8-kV switchgear and ancillary equipment.
- Shutdown of the existing No. 1 power plant refinery steam boilers currently providing steam to the Refinery.
- A 17-MW net extraction, condensing steam turbine generator (STG), an associated cooling tower, and 12-kV switchgear installed as part of the new hydrogen production facility (the remainder of the hydrogen plant is under CEQA review as part of the Renewal Project). The new hydrogen plant will be a net generator of steam for both the STG and the Refinery steam system.
- Reconductoring of approximately 4,000 feet of existing onsite double-circuit overhead 115-kV transmission line to upgrade its ampacity. The reconductoring will reuse existing transmission line structures.
- Adjacent onsite service connections for fuel, reclaimed water, water, wastewater, steam, and electricity to existing piperacks, with the exception of the reconductoring noted above.

The Cogen 3000 portion of the PPRP will occupy approximately 0.5 acre within an existing 5.2-acre cogeneration facility, and the STG and associated equipment (H₂-STG) will occupy approximately 0.5 acre within a new 7.9-acre hydrogen plant that will be built as part of the Richmond Refinery Renewal Project. The PPRP will be located well within the heart of the existing 2,900-acre Richmond Refinery. Temporary construction laydown and parking for

the PPRP will be provided in various existing laydown areas within the Refinery that are currently used for ongoing maintenance and project laydown. A complete description of the PPRP is provided in Section 2.0.

8.13.2 Laws, Ordinances, Regulations, and Standards

The LORS applicable to geologic resources and hazards are summarized in Table 8.13-1.

TABLE 8.13-1
Laws, Ordinances, Regulations, and Standards

Jurisdiction	Authority	Administering Agency	Compliance
State/Local	California Building Code (CBC), 2001 as amended by the City of Richmond	California Building Standards Commission, State of California, and City of Richmond	Acceptable design criteria for structures with respect to operating (dead plus live and wind) loads, seismic design loads, and load-bearing capacity
State/Local	Alquist-Priolo Earthquake Fault Zoning Act	Title 14, Division 2, Chapter 8, Subchapter 1, Article 3, California Code of Regulations	Identifies areas subject to surface rupture from active faults
State /Local	The Seismic Hazards Mapping Act	Title 14, Division 2, Chapter 8, Subchapter 1, Article 10, California Code of Regulations	Identifies non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides
Local	Contra Costa County General Plan, Conservation and Safety Element	Contra Costa County	The County shall require all new buildings to be constructed in accordance with the CBC for a Seismic Zone 4
Local	City of Richmond General Plan, Public Safety Element	City of Richmond	The City shall require all new buildings to be constructed in accordance with the CBC for a Seismic Zone 4

8.13.3 Geologic Setting

The Project is located on the Chevron Richmond Refinery site in the City of Richmond, Contra Costa County, California. The power plant Project site lies near the San Pablo Peninsula. The peninsula is characterized as a northwest-trending, steep-sided ridge about 3 miles long that separates the San Francisco and San Pablo Bays. The San Francisco Bay Area lies within a fairly broad depression within the coast ranges created from an east-west expansion between the San Andreas and Hayward faults (Norris and Webb, 1990). The San Pablo Peninsula is a fairly resistant basement rock.

8.13.3.1 Local Geology

The Project site is located in an area of relatively flat topography (elevation approximately 10 feet above mean sea level) on the northeastern side of San Pablo Peninsula. Franciscan Complex Formation rocks dominate the area, and consist of sedimentary and volcanic rocks. Specifically, sandstone, serpentine, chert, greenstone, and other metamorphic rocks are present. Also present, to the northeast, is a thick sequence of estuarine and alluvial sedimentary deposits that include Bay Mud, and areas where reclamation has occurred with

artificial fill. Older alluvial and estuarine deposits underlie the Bay Mud and originate from erosion of the hills to the east (Wagner et al., 1990). Figure 8.13-1 (all figures are located at the end of this section) shows the geology within a 2-mile radius of the Project site.

8.13.3.2 Structure

The structural geology of the area is complex, and the area contains major deformations associated with historic tectonic activity, faulting, and landslides. Repeated tectonic activity in the San Francisco Bay Area has resulted in a complex geologic structure dominated by activity along major faults that comprise the San Andreas and Hayward fault systems.

8.13.3.3 Seismicity

The San Francisco Bay Area is known to be a region of high seismic activity. The U.S. Geological Survey (USGS) Working Group on Northern California Earthquake Potential (WGNCEP) has evaluated that there is a 62-percent probability of one or more earthquakes with a moment magnitude (M_w) of 6.7 or higher occurring in the San Francisco Bay Area before 2032 (WGNCEP, 2003).

Numerous active and potentially active faults are present within 30 miles of the Project site area. Approximate fault alignments are shown on Figure 8.13-2. The nearest active fault to the site is the Hayward fault, which is a northwest-southeast trending fault approximately 4 miles to the east. The West Napa fault lies approximately 17 miles to the northeast. The Concord-Green Valley fault lies approximately 18 miles to the east. The Rodgers Creek fault lies approximately 15 miles to the north. The San Andreas fault lies approximately 14 miles to the west. The northern part of the Calaveras fault lies approximately 20 miles to the southeast. All of these faults are considered active. The Hayward-Rodgers Creek fault systems, according to the WGNCEP (2003), are the faults that have the highest probability of generating M_w 6.7 or greater earthquakes before 2032.

The site is not located within the special study zone, as delineated by the Alquist-Priolo Special Studies Zone Act of 1972, and no known fault, active or inactive, reaches the surface within the Project site area (Jennings, 1994).

Table 8.13-2 presents the known active faults within the vicinity of the Project site.

TABLE 8.13-2
Active Faults in the Project Site Area

Fault	Distance and Direction from Project Site	Recent Activity	Notable Activity	Maximum Moment Magnitude Earthquake (M_w)
Hayward	4 miles east	Pre-Historic Holocene	1836 and 1868 ruptures	6.9
West Napa	17 miles northeast	Holocene		6.5
Concord-Green Valley	18 miles east	Historic Holocene		6.7
Rodgers Creek	15 miles north	Historic Holocene		7.0
San Andreas	14 miles west	Historic	1906 and 1989 ruptures	7.9
Calaveras (northern)	20 miles southeast	Historic Holocene		6.8

Note:

The maximum moment magnitudes are taken from the USGS National Mapping Fault Parameters (2002). The USGS (2002) also considers a rupture scenario that involves both the Hayward-Rodgers Creek Fault with an assigned maximum moment magnitude of 7.2.

An inactive fault is present near the Project site area. The San Pablo fault runs parallel to and along the east side of the San Pablo Peninsula. This fault has shown no evidence of displacement in the last 1.6 million years (Blake, 1974).

8.13.3.4 Geologic Hazards

The following sections discuss the potential geologic hazards that might occur in the Project area based on a literature search and preliminary analysis for the site. There are seven hazards that could potentially be significant: seismic ground shaking, ground rupture, liquefaction (leading to settlement and/or lateral spreading), slope stability, subsidence (local settlement) and settlement, expansive soils, and seiches/tsunamis.

8.13.3.4.1 Seismic Ground Shaking

During an earthquake, seismic waves are produced that emanate in all directions from the fault rupture. Seismic waves can produce strong ground shaking that is typically strongest near the fault and attenuates as the waves move away from the source. The severity of ground shaking is controlled by the interaction of magnitude, distance, the type of rupture, and thickness and condition of underlying geologic material. Areas underlain by unconsolidated, recent alluvium or fill may amplify the strength of ground motion.

Strong ground motion is the most significant geologic hazard at the Project site. Peak ground bedrock and alluvium acceleration of up to approximately 0.57g (10 percent probability in 50 years) has been estimated based on a M_W 7.1 event on the Hayward fault (CGS, 2003).

The potential for strong ground motion to occur in the Project site is high.

8.13.3.4.2 Ground Rupture

The site is not located within a special study zone, as delineated by the Alquist-Priolo Special Studies Zone Act of 1972, and no known fault, active or inactive, reaches the surface within the Project area (CGS, 1999). No known faults were found to cross the Project site or linears. The potential for ground rupture to occur at the Project site or along the Project linears is low.

8.13.3.4.3 Liquefaction

During strong ground-shaking, loose, saturated, cohesionless soils can experience a temporary loss of shear strength. This phenomenon is known as liquefaction. Liquefaction is dependent on grain size distribution, relative density of the soils, degree of saturation, and intensity and duration of the earthquake. The potential hazard associated with liquefaction is seismically induced settlement and lateral spreading. The depth to groundwater at the Project site is very shallow, measured in several borings at approximately 5 feet below ground surface (approximately 9 feet mean sea level) (URS, 2006a and 2006b). Because of the seismic potential and high groundwater, Contra Costa County has identified the Project site area to have a generally high potential for liquefaction to occur (Contra Costa County, 1994). However, the site-specific geotechnical investigations conducted at the site did not identify liquefiable deposits and the loss of soil strength due to liquefaction is not anticipated (URS, 2006a and 2006b).

8.13.3.4.4 Slope Stability

Slope instability depends on steepness of the slope, underlying geology, surface soil strength, and pore pressures in the soil. Significant excavating, grading, or fill work during

construction might also introduce temporary slope stability hazards at either the Project site or along linear facility routes. Seismic-induced landslides typically occur in slide-prone geologic units that contain excessive amounts of water and which are located on steep slopes. Because the Project site and linear corridors are relatively flat, and no significant and permanent vertical excavations or fills are planned during site construction, the potential for direct impact from landslides is considered low.

8.13.3.4.5 Subsidence and Settlement

Subsidence can be caused by natural phenomena during tectonic movement, consolidation, hydrocompaction, liquefaction settlement as described above, or rapid sedimentation. Subsidence can also result from human activities, such as, on a regional scale, the withdrawal of water and/or hydrocarbons from the subsurface soils, and on a local scale, the construction of new facilities such as mass fills and new structures or buildings. Artificial fill may also be susceptible to differential settlement. The site-specific geotechnical investigations conducted at the sites did not identify subsidence as a hazard of concern.

8.13.3.4.6 Expansive Soils

Expansive soils are clay rich soils that have the ability to shrink and swell with wetting and drying. The shrink-swell capacity of expansive soils can result in differential movement beneath foundations. The site-specific geotechnical investigations conducted at the sites did not identify soil that exhibits a high shrink-swell potential.

8.13.3.4.7 Tsunami/Seiche

Tsunamis are waves typically generated offshore during a subaqueous fault rupture or a subaqueous landslide event. Seiches are waves generated within an enclosed large body of water (such as a lake) caused by horizontal movement of an earthquake. Due to the proximity of the Project site to the San Francisco Bay, there is a potential for the Project site to be exposed to a tsunami resulting from the occurrence of a major earthquake along the San Andreas and/or Hayward faults. A tsunami with a wave height of 20 feet at the Golden Gate Bridge, which is likely to occur approximately once every 200 years, would attenuate to a wave height of less than 2 feet at the Carquinez Strait (Contra Costa County, 1994). The potential for tsunami/seiche impact to the Project site is low.

8.13.3.5 Geologic Resource of Recreational, Commercial, or Scientific Value

Geologic resources of recreational, commercial, or scientific value in the Project vicinity that could be affected include mineral/aggregate production. No known scientific or recreational geologic resources were identified in the vicinity of the Project site. No known oil or gas reserves were identified to be present in the Project vicinity (CDOGGR, 2003). Commercial geologic resources of value are discussed in the next paragraph.

8.13.3.5.1 Mineral/Aggregate Production

The Richmond area has been identified as containing mineral resources that are largely limited to sand, gravel, and rock products. Within the City of Richmond's planning area, the State of California has classified several sectors as Mineral Resource Zone-2. This classification indicates the existence of a deposit that meets certain criteria for value and marketability. Sector W-1, located in the knobby bayfront hills of the San Pablo Peninsula to the west of the Project site, is a source of crushed rock, but is not mined because of the presence of the Refinery tank farm. The Project will not affect this resource. No other mineral or aggregate resources in the Project site area have been identified (City of Richmond, 1994).

8.13.4 Impacts

Presented below are the CEQA Checklist questions used to assess the significance of potential impacts.

8.13.4.1 Environmental Checklist

The checklist in Table 8.13-3 is used by the CEC to assess the significance of potential impacts.

TABLE 8.13-3
California Energy Commission Environmental Checklist

	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant	No Impact
Geology —Would the Project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving the following:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault. Refer to Division of Mines and Geology Special Publication 42.				X
ii) Strong seismic ground shaking.	X			
iii) Seismic-related ground failure, including liquefaction.			X	
iv) Landslides.				X
b) Result in substantial soil erosion?				X
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in an on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse due to the loss of topsoil?			X	
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?				X
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?				X
Mineral Resources —Would the Project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?				X
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?				X

8.13.4.2 Discussion of Impacts

No active faults cross the Project site, and the vicinity of the site is not within the Alquist-Priolo Earthquake Fault Zone (CGS, 1999).

The most likely geologic hazard at the Project site is strong ground shaking from a seismic event.

Even though there is relatively high potential for the site to be exposed to strong ground shaking, the potential for liquefaction to occur is low since site-specific geotechnical investigations did not identify liquefiable material to be present at the sites (URS, 2006a and 2006b).

Since the Project site is relatively flat, the potential for slope instability (landslides, soil collapse) and substantial soil erosion is considered low. The site-specific geotechnical investigations did not identify these geologic hazards to be significant at the sites (URS, 2006a and 2006b).

Subsidence and expansive soils were not identified to be present at the site during the geotechnical investigations (URS, 2006a and 2006b). As a result, the potential for subsidence to occur and expansive soils to be present is low.

No mineral resources of significant commercial value were noted to be present at the Project site. No recreational or scientific resources are known to exist at the Project site.

8.13.5 Mitigation Measures

Mitigation measures are necessary for the Project site because of potential geologic hazards. Therefore, the following measure is proposed:

- Design and construct the Project to conform to the CBC requirements for Seismic Zone 4.

8.13.6 Involved Agencies and Agency Contacts

The City of Richmond Building and Engineering Departments are responsible for the compliance of construction projects with regard to geologic hazards. Table 8.13-4 presents contact information for the City of Richmond.

8.13.7 Permits Required and Permit Schedule

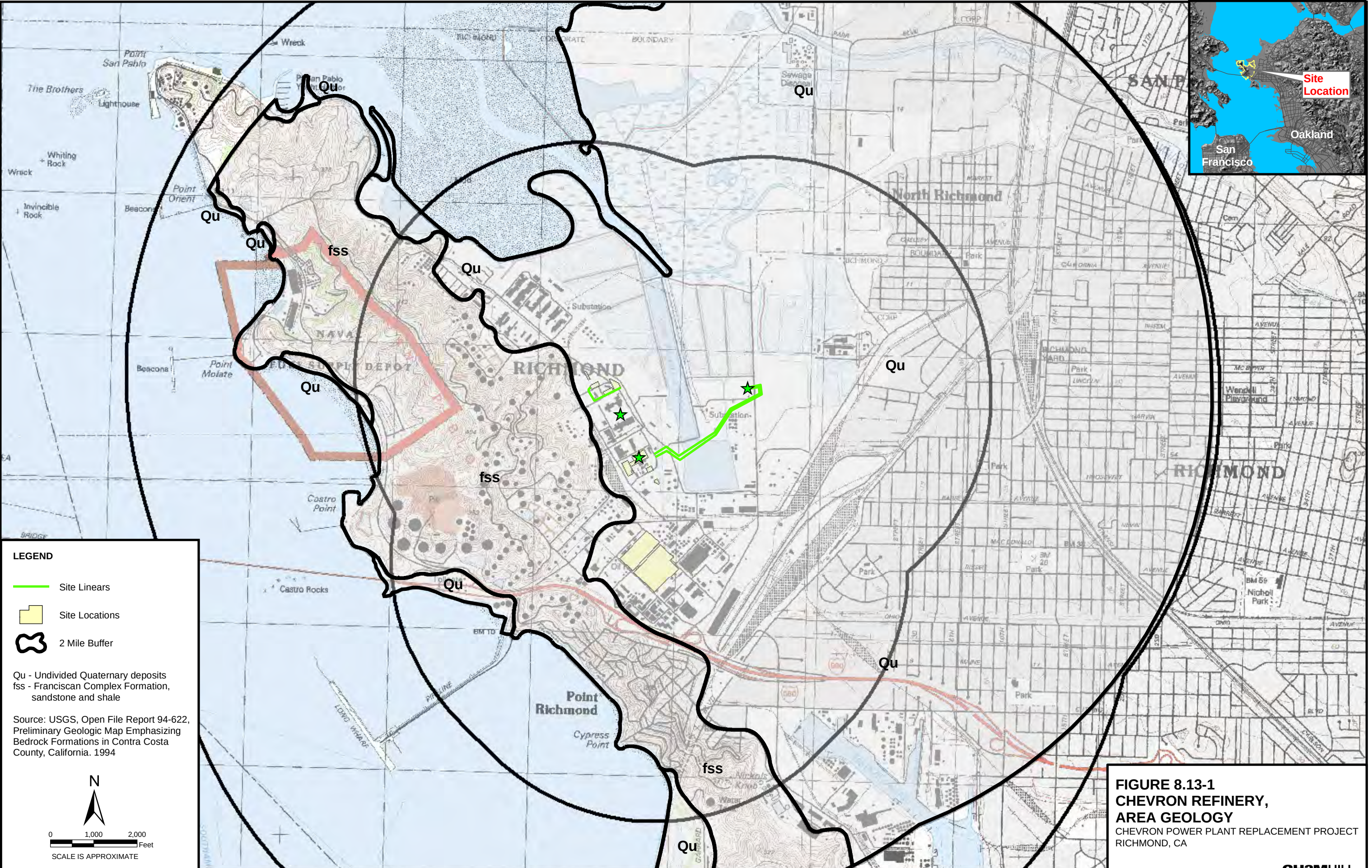
No permits that specifically address geologic resources and hazards were identified. Compliance of building construction to CBC standards is covered under engineering and construction permits for the Project.

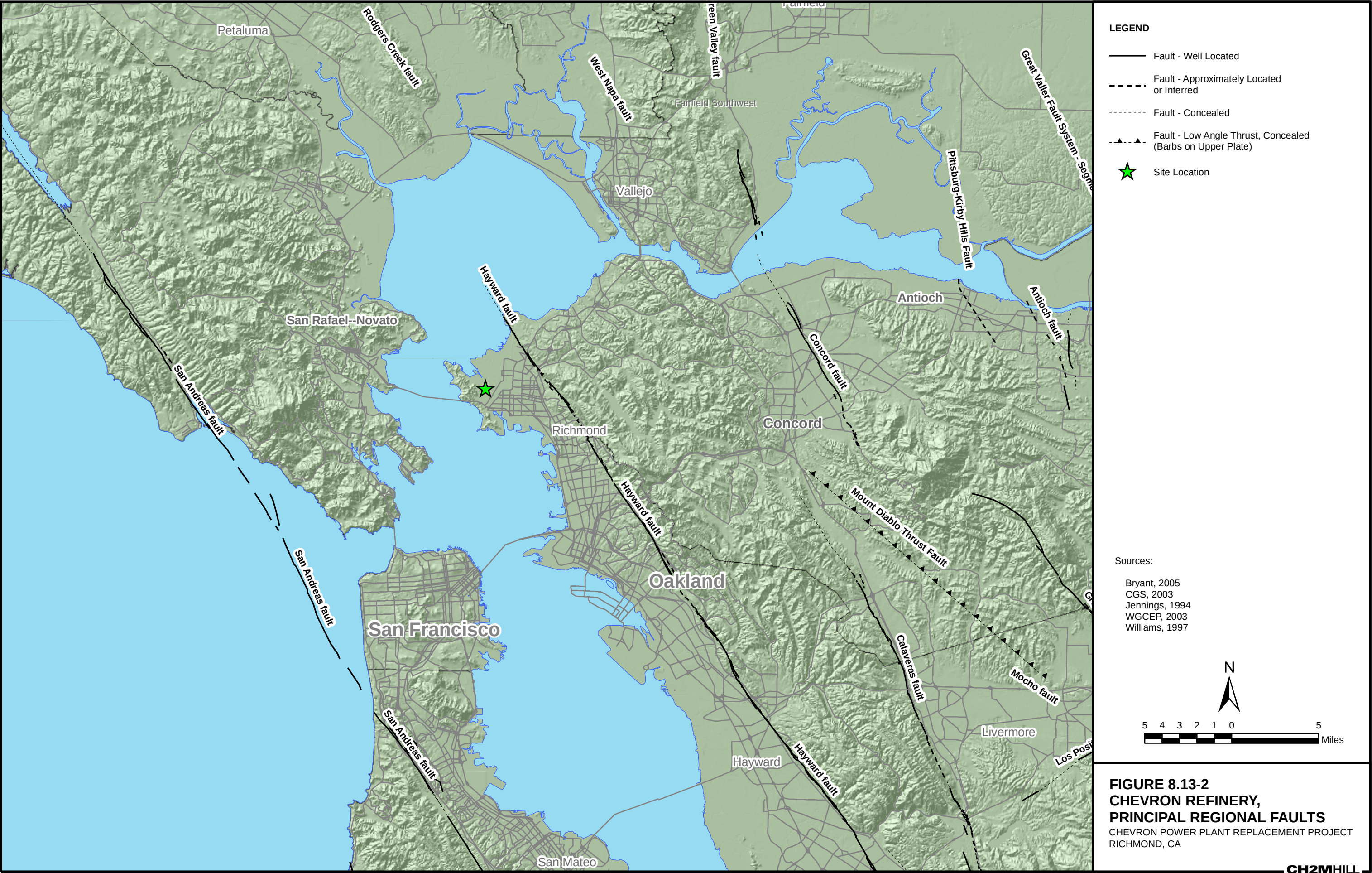
TABLE 8.13-4
Agency Contacts

Agency	Contact	Title	Address	Telephone
City of Richmond – Engineering Department	Rich Davidson	City Engineer	1401 Marina Way South, Richmond, CA 94804	(510) 307-8092

8.13.8 References

- Blake, M. C. 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.
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8.14. Paleontological Resources

Paleontological resources are fossils, the remains of prehistoric plants and animals, that are important scientific and educational resources because of their usefulness in

(1) documenting the presence and evolutionary history of particular groups of extinct and extant organisms; (2) reconstructing the environments in which these organisms lived; and (3) determining the relative ages of the strata in which they occur and the geologic events that resulted in the deposition of the sediments that formed these strata. This section summarizes the assessment of potential impacts on paleontological resources that may result from construction of the Power Plant Replacement Project (PPRP, or the Project). As is normally the case with power generation facilities, no impacts to paleontological resources will occur from the operation of this facility. Prior paleontological resources assessments in the San Francisco Bay Area, a paleontological resources records review, and geological and paleontological studies in physiographically similar settings are the primary basis for this assessment.

8.14.1 Introduction

Chevron is proposing the PPRP to add an additional 60 megawatts (MW) net generation to its existing Refinery electrical generation located within Chevron's Richmond Refinery in the City of Richmond (see Figure 1.2-1) in Contra Costa County, California. The proposed PPRP will be integrated into Chevron's plans to meet its growing Refinery electrical load, and produce steam to replace an existing boiler plant that is approaching its end of life. The PPRP is a subset of the larger Richmond Refinery Renewal Project that is concurrently undergoing California Environmental Quality Act (CEQA) review by the City of Richmond. The California Energy Commission (CEC) has jurisdiction for only the PPRP portion of the Renewal Project that is the subject of this application.

The PPRP will consist of the following components:

- A nominal 43-MW net, natural gas- or liquid petroleum gas (butane)-fired cogeneration train consisting of one combustion turbine generator (CTG), a refinery fuel gas-fired heat recovery steam generator, 13.8-kV switchgear and ancillary equipment.
- Shutdown of the existing No. 1 power plant refinery steam boilers currently providing steam to the Refinery.
- A 17-MW net extraction, condensing steam turbine generator (STG), an associated cooling tower, and 12-kV switchgear installed as part of the new hydrogen production facility (the remainder of the hydrogen plant is under CEQA review as part of the Renewal Project). The new hydrogen plant will be a net generator of steam for both the STG and the Refinery steam system.
- Reconductoring of approximately 4,000 feet of existing onsite double-circuit overhead 115-kV transmission line to upgrade its ampacity. The reconductoring will reuse existing transmission line structures.

- Adjacent onsite service connections for fuel, reclaimed water, water, wastewater, steam, and electricity to existing piperacks, with the exception of the reconductoring noted above.

The Cogen 3000 portion of the PPRP will occupy approximately 0.5 acre within an existing 5.2-acre cogeneration facility, and the STG and associated equipment (H₂-STG) will occupy approximately 0.5 acre within a new 7.9-acre hydrogen plant that will be built as part of the Richmond Refinery Renewal Project. The PPRP will be located well within the heart of the existing 2,900-acre Richmond Refinery. Temporary construction laydown and parking for the PPRP will be provided in various existing laydown areas within the Refinery that are currently used for ongoing maintenance and project laydown. A complete description of the PPRP is provided in Section 2.0.

8.14.2 Laws, Ordinances, Regulations, and Standards

Paleontological resources are non-renewable scientific and educational resources protected by several federal and state statutes (California Office of Historic Preservation, 1983; see also Marshall, 1976; West, 1991; Fisk and Spencer, 1994; and Gastaldo, 1999), most notably by the 1906 Federal Antiquities Act and by the State of California's environmental regulations under CEQA (Section 15064.5).

Professional guidelines for the assessment and mitigation of impacts to paleontological resources have been disseminated by the Society of Vertebrate Paleontology (SVP, 1995 and 1996). These guidelines are followed by most professional paleontologists engaged in paleontological resources management and mitigation. Design and construction of this facility will be conducted in accordance with all laws, ordinances, regulations, and standards (LORS) applicable to paleontological resources. Federal and state LORS applicable to paleontological resources are summarized in Table 8.14-1 and discussed briefly below, along with relevant professional guidelines.

TABLE 8.14-1
Federal and State Laws, Ordinances, Regulations, and Standards Applicable to Paleontological Resources

LORS	Applicability	Project Conformity
Federal Antiquities Act of 1906	Protects paleontological resources on federal lands	Yes
CEQA, Appendix G	Requires that impacts to paleontological resources be assessed and mitigated on all discretionary projects, public and private	Yes
California Public Resources Code Chapter 1.7, Section 5097.5 (Stats.1965, c. 1136, p.2792)	Defines any unauthorized disturbance or removal of a fossil site or fossil remains on public land as a misdemeanor and specifies that state agencies may undertake surveys, excavations, or other operations as necessary on state lands to preserve or record paleontological resources	Yes

8.14.2.1 Federal LORS

Federal protection for significant paleontological resources would only apply to this Project if any construction or other related Project impacts occur on federally owned or federally

managed lands, or if a federal entitlement would be required. Federal legislative protection for paleontological resources stems primarily from the Antiquities Act of 1906 (PL 59-209; 16 U.S.C. 431 et seq.; 34 Stat. 225), which calls for protection of historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest on federal lands. Since the Project site and its linear features (which are all located on the Richmond Refinery site) do not impact federally owned or managed land, federal LORS do not apply to this Project.

8.14.2.2 State LORS

The CEC environmental review process under the Warren-Alquist Act is considered functionally equivalent to that of CEQA (Public Resources Code Sections 21000 et seq.). CEQA requires that public agencies and private interests identify the potential environmental consequences of their proposed projects on any object or site of significance to the scientific annals of California (Division I, California Public Resources Code Section 5020.1 [b]). Guidelines for the Implementation of CEQA (Public Resources Code Sections 15000 et seq.) define procedures, types of activities, persons, and public agencies required to comply with CEQA. Appendix G in Section 15023 provides an Environmental Checklist of questions that a lead agency should address if relevant to a project's environmental impacts. One of the questions to be answered in the Environmental Checklist (Section 15023, Appendix G, Section V, Part c) is the following: "Would the project directly or indirectly destroy a unique paleontological resource or site...?"

Although CEQA does not define what is "a unique paleontological resource or site," Section 21083.2 defines "unique archaeological resources" as "...any archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

[It] contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.

It has a special and particular quality such as being the oldest of its type or the best available example of its type.

[It] is directly associated with a scientifically recognized important prehistoric or historic event."

This definition of "unique archaeological resources" is also applicable to recognizing "a unique paleontological resource or site." Additional guidance is provided in CEQA Section 15064.5 (a)(3)(D), which indicates "generally, a resource shall be considered historically significant if it has yielded, or may be likely to yield, information important in prehistory or history."

Section XVII, Part a, of the CEQA Environmental Checklist asks a second question applicable to paleontological resources: "Does the project have the potential to eliminate important examples of the major periods of California history or pre-history?" Fossils are important examples of the major periods of California prehistory. To be in compliance with CEQA, environmental impact assessments, statements, and reports must answer both these questions in the Environmental Checklist. If the answer to either question is *yes* or *possibly*, a

mitigation and monitoring plan should be designed and implemented to protect significant paleontological resources.

The CEQA lead agency having jurisdiction over a project is responsible for ensuring that paleontological resources are protected in compliance with CEQA and other applicable statutes. The lead agency with the responsibility to ensure that fossils are protected during construction of the Project is the CEC. California Public Resources Code Section 21081.6, entitled Mitigation Monitoring Compliance and Reporting, requires that the CEQA lead agency demonstrate project compliance with mitigation measures developed during the environmental impact review process.

Other state requirements for paleontological resource management are in California Public Resources Code Chapter 1.7, Section 5097.5 (Stats. 1965, c. 1136, p. 2792), entitled Archaeological, Paleontological, and Historical Sites. This statute defines any unauthorized disturbance or removal of a fossil site or fossil remains on public land as a misdemeanor and specifies that state agencies may undertake surveys, excavations, or other operations as necessary on state lands to preserve or record paleontological resources. This statute does not apply to the PPRP since construction or other related impacts would not occur on publicly owned or managed lands.

8.14.2.3 City LORS

California Planning and Zoning Law requires each city jurisdiction to adopt a comprehensive, long-term general plan for its development. The general plan is a policy document designed to give long-range guidance to those making decisions affecting the future character of the planning area. It represents the official statement of the community's physical development as well as its environmental goals. The general plan also acts to clarify and articulate the relationship and intentions of local government to the rights and expectations of the general public, property owners, and prospective investors. Through its general plan, the local jurisdiction can inform these groups of its goals, policies, and development standards, thereby communicating what must be done to meet the objectives of the general plan.

The general plan for the City of Richmond (1994) contains no specific requirements, regulations, ordinances, conditions, standards, goals, or objectives designed to mitigate the negative impacts of development on paleontological resources.

8.14.3 Setting

San Pablo Bay is essentially a northern extension of San Francisco Bay and is the marine embayment occupying the structural trough in the central Coast Ranges immediately north of that occupied by San Francisco Bay. Like the Berkeley Hills to the east, San Pablo Point is a northwest-oriented ridge representing a western portion of the Coast Ranges Physiographic Province (Fenneman, 1931; Jahns, 1954). The Great Valley Physiographic Province is to the east and the Pacific Ocean is to the west.

The general Project area is located east of San Pablo Ridge (Figure 8.14-1), occupying the western periphery of a broad and level expanse of artificial fill, Quaternary alluvium, and estuarine sediment between the ridge on the west and the alluvial fan of the northern Berkeley Hills. The toe of the northern Berkeley Hills lies about two miles to the east of the

Project site (Graymer et al., 1994). The site is entirely on historic fill used to “reclaim” this area from the Wildcat Creek estuary.

Land use in the vicinity of the Project site is industrial. To the east beyond the limits of the Refinery is an estuarine area¹ composed of a mosaic of cattail marsh and open water areas. The cogeneration unit’s transmission line traverses this estuarine area². The laydown areas for the Project are located within the Refinery proper. These areas are currently used by the Refinery as staging/laydown areas, so no new disturbances are expected. To the immediate west, the east flank of San Pablo Ridge rises rather abruptly as a northwest-southeast oriented hill. The site lies in the western portion of what was once a relatively large estuary that lay at the mouths of Wildcat and San Pablo Creeks, opening to San Pablo Bay to the north (Figure 8.14-1). Regarding the two principal components of the Project, the hydrogen generation facility is located approximately 232 feet east of the east flank of San Pablo Ridge, and the cogeneration facility is located about 970 feet east-northeast of the foot of the hill.

Maps of historic creek and estuarine habitats show that, in the vicinity of the Wildcat and San Pablo Creek drainages and the Project area, the historic topography descended rather steeply to near sea level. This is a pattern repeated throughout the Bay Area that frequently restricted the extent of commercial and industrial acreage originally available in the area. A great deal of artificial fill was dumped in many low-lying areas to extend the areas available to development in vicinity of the shore. The nearly-level ground that now extends east from the margin of the topographic highs of San Pablo Ridge to the Project area is artificial and composed entirely of historic fill used to build up the land of the estuarine marsh that originally lay immediately to the east of San Pablo Ridge (Oakland Museum of California, n.d.).

8.14.4 Resource Inventory

The resource inventory addressing paleontological sensitivity of the Project site includes a consideration of the geological units that may yield fossils, the known records of fossil sites in the vicinity, and a field reconnaissance of the Project area.

The PPRP site and vicinity is thoroughly developed, with fill, concrete, asphalt, refining facilities and buildings covering the entire surface area. No rock outcrops or exposures of undisturbed sediments occur within the area potentially affected by Project construction. Due to the lack of geological exposures as a consequence of the industrialized nature of the Project area, and because the Projects are sited on artificial fill, no paleontological resources field survey was warranted. A field reconnaissance of the Project site, including the Hydrogen plant and the Cogeneration plant, was conducted in November 2006.

Rocks and sediments in the general vicinity can be divided into three distinct geological domains. The first and by far the oldest is bedrock composed of Mesozoic age (Jurassic and Cretaceous; older than 65 million years [my]) low-grade metamorphosed sediments named the Franciscan Complex. The Franciscan Complex forms the bedrock “basement”

¹ This estuarine area is part of the Refinery’s wastewater treatment system called the Aggressive Biological Treatment Area or Bioreactor for short.

² The cogeneration unit’s electrical interconnection will use existing transmission line facilities which will require reconductoring only. No additional transmission line towers will be required for the cogen unit’s interconnection to the Standard Oil Switching Station.

throughout the Bay Area. Sediments resting unconformably on the Franciscan Complex constitute the second major grouping. These are much younger sedimentary and volcanic rocks of Tertiary age that originated in different depositional basins as well as at different times and were subsequently folded and forced together along this tectonically active continental margin (Graymer et al., 1994). The third domain is represented by unconsolidated to poorly consolidated Quaternary (Pleistocene and Holocene) deposits. Formal names have been applied to Quaternary sedimentary sequences by some authors (see for instance Lawson, 1914). However, many geologists working in the San Francisco Bay Area have used informal designations, such as “old bay mud,” “sand deposits,” and “young bay mud.” A summary of Quaternary stratigraphic nomenclature and age assignments based on studies throughout the Bay Area is presented in Table 8.14-2, and the data show that there is a general lack of agreement both on the nomenclature and on the age of different stratigraphic units in the Bay Area. The details of the Quaternary geology of the area are debated due to a number of factors, not the least being structural and stratigraphic complexity and a lack of exposures for study. Many Quaternary deposits in the area have limited local exposure and are discontinuous, and their relationships cannot be determined by tracing their lateral continuity due to that lack of exposure. It is evident from Table 8.14-2 that the statement of Savage (1951) applies more than a half-century later: “Many stratigraphic problems still exist in this area despite the fact that these problems have at times received the attention of competent geologists and paleontologists.” New excavations in undisturbed sediment therefore can potentially yield important new geologic information or new fossils that could provide a more complete and accurate understanding of both the geological and biological history of the area.

Despite the apparent discrepancies, there is some consensus in these studies as well (Table 8.14-2). The major points of consensus, and therefore reliable aspects of the stratigraphic framework of the study area, include the following:

- The Franciscan Complex and related rocks, such as the Coast Range ophiolite, form the basement rock throughout this area. These are of Mesozoic age (Jurassic and Cretaceous; about 200 to 65 million years ago [mya]) and usually display some degree of metamorphic alteration.
- A pronounced interval separates Franciscan Complex and related rocks from overlying sediments, representing a hiatus of 40 my or more.
- The oldest sediments resting on the Franciscan Complex recognized thus far in the northern Berkeley Hills area (including San Pablo Ridge; Assemblage I of Graymer et al. [1994]) are middle to late Miocene age (about 12 to 9 mya). These are assigned to the Orinda and Moraga Formations and are frequently included in a larger sequence named the Contra Costa Group.
- Deposition of fossiliferous sediments in the Bay Area during the Quaternary was strongly affected by glacio-eustatic changes in sea level as well as by tectonism.

TABLE 8.14-2
Stratigraphic Nomenclature and Age Assignments for Quaternary Stratigraphic Units in the Project Area

Epoch	Glacial Age/ Marine Isotope Stage		Jones and Stokes, 2004	Trask & Rolston, 1951	Sloan, 1992		URS, 2001*	RWQCB, 2004	Clifton and Leithold, 1991		
Holocene	Current Interglacial	Mid to Late Stage 1	n.d.	Bay Mud	n.d.	Young Bay Mud	Artificial fill	n.d.			
		Latest Stage 2 to Stage 1					? <i>hiatus</i> ?				
			Young Bay Mud				Temescal Formation				
Late Pleistocene	Wisconsin Glacial Age (Stages 4-2)		San Antonio Fm	Posey Sand & Merritt Fm	San Antonio Fm.	n.d.	Upper Alluvial/Marine Sediments or San Antonio Fm	Alameda Formation	Colma Formation		
	Last Interglacial (Stage 5)		Old Bay Mud	San Antonio Formation		Yerba Buena mud	Old Bay Mud or Yerba Buena Fm.				
Early to Middle Pleistocene	Previous glacial- interglacial cycles		? <i>hiatus</i> ?	Alameda Formation	n.d.	Lower Alluvial/ Marine Sediments (Alameda Fm)- marine facies	? <i>hiatus</i> ?	Santa Clara Formation	Merced Formation		
			Alameda Fm (1.0 to 0.5 my)				Lower Alluvial/ Marine Sediments (Alameda Fm)- continental facies				
			<i>hiatus</i>								

Notes:

n.d. = not described.

Dashed lines are used to designate gradational boundaries.

"Hiatus" is gap in sequence due to erosion or non-deposition.

* Stratigraphic superposition, geology and nomenclature described, but no age assignments provided for most units.

- Low sea level during glacial ages is often represented by alluvial or fluvial gravels and sands while marine transgressions following sea-level rises during interglaciations are represented by bay and estuarine muds. There have been at least a half-dozen glacial-interglacial cycles in the past 0.7 my.
- In many areas on the shores of San Francisco and San Pablo Bays, including the present study area, estuarine sediments are overlain by artificial fill dumped into estuaries in the late 19th and early 20th centuries to expand developable acreage.

8.14.4.1 Paleontological Potential In The Project Vicinity

The geological units with the potential of occurring at the site of PPRP construction are discussed below as well as paleontological records relevant to their potential to yield additional, scientifically significant fossils. These are presented from oldest to youngest, and include all rock units within 3 miles of the Project vicinity mapped by Graymer et al. (1994), considered to be the local study area for this assessment.

Mesozoic Rocks—The Franciscan Complex, Coast Range Ophiolite, Undifferentiated Serpentine and Keratophyre. The Franciscan Complex is melange of rock units that were variably deformed and metamorphosed in a subduction zone at the western edge of the North American Plate (Hamilton, 1969; Page, 1981; Wakabayashi, 1992). Franciscan lithologies are predominantly meta-sedimentary rocks with subordinate volcanic rocks that are believed to represent trench fill and volcanic islands, respectively. In the Project area they include greenstone, sandstone, greywacke, and shale. San Pablo Ridge itself, immediately to the west of the Project area, is mapped as hard greywacke and shale (Graymer et al., 1994).

Franciscan rocks can be expected below artificial fill and Quaternary-age sediment at the Project site. Weathered sandstone bedrock representing Franciscan Complex sediment has been encountered at depths of 125 to 160 feet beneath the eastern portion of the Cogeneration plant site, and fractured shale was encountered at a depth of about 100 feet farther west and closer to San Pablo Ridge (URS, 2006a). As noted in section 8.14.3, the Hydrogen plant site is closer to the ridge and therefore Franciscan Complex rocks are expected at shallower depth, which indeed is the case. Sandstone occurs between 40 and 60 feet below the surface in some areas, and generally 90 to 140 feet below the surface elsewhere (URS, 2006b).

Fossils from Franciscan Complex rocks have been very important in unraveling the ages, depositional environments, and tectonic history of the continental margin during the Mesozoic. Based primarily on fossil evidence, rocks in the sequence have been dated as Jurassic, Cretaceous, and (rarely) early Tertiary. Although uncommon, low-grade metamorphic rocks of the Franciscan Complex have produced significant fossils at numerous localities in the past. Schlocker et al. (1958) reported a Cretaceous ammonite found in shales of the Alcatraz Terrane in northeastern San Francisco. Schlocker (1974) also referred to fossil plant remains in Franciscan rocks, although usually with such terms as “carbonaceous matter,” “lignitic material,” “large carbonaceous particles and layers,” “large abundant paper-thin flakes of coaly material...,” or “carbon having relict plant-cell structures.” Other fossils reported from the Franciscan Complex range from those of the large marine reptilian piscivore, the ichthyosaur, to microfossils which frequently provide clearer indication of the age of a unit than do the vertebrate fossils. Radiolarian chert beds in

the Franciscan Complex produce microfossils (including radiolarians) important as biostratigraphic markers. Schlocker (1974) wrote: "In some chert beds fossils are so crowded that they touch each other." Limestone nodules and concretions in Franciscan shales often also contain abundant radiolaria (Schlocker, 1974). Fossil foraminifera have also been reported from Franciscan limestone (Kupper, 1956). Fossil gastropods (snails) and pelecypods (clams) have been reported from a locality on Alcatraz Island and elsewhere by Stewart (1930), Anderson (1938), and Ghent (1963). Plant microfossils (pollen and spores) and dinoflagellates have been reported in Franciscan shales (Evitt and Pierce, 1975; Damassa, 1979a and 1979b; Blake et al., 1984), and were instrumental in determining that some rocks included in the Franciscan Complex north of Cape Mendocino are as young as early Tertiary.

Other Mesozoic rocks within three miles of the Project site include the Coast Range Ophiolite, as well as keratophyre and serpentine/serpentinite. These are all igneous or metamorphosed igneous rock types and, due to their igneous origin they possess no paleontological potential and will not be addressed further in this assessment.

Middle Tertiary Sediments of the Contra Costa Group. Approximately 3 miles northeast of the Project area is the most pronounced geological feature in the vicinity, the Hayward Fault. To the east of the Hayward Fault Zone the terrain rises abruptly forming the Berkeley Hills, which extend from San Pablo Bay southeast for more than 40 miles forming the eastern margin of the Bay Area. The sediments exposed at and east of the Hayward Fault are often assigned to the Contra Costa Group, and in this area they are mapped by Graymer and others (1994) as the Orinda Formation, which comprises one unit of the Contra Costa Group.

The Orinda Formation is a terrestrial (although in some cases near to the shore) sedimentary sequence consisting of fluvial conglomerates, as well as sandstone, mudstone, and siltstone facies. Its upper age limit is constrained by radiometric dating of the overlying Moraga volcanics, reported by Tedford and others (2004) to date to about 10.3 mya. The Orinda Formation and the Contra Costa Group (undifferentiated) are fossiliferous, and the UCMP database includes entries for the following vertebrates from these Miocene deposits:

- *Gomphotherium* (primitive elephantid)
- *Hipparion*, *Nannipus*, and *Pliohippus* (primitive horses)
- *Barbourofelis* (a member of the primitive cat family Nimravidae)
- *Cranioceras* (deer-like artiodactyl)
- *Ticholeptus* (an oreodont; an extinct group of pig-like grazing animals)
- *Desmostylus* (an extinct sea-cow morphologically similar to hippopotami)

Tedford and others (2004) assign most of the Orinda Formation vertebrate material to the middle Clarendonian Land Mammal Age (LMA), or about 11 to 12 mya.

Based on the geological relationships illustrated by Graymer and others (1994) it is doubtful that Tertiary-age rocks of the Contra Costa Group, such as the Orinda Formation, range to the west of the Hayward Fault Zone (Figure 8.14-1) and occur at accessible depth in the Project area.

Quaternary Sediments. The oldest Quaternary sediments in the San Francisco Bay Area include those assigned to the San Antonio, Alameda, and Santa Clara Formations

(Table 8.14-2). They also include the Irvington Gravel and other older alluvial units uplifted by tectonic activity along the Hayward Fault. As noted above, due to repeated lowering and raising of the sea level and tectonic displacement in a very seismically active area, facies relationships among these sedimentary units are complex. Any one unit can be expected to have facies that record terrestrial, estuarine, and marine conditions during one time period. Moreover, many low areas on (and in) the San Francisco and San Pablo Bays have alternated between submerged and dry land in response to glacially controlled fluctuations of sea level. Depending on whether they were deposited during a high or low sea level stand, sediments can reflect environments varying from estuarine and intertidal mud flats, to swamps, streams and alluvial hill slopes of a terrestrial setting.

Early to Middle Quaternary age (1.7 to 0.13 mya) sediments are likely to lie at depth beneath the Project site because the current site lies above a topographic low representing the historic estuarine marsh of San Pablo and Wildcat Creeks (Oakland Museum, n.d.). As far as Late Quaternary (0.13 mya to present) sediments are concerned, most (but not all) studies in the Bay Area recognize a basal unit relating to the last interglacial sea-level high (Marine Isotope Stage 5; known also as the Sangamon) between about 130,000 and 75,000 years ago. In most cases it rests unconformably on older deformed sediments. In depo-centers such as the San Francisco Bay, the sediments are clays and muds assignable to the Old Bay Mud or Yerba Buena Formation; however, on topographically elevated surfaces these sediments are normally coarser grained and, despite the fact that they may simply represent facies changes within the same formation, have most often been assigned different names, in particular the Colma Formation and Merritt Sand (Table 8.14-2).

Sea level regression during the subsequent Wisconsin glacial age (ca. 75,000 to 10,000 years ago) witnessed the retreat of the shoreline far westward to about the position of the Farallon Islands. The coarser-grained terrestrial sediments relating to this period have been identified as the San Antonio Formation by some authors and the Merritt Sand or Merritt Formation by others (Table 8-14.2). This coarse sediment is in turn capped by the Young Bay Mud, marking the return of the ocean and marine deposition between 15,000 and 9,000 years ago. On the east side of San Francisco Bay the marine type Merritt Sand grades into and interfingers with terrestrial alluvial-fan deposits. Schlocker et al. (1958) named possibly equivalent sands the Colma Formation, while clearly stating that at least the marine portion of the Colma was “correlated with the Merritt Sand.”

The environment of deposition of Merritt Sand deposits varies greatly over short distances; it is a complex of Pleistocene marine and coastal sediments, including some interbedded gravel and silt, and clay beds. Depending on whether they were deposited during high or low sea-level, the environment in which they were deposited varies among offshore marine, estuarine, lagoonal, beach, paludal (swamp), lacustrine (lake), fluvial (stream), flood plain, and dune environments (Schlocker, 1974). Part of this complexity is due to the difficulty in discriminating between sand units that may, or may not, be related to one another in time and manner of deposition.

Latest Pleistocene and Holocene age (about 15,000 years to present) alluvium in the Bay Area was named the Temescal Formation by Lawson (1914), who included within this formation alluvial deposits younger than and overlying the Merritt Sand. The principal differences between the younger and older alluvium are stratigraphic position (separated by the Merritt Sand), lithologic components, degree of consolidation, topographic expression,

attitude (tilted versus flat-lying), and fossil content. According to Savage (1951), sediments in the Bay Area containing Rancholabrean LMA fossil faunas can often be distinguished from the older Pleistocene (Irvingtonian LMA) deposits because they are relatively flat-lying, while the older sediments are often tilted. This criterion has also been helpful to others in distinguishing older alluvium from younger alluvium (see Taliaferro, 1951; Hall, 1958; Helley et al., 1972). Like other units, depending on whether they were deposited during high or low sea level the depositional environment of Temescal Formation sediments varies from estuarine to swamp to stream.

Schlocker (1974) suggested that sediments of the Temescal Formation were deposited after about 14,000 years ago, when sea level began to rise with the melting of continental ice sheets at the close of the Wisconsin Glacial Age (Table 8.14-2) and the ocean re-entered San Francisco Bay. This then would make the “Young” or “Recent Bay Mud” of many authors quite literally the marine facies of the Temescal Formation. Atwater et al. (1977) note that with more radiocarbon dating tests, the incursion of the ocean into what would become the San Francisco and San Pablo Bays occurred between 11,000 and 9,000 years ago. Therefore virtually all of the Young Bay Mud unit is post-Rancholabrean (Holocene; Table 8.14-1) and would therefore possess only low paleontological sensitivity.

Young Bay Mud is recognized in nearly all of the geotechnical borings beneath and in the vicinity of the Project (URS, 2006a and 2006b). Based on the age relationship discussed immediately above, the lower contact of this unit can be used as the conceptual divider between sediment and fill of no to low paleontological sensitivity above, and sediment of moderate to high paleontological sensitivity below. At both the Cogen and the Hydrogen plant sites this contact ranges from about 19 to 28 feet below the surface.

Quaternary Fossil Records. From his survey of vertebrate faunas from the non-marine Quaternary deposits of the San Francisco Bay region, Savage (1951) concluded that two faunal divisions could be recognized. He assigned the earlier Pleistocene fauna to what eventually was designated the Irvingtonian LMA (older than ca. 400,000 years), and the later Pleistocene and Holocene fauna to the Rancholabrean LMA (younger than ca. 400,000 years). Deformed gravels with interbedded sand and clay on the west flank of the Berkeley Hills have yielded an abundant Early to Middle Pleistocene Irvingtonian fauna (Savage, 1951; Wahrhaftig et al., 1993; Jefferson, 1991a and 1991b), named for the productive quarries at Irvington in the southern Berkeley Hills. The Irvington Gravels are distinctly folded and the strata dip as much as 20° to 25° (Savage, 1951; Louderback, 1951; Hall, 1958). Lithologically similar and probably age-equivalent gravels occur elsewhere in the San Francisco Bay Area. These gravels have also yielded Irvingtonian-age land mammal fossils (for instance UCMP localities V-6322, V-3602, V-3604, and V-3605) and are probably correlative with the Irvington Gravels.

Fossils from sediments referred to the San Antonio, Alameda, Santa Clara, and Merced Formations by most (but not all; see Table 8.14-2) authors are Early to Middle Pleistocene in age, generally coeval with those reported from the Irvington Gravels and equivalents. The terrestrial mammals collected from these units include mammoths, musk oxen, horses, peccaries, camels, deer, elk, pronghorns, ground sloths, saber-tooth cats, dire wolves, coyotes, foxes, gophers, mice, and squirrels (Peabody, 1945; Savage, 1951; Stirton, 1951; Louderback, 1951; Hall, 1958).

The Colma Formation has produced significant marine and terrestrial fossils in the past. Rodda and Baghai (1993) reported bones and teeth of mammoth and extinct bison from sands and clays unconformably overlying the Franciscan Complex that they refer to as the Colma Formation. Fossil diatoms and pollen were also recovered from this site, with the former indicating an estuarine environment. A leg bone of a ground sloth (*Glossotherium* sp.) had been previously recovered from a shallow well in this same vicinity which is related to the same bone bed (Rodda and Baghai, 1993). A radiocarbon age of 25,380 +/- 1,100 years before present (ibid.) for fossils found at this site would, however, make it too young for the Colma Formation (Stage 5, or 128,000 to 75,000 years old). The standard deviation of the radiocarbon date is large, and it would take only a minute amount of modern carbon to make a sample that is older than the range of radiocarbon dating (>30,000 years for conventional counters) appear to be younger.

Savage (1951) listed other vertebrate fossil localities in the San Francisco Bay region to which he assigned an “undifferentiated Pleistocene” age. Some of these additional vertebrate fossils may also be referable to the Colma Formation. Schlocker (1974) reported fossil plant remains and a peat layer at the top of his Colma Formation possibly representing “an old soil that developed in or near local marshes or lakes.” Marine facies of the Colma Formation (including some units identified as the Merritt Sand) have produced marine megafossils, marine and nonmarine diatoms, and sponge spicules (Schlocker, 1974).

Sediments assigned to the Temescal Formation (Table 8.14-2) have yielded fossil remains of petrified wood, marine mollusks and mammals, bony fishes, amphibians, reptiles, birds, and a diversity of extinct land mammals, including ground sloths, mammoth, mastodon, deer, horse, camel, and bison (Hay, 1927; Stock, 1925; Savage, 1951; Jefferson, 1991b). Fossils recovered from Wisconsin and Holocene-age sediments at sites in the area around San Francisco Bay also include microfossils useful in paleoenvironmental reconstructions (radiolaria, foraminifera, sponge spicules, coccoliths, diatoms, dinoflagellates, pollen, and spores) (Atwater et al., 1977; McGann et al., n.d.; Sloan 1992). Schlocker (1974) has also reported fossil plant remains from sediments he referred to as “Bay mud and clay.” Bonilla (1971) reported fossil shells and plant remains from “Bay Mud.” Generally, Holocene-age facies of the Temescal Formation would be assigned low paleontological potential, while latest Pleistocene facies (late Rancholabrean LMA) and the Younger Bay Mud would be assigned moderate to high paleontological potential depending on the setting.

8.14.4.2 Artificial Fill

Extensive mapping information is available for the San Francisco and San Pablo Bays showing where marshes and estuarine habitats existed in historic times, but are now filled in (Oakland Museum, n.d.). The practice of creating land by filling in the tidal flats and deeper estuaries on the shores of the Bay Area began about the time of the Gold Rush in response to the need for room to expand along the waterfront. Over time, more than 3 square miles of the most valuable land in San Francisco originated in this way (Schlocker, 1974). For fill, developers used whatever materials were available, including dune sand, alluvium, sediment dredged from the Bay, spoils from excavations, solid rock from quarries, and man-made debris, including foundry slag and garbage. Both the thickness and type of fill vary widely over short distances.

The area proposed for construction of the PPRP is located entirely on artificial fill, as is the route of the cogeneration unit's transmission line (URS, 2006b, Fig. 5). Artificial fill possesses no paleontological sensitivity. The thickness of artificial fill beneath and near the Cogeneration plant site, as determined from geotechnical borings, generally ranges from 10 to 14 feet (URS, 2006a). It is shallower (6 to 8 feet thick) in areas that appear to be underlain by Holocene and historic peat, sands and gravels of low paleontological sensitivity. The thickness of fill in the vicinity of the Hydrogen plant site is more variable, ranging from approximately 3.5 feet to as much as 13 feet in depth (URS, 2006b).

8.14.5 Impacts and Mitigation

This review found no records of fossil sites within the footprint of the Project, nearby laydown areas, or the transmission line. Artificial fill, which possesses no paleontological sensitivity, underlies the entire Project site. Holocene alluvium and then Young Bay Mud of low paleontological sensitivity occur below the fill, with older Quaternary alluvium and Franciscan bedrock of moderate to high paleontological sensitivity at the base of the section. The lower contact of the Young Bay Mud provides a useful marker for the upper limit of paleontologically sensitive sediment, and geotechnical investigations show that this depth ranges from 19 to 28 feet. Therefore, excavations at depths shallower than, conservatively, 15 feet would have no impact to scientifically significant paleontological resources.

Because excavations are expected to disturb only the top six feet or less of sediment in the Project area, and because the sediment to be disturbed at this shallow depth is chiefly artificial fill with no paleontological sensitivity, no impacts to paleontological resources are anticipated from Project construction. Nor are impacts anticipated from Project operation, which will not involve ground disturbance.

Because no impacts to paleontological resources will occur, no mitigation is recommended as part of PPRP implementation. It is noted that paleontological resources awareness training is included as a module in the general Worker Environmental Awareness Program.

Based on these findings, no further assessment is needed of impacts to paleontological resources resulting from the PPRP as described herein.

8.14.6 Involved Agencies and Agency Contacts

There are no state or local agencies having specific jurisdiction over paleontological resources. The CEQA lead agency having specific responsibility to ensure that paleontological resources are protected in compliance with CEQA and other applicable statutes during construction of the PPRP is the CEC. California Public Resources Code Section 21081.6, entitled Mitigation Monitoring Compliance and Reporting, requires that the CEQA lead agency demonstrate project compliance with mitigation measures developed during the environmental impact review process.

8.14.7 Permits Required and Permit Schedule

No state or local agency requires a paleontological collecting permit to allow for the recovery of fossil remains discovered as a result of construction-related earth moving on private or public lands, except for federal lands. However, since no federal lands are involved in this Project, no permits will be required.

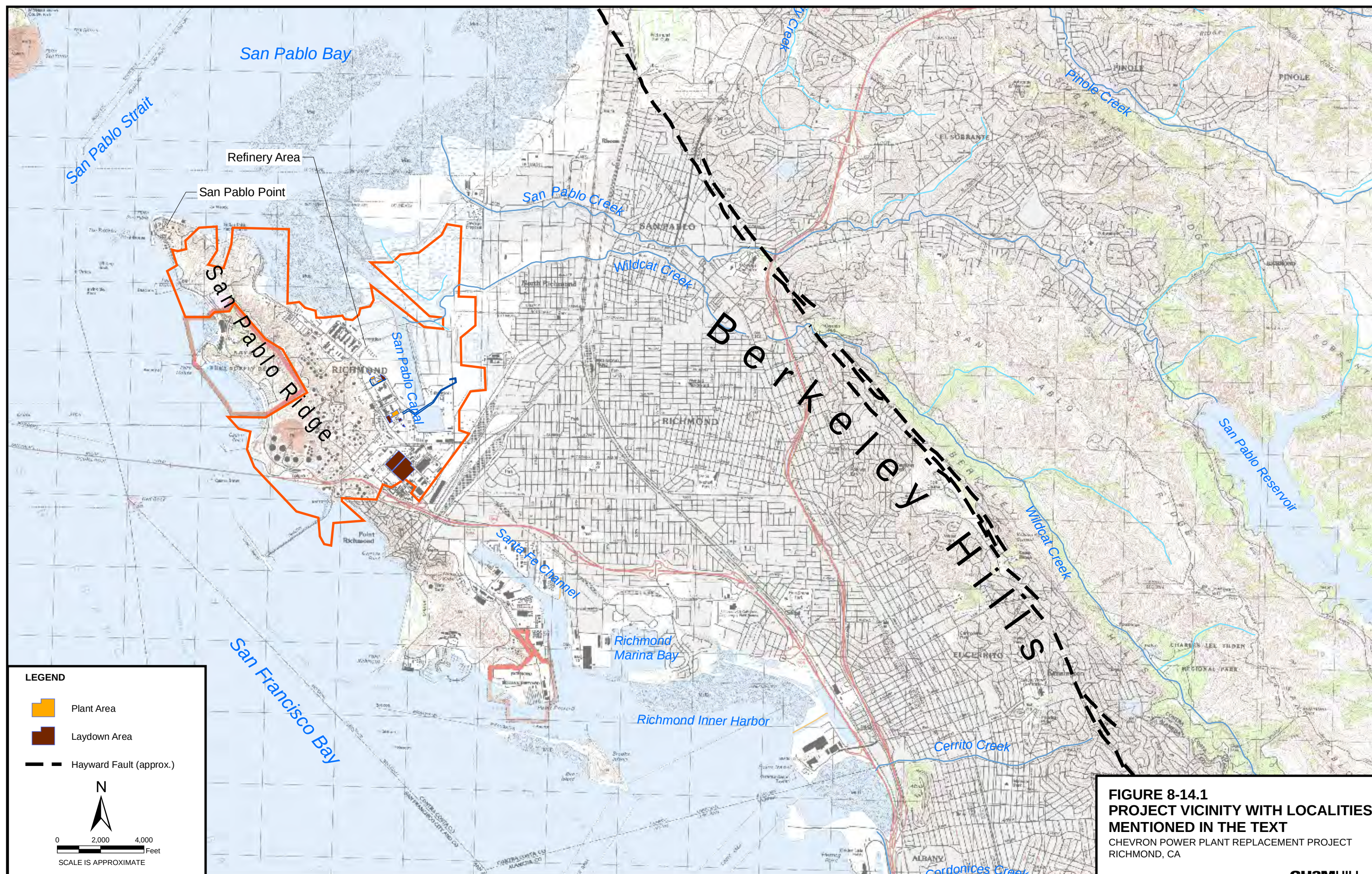
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Alternatives

In a CEQA alternatives analysis, the range of alternatives should be limited to those that would attain most of the basic objectives of a proposed project, would be feasible, and would avoid or substantially lessen any of the significant adverse effects of the project. Factors to consider include site suitability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries, economic viability, and whether the Applicant can reasonably acquire, control or otherwise have access to an alternative site. A CEQA alternatives analysis need not consider an alternative whose impact cannot be reasonably ascertained and/or whose implementation is not feasible.

A CEQA alternative to a given project must permit feasible attainment of most of the project's basic objectives, without consideration of cost relative to the proposed project; it need not fully attain all the project goals.

This section identifies and evaluates a range of reasonable alternatives to the proposed Chevron Richmond Refinery Power Plant Replacement Project (PPRP, or the Project) pursuant to the required CEQA alternatives analysis process. This section includes the following sections:

- **Section 9.1 – Project Objectives.**
- **Section 9.2 – No Project Alternative.** Provides information on what would be expected to occur if the PPRP does not occur.
- **Section 9.3 – Alternative Sites Analysis.** Provides a discussion of potential site selection and examines why alternative sites were not feasible.
- **Section 9.4 – Alternative Project Configurations.** Provides information on other feasible power generation configuration alternatives to the combustion turbine and steam generator currently proposed for the PPRP.
- **Section 9.5 – Alternative Power Generating Technologies.** Provides information on alternative power generation technologies that were considered for the PPRP.

9.1 Project Objectives

Chevron's basic objectives for the PPRP include the following:

- To safely construct and operate a nominal 60-megawatt (MW) addition to Refinery generation capacity
- To provide additional electrical generation to meet the Refinery's growing electrical load
- To replace the aged boiler plant steam supply with a more efficient state-of-the-art cogeneration system steam supply and shut down the existing boiler plant

- To incorporate energy efficiency in the new hydrogen plant replacement by recovering heat for steam and power generation
- To improve the reliability of critical Refinery operations by reduced dependence on power imported from the PG&E grid
- To assist the State of California by reducing the amount of utility power used by the Refinery, thus helping to reduce the state's dependence on imported power
- To contribute to the diversification of the area's economic base by providing increased employment opportunities during construction and additional tax base
- To enhance the reliability of local power supply through self-generation of power

9.2 No Project Alternative

9.2.1 Description

Under the No Project Alternative, Chevron would not receive authorization to construct and operate the proposed new power generation facilities, meaning that Chevron would continue to operate the aging, inefficient steam generation facilities (Power Plant #1) and would not incorporate energy recovery provisions in the new hydrogen plant. The following analysis considers the effects of the No Project Alternative.

Compared to the proposed Project, the No Project Alternative would avoid all potential construction-related impacts to air quality, noise, traffic, geology, soil resources, hazardous materials, public health, traffic and transportation, water resources, and cultural resources because the electrical generating facilities would not be constructed. From an operational standpoint, the No Project Alternative will avoid any impacts associated with air quality and visual resources because no changes in current steam generating facilities operations or location would occur. The No Project Alternative would also result in some energy inefficiency associated with the new hydrogen plant, as high-pressure steam produced in the new hydrogen plant would need to be introduced directly to the Refinery's lower-pressure main steam system through a pressure reducing station instead of being expanded through a new steam turbine to generate electricity.

Although the No Project Alternative is technically feasible, it would fail to meet many of Chevron's Project objectives. If the PPRP is not implemented, the Refinery would continue to operate using existing inefficient steam generating facilities and would require extensive maintenance with long shutdown periods as compared to the proposed Project. The Project would provide significant energy efficiency and reliability, whereas implementation of the No Project Alternative could result in adverse effects to energy supplies and climate change due to the use of existing inefficient, aging steam generation equipment, and could ultimately affect public safety through an increase in Refinery upsets due to the unscheduled outage of the existing steam generating facilities. Therefore, the No Project Alternative would directly conflict with the stated objectives of the Project.

9.2.2 Potential Environmental Impacts

Implementation of the proposed Project would produce energy-efficient electricity and steam to serve the Refinery in a manner that would consume less fuel. The No Project Alternative would provide for the continued operation of the existing, older steam generation facilities and a less efficient new hydrogen plant. These existing steam generation facilities produce steam but no electricity, with a lower efficiency (energy production per unit of energy consumed), resulting in the consumption of more energy resources than would be the case with implementation of the proposed Project. Furthermore, the No Project Alternative would mean air pollutants would be emitted at a higher rate on a pound per unit energy basis than under the proposed Project. Overall, the No Project Alternative would not avoid significant environmental impacts as compared to the proposed Project.

9.3 Alternative Sites Analysis

The Project is proposed to replace existing steam generation facilities at the Refinery, to add electricity generation for more energy-efficient hydrogen production, and to increase the overall generation of electrical power. The location of the proposed Project components outside of the Refinery would not reduce any significant impact, but would likely result in new significant impacts associated with Project development and the need to transmit steam and electricity to the Refinery. Furthermore, it would not be feasible to locate the hydrogen plant steam generator offsite, at a location distant from its source of steam. Therefore, evaluation of alternative offsite locations was not performed.

Furthermore, as the Project is not expected to have significant unmitigated impacts at the proposed site, relocating to another location at the Refinery would not reduce impacts below the levels identified for the Project. Therefore, evaluating alternative onsite locations for the Project was not performed.

9.4 Alternative Project Configurations

The Applicant has reviewed two configurations for the replacement of steam production currently generated by the Refinery's power house. The two configurations were reviewed for the cogeneration aspect of the Project (Cogen 3000). The focus of this review was on combined cycle combustion turbine systems due to energy efficiency considerations and the need for both electrical and steam generation for Refinery process use. The two alternatives reviewed by the Applicant were the General Electric (GE) LM6000 SPRINT® and the GE Frame 6B. Both configurations provide a high thermal efficiency and reliability. Furthermore, both systems generate both electricity and steam. However, the selection of the Frame 6B engine was made based on its ability to fire the types of fuels (specifically butane) available at the Refinery.

The alternative of not utilizing high-pressure steam generated in the hydrogen plant for electricity generation was rejected as being less energy-efficient relative to the proposed configuration, since high-pressure steam would need to be let down to a lower pressure in order to be introduced to the Refinery main steam header.

9.5 Alternative Power Generating Technologies

A review of alternative technologies was limited to those technologies that allowed for continuous steam and electrical production; technologies with limited capacity to generate these commodities on a continuous basis were eliminated as not feasible.

9.5.1 Selection Methodology

Technologies considered were primarily those that could provide baseload steam and power generation. The reason for using this screening criterion was Chevron's need for continuous steam and electricity to support Refinery operations. Two intermittent technologies with no fuel cost, solar and wind, were examined but rejected as not feasible due to the intermittent nature of these technologies.

The selection methodology included a stepped approach with each step containing a number of criteria. The selected technology would have to pass Steps 1 and 2 and provide the lowest or near lowest cost in Step 3. The steps are as follows:

Step 1. Commercial Availability – The technology had to be proven commercially practical with readily available, reliable equipment.

Step 2. Implementable – The technology had to be implementable; specifically, it had to be able to meet baseload generating needs as well as environmental, public safety, public acceptability, fuel availability, financial, and system integration requirements.

Step 3. Cost-effective – The technology had to be cost-effective. Relevant costs included both capital and operation and maintenance costs.

This methodology was applied to a number of potential baseload generation technology alternatives, as discussed below.

9.5.2 Technologies Reviewed

The technologies reviewed can be grouped according to the fuel used (i.e., oil, natural gas, coal, nuclear, water (including hydropower, ocean conversion, and geothermal), biomass, municipal solid waste, and solar radiation). However, due to the need for baseload generation and steam production, many of the technologies were immediately rejected due to not being feasible. These technologies were simple-cycle combustion turbines, solar thermal, photovoltaic, wind, hydroelectric, and ocean energy. Furthermore, biomass, municipal solid waste, coal, and nuclear technologies were excluded due to environmental, cost, and public acceptance concerns.

9.5.2.1 Oil and Natural Gas

These technologies use oil or natural gas and include combustion turbines in various configurations, and fuel cells. Descriptions of these technologies are presented below.

Conventional Cogeneration Cycle

This technology integrates combustion turbines and heat recovery steam generators to achieve higher efficiencies. The combustion turbine, which drives a generator, would normally exhaust its hot combustion gas to the atmosphere. However, in the cogeneration

cycle technology, the exhaust gas is passed through a heat recovery steam generator, creating steam that is used to provide steam to the Refinery. The resulting CHP (combined heat and power) efficiency for the system is 70 to 85 percent, which is considerably greater than most other alternatives. In addition, natural gas fuel emits little sulfur dioxide and little particulate matter. For these reasons, the system is considered the benchmark against which all other base load technologies are compared. Applying the review methodology, this technology is commercially available, economical, and can be implemented. Therefore, this technology satisfies Steps 1, 2 and 3.

Kalina Combined-Cycle

This technology is similar to the conventional combined-cycle except water in the heat recovery boiler is replaced with a mixture of water and ammonia. As this technology does not generate steam required for continued Refinery operation, it fails Step 2 and is rejected.

Advanced Gas Turbine Cycles

There are numerous technologies being developed to enhance the performance and/or efficiency of gas turbines by injecting steam, intercooling, and staged firing. These include the steam-injected gas turbine (SIGT), the intercooled steam-recuperated gas turbine, the chemically recuperated gas turbine, and the humid air turbine cycle. The SIGT is commercially available and does pass Steps 1 and 2. However, due to the untested nature of this technology in a refinery setting where high levels of reliability are required, it was eliminated from consideration.

9.5.2.2 Fuel Cells

This technology uses an electrochemical process to combine hydrogen and oxygen to liberate electrons, thereby providing a flow of current. The types of fuel cells include phosphoric acid, molten carbonate, solid oxide, alkaline, and proton exchange membrane. With the exception of the phosphoric acid fuel cell and possibly the molten carbonate fuel cell, none of these technologies are commercially available in the size required for the Project and therefore fail Step 1. The phosphoric acid fuel cell has been operated in smaller-size units, and the molten carbonate fuel cell has completed testing. However, currently neither of these technologies are cost-competitive with conventional combined-cycle technology, and therefore fail Step 3 of the review methodology.

9.5.2.3 Water

These technologies use water as “fuel” and include geothermal (discussed separately below). Other water technologies (hydroelectric and ocean energy conversion) were excluded due to the inherent limitations in these technologies to provide baseload electrical generation and steam production. In addition, it is not clear that these technologies would minimize environmental impacts relative to the proposed Project.

Geothermal

These technologies use steam (vapor-dominated resource) or high-temperature (liquid-dominated resource) water (HTW) obtained from naturally occurring geothermal reservoirs to drive steam turbine/generators. Geothermal technologies use a number of heat recovery techniques to extract energy from the geothermal resource. Geothermal technologies are a commercially available technology. However, geothermal resources are limited, and most, if not all, economical resources have been discovered and developed in

California. Furthermore, no known geothermal resource areas (KGRA) are located near the Project site. The closest KGRA is the Geysers KGRA, which is over 50 miles from the Project site. Therefore, this technology fails Steps 2 and 3 and was rejected.

9.5.3 Conclusions

All feasible technologies that might be available for base load operation and steam production were reviewed using a methodology that considered commercial availability, ability to implement, and cost-effectiveness. None of the technologies other than the cogeneration cycle burning natural gas and Refinery fuels was commercially available and could be feasibly implemented. In addition, for all alternatives commercially available, the implementable technologies were less cost-effective than the cogeneration cycle technology. Consequently, the currently proposed conventional cogeneration cycle technology using gaseous fuels is the best available option for meeting Chevron's need for replacement power and steam generation, and the one that should be employed.