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October 5, 2007

Mr. Charlie Knox
Director, Community Development Department
City of Benicia
250 East "L" Street
Benicia, California 94510

RE: Valero Refining Company – Benicia, California
Planning Commission Use Permit Application No. 07PLN-00032
Revised Environmental Analysis for the Valero Improvement Project Amendments

Dear Mr. Knox;

On April 25, 2007, Valero Refining Company – California (Valero) submitted a Planning Commission Use Permit Application (No. 07PLN-00032) to amend the 2003 Valero Improvement Project (VIP) approved by the City of Benicia on April 28, 2003 (Resolution 03-5). This submittal includes a revised Environmental Analysis (EA) that updates the one submitted to the City of Benicia on April 25, 2007 for the proposed changes to VIP (VIP Amendments).

The revised EA is presented to the City of Benicia to provide a thorough review of a flue gas change related to the Main Stack Scrubber and to address comments received on May 23, 2007 related to the initial completeness review of the April 25, 2007 submittal. The comments are addressed in Attachment I to this letter, and the responses are incorporated as appropriate throughout the revised EA.

The revised EA describes a further process enhancement for the Main Stack Scrubber. Valero has elected to add a new furnace to accept the carbon monoxide (CO) gases from the Fluid Coker (CKR) and the Fluid Catalytic Cracking Unit (FCCU). This will be added to the project to replace the Pipestill (PS) Helper Furnace included in the certification of the Environmental Impact Report (EIR) (State Clearinghouse #002042122) and approved by the City of Benicia (City) Use Permit PLN 2002-00022 in 2003. The existing PS furnaces will be converted to operate on refinery fuel gas supplemented by natural gas as needed. There will be no net increase in consumption of refinery fuel gas for the PS furnaces from the Certified EIR.

By adding the new CKR and FCCU CO furnace, Valero is able to return to the regenerative amine scrubbing technology discussed in the Certified EIR. This technology eliminates the need to construct the Solids Regeneration and Handling Facility in the southern portion of the Valero Benicia Refinery. Additional minor changes from the April submittal include: eliminating

consideration of locating the new oxygen plant off-site and consideration of an alternative on-site location for the relocated Fire House.

Due to increasing attention to the issue of GHG emissions following the passage of AB 32 and other regulatory developments, a GHG analysis is included in this EA. As documented in the EA document, the VIP Amendments will decrease GHG emissions relative to the Certified EIR and thus there will not be a new significant impact related to GHG emissions.

In addition to the revised EA, this submittal includes the following enclosures:

- Site Plan (6 sets)
- Compact disk (CD) with an electronic copy of the EA including all figures, drawings, maps, and photographs
- A check in the amount of \$227,019

The check in the amount of \$227,019 which is to be placed on deposit for Valero to cover the City's costs associated with processing the Land Use Permit Application. The funds include:

- ESA's projected costs - \$188,712
- Benicia's standard administrative cost (15%) of the CEQA consultant (ESA) - \$28,307
- Additional funding for Kitty Hammer - \$10,000

Application forms including Use Permit Application Checklist, Planning Application, Project Summary Sheet, and Environmental Checklist and mailing labels (three sets) including the Assessor's Roll and base map to meet mailing notice requirements were previously submitted on April 25, 2007.

A response to comments and questions regarding the technical completeness of the April 25, 2007 submittal is provided in Attachment I. The information is provided here in order to complete the application for the VIP amendment project and to allow for full review and informed decision-making with regard to the requested use permit amendment. Valero will be happy to provide additional information as needed, as the project review progresses.

Associated with these proposed amendments to the VIP, Valero is requesting the following revisions to the conditions in the VIP Use Permit approved by the City of Benicia by Resolution No. 03-05.

Use Permit Condition No.	Suggested Change(s)
1.	Amend list of documents references to include 2007 Use Permit Application and attached documents, relevant correspondence and other supporting documents as may be developed.
9.	Change end date of Use Permit to December 31, 2014.
13.	Delete this requirement. Valero has satisfied this permit condition. Consistent with the Settlement Agreement dated June 6, 2003, the City, Valero, and city residents have worked jointly through the People Using Resources Efficiently (PURE) committee to develop a wastewater reuse project that could potentially supply up to 2 million gallons per day of recycled water from the City's wastewater treatment plant for use in the Benicia Refinery as cooling tower make-up water. However, current cost projections for the project exceed the economic feasibility provisions of the Settlement Agreement. The Benicia City Council agreed on June 5, 2007 to terminate further work on the wastewater reuse project (the PURE Project) once the Preliminary Design Review document is prepared by Valero.
14.a	Reword subparagraph a. to read, "Valero shall not operate the sulfur plant expansion until the Main Stack Scrubber is installed and operational."
19.	Change to say, "The reports shall be submitted until the year 2015."
22.	Change the expiration date to December 31, 2014.

If you have any questions, please do not hesitate to call Mr. Don Cuffel at 707-745-7545 or myself at 707-745-7203.

Sincerely,
VALERO REFINING COMPANY – CALIFORNIA



Todd M. Lopez
Environmental Manager
Valero Benicia Refinery

TML
Enclosures

cc: Doug Comeau, Vice President & General Manager – Benicia

Attachments

Attachment I
Response to May 23, 2007 Completeness Review

Response to May 23, 2007 Completeness Review By City of Benicia

In response to the City of Benicia letter regarding the completeness of Use Permit Application (07PLN-00032) of Valero Refining Company – California, dated April 25, 2007, for General Amendments to the Valero Improvement Project (VIP), Valero provides the requested information below. For ease of review, we have provided the information in a question/answer format under the headings given in the May 23, 2007 letter. Specific numbered requests from the May 23, 2007 letter are provided followed by Valero's response.

INFORMATION NEEDED TO COMPLETE THE APPLICATION

- 1. Written authorization from Praxair for the alternative oxygen generator site. The use permit application identifies an alternative site for the new oxygen generator that was approved as part of the VIP. The alternative site is at the Praxair facility that abuts Valero property on the east. In order to review and approve this alternative as part of the use permit amendments, the City will need written authorization from Praxair, and from the Praxair property owner if different.***

Response: The off-site oxygen plant has been removed from the Use Permit Application and is no longer being considered. The plant will be constructed on-site as specified in the Certified EIR.

- 2. A statement as to whether Valero or Praxair would own and operate the oxygen generator at the Praxair facility.***

Response: The off-site oxygen plant has been removed from the Use Permit Application and is no longer being considered. The plant will be constructed on-site as specified in the Certified EIR.

- 3. Further information regarding the proposed storm water holding tank at the solids handling facility. The application proposes construction of a new 700,000-gallon above-ground tank to contain storm water at the new solids handling facility. (A) Please explain whether and how the new tank may be used on to (sic) manage storing water from other parts of the refinery. (B) Please provide the dimensions of the existing tanks adjacent to the proposed solids handling area, for comparison purposes.***

Response: The dual alkali scrubber technology is no longer being considered and the Regeneration and Solids Handling Facility will not be constructed nor will the previously proposed storm water management systems for this area. The storm water holding tank has been removed from the EA.

- 4. Quantified estimates of baseline and project emissions of greenhouse gases. Subsequent to certification of the VIP EIR, a heightened focus on greenhouse gases has dictated a need to evaluate these emissions in CEQA documents.***

Response: A greenhouse gas analysis section has been provided in Section 3.1.3 of the revised EA. Based on two independent sources of emission factors, the VIP Amendments

will result in a net decrease in greenhouse gas emissions of between about 2,700 and 7,000 metric tons (Tonnes) per year, carbon dioxide (CO₂) equivalent (CO₂-e).

5. *A statement as to whether the methodology used to calculate fugitive emissions is the same methodology used for the original VIP.*

Response: Fugitive emissions are based on 2005 actual emissions measured in accordance with EPA and BAAQMD leak detection regulations. Emissions are calculated using the facility-specific emission factors presented in the document entitled “Environmental Analysis – Valero Benicia Refinery Proposed Refinements to VIP,” submitted to the City of Benicia on December 15, 2006.

6. *A statement affirming that Valero desires to retain flexibility to implement or not implement any or all project components of the VIP amendments, consistent with its existing flexibility under the VIP.*

Response: Consistent with our existing flexibility under VIP, Valero desires to retain flexibility to implement or not implement any or all project components of the VIP Amendments.

7. *Public safety information as to whether the amendments create an increased hazard of explosion. The potential for the VIP amendments to create a new or changed explosion hazard was not addressed in the public safety analysis provided with the application. Please provide an explanation of the explosion risk including any anticipated offsite consequences.*

Response: The only element of the VIP Amendments that represents a potential for a new or changed explosion hazard is the new hydrogen plant (H₂U). The new H₂U will include a number of pressure vessels containing organic materials, which could have the potential to cause an explosion. The new scrubber and regeneration system and the desalter will not increase the possibility of explosions, because they do not contain pressurized organic vapors.

The storage and handling of organic materials is a routine part of oil refinery operation. The H₂U will not introduce a new category of risk to the Benicia Refinery, but will only add additional equipment similar to existing units. Explosions are very low-probability events, and the likelihood of an explosion associated with the VIP Amendments is remote. Valero conducted a siting study in the initial planning stages for the new hydrogen plant, which included an analysis of explosion potential. The results of this study indicated that a potential explosion would not result in off-site community impact.

This discussion has been included in Section 3.1.9 of the revised EA.

8. ***The anticipated date when the Naphtha Reformer Unit catalyst regeneration facility will begin operating.***

Response: The Naphtha Reformer Unit catalyst regeneration facility began operation in April 2007.

9. ***A statement as to whether there will be a new hydrogen flare associated with the new hydrogen plant.***

Response: There are no plans to construct a new hydrogen flare associated with the new hydrogen plant. The new H2U will be connected to the existing flare system. Uncommon and infrequent operational upsets and malfunctions at the H2U can result in flaring from the existing refinery flares at either the existing or new H2U. The occurrence of operational upsets and malfunctions at the new H2U are expected to be less frequent than at the older H2U train that will be shut down. Therefore, the new H2U is expected to reduce any flaring that could be caused by H2U upsets and malfunctions. Furthermore, the new H2U will cause a decrease in flaring at the Valero Benicia Refinery as discussed in the response to Question No. 10 below.

10. ***A statement as to whether and how the VIP amendments will affect flaring at the refinery.***

Response: The VIP Amendments will reduce the frequency and duration of flaring. Flaring is expected to decrease due to improvements to the refinery fuel gas balance resulting from the consumption of additional fuel gas by the new H2U. As with the existing H2U trains, the new H2U will not cause flaring during startup and shutdown of the unit for turnaround and maintenance purposes. A more detailed discussion of flaring reductions associated with the new H2U is provided in Section 2.4.3.3 of the revised EA.

ADDITIONAL REQUESTED INFORMATION

1. ***Quantified baseline and project-related air emissions from construction vehicles and equipment.***

Response: The expected scope of the construction of the VIP Amendments will be essentially the same as the previously analyzed construction scope for VIP. Therefore, the Certified EIR already addresses the impacts of construction of the VIP Amendments.

2. ***Quantified estimates of emissions attributable to project-related flaring, if any.***

Response: The VIP Amendments will not increase refinery flaring, as discussed above in Question No. 10.

3. ***Quantification of health risk associated with air emissions from construction vehicles and equipment.***

Response: Similar to the response to Item 1 of this section, there will be no change to the health risks associated with air emissions from construction vehicles and equipment, relative to VIP.

4. ***A description of the history and use of the existing pipeline between Praxair and the refinery.***

Response: The existing pipeline between Praxair and the refinery was installed in 2004 under Praxair's oversight. The pipeline transports CO₂ from the Benicia Refinery to Praxair's facility. However, this is no longer a concern of the VIP Amendments since an on-site Oxygen Plant will be located on-site, as described in the Certified EIR.

5. ***Baseline and project-related PM2.5 emissions from construction and operation.***

Response: Particle size distributions are not readily available for Valero's processes. To provide a conservative estimate of PM2.5 emissions, the air quality analyses in the revised EA assume that PM2.5 emissions are equal to PM10 emissions.

6. ***Additional photo simulations of the proposed construction. New areas of the Southhampton housing development have been constructed since the VIP was approved. (A) If the new hydrogen plant will be visible from those areas, one or more additional photo simulations should be provided. (B) In addition, it would be helpful to clearly indicate the equipment to be added by the VIP amendments on all photo simulations.***

Response: (A) The new areas of the Southhampton housing development were field-surveyed to determine if the hydrogen plant would be visible. A new Key Observation Point photo and project simulation were added for a view from Addison Court looking southeast. The simulation and discussion is provided in Section 3.1.1 of the revised EA.

(B) The photo simulations in the revised EA have been labeled to clearly indicate the equipment to be added by the VIP Amendments on each.

7. ***Additional information regarding hydrogen pipeline projects. The application identifies a proposed hydrogen pipeline by Air Liquide as a cumulative project. A potentially competing project by Air Products was not mentioned. Please indicate whether either or both of these projects has the potential to be an alternative to construction of the proposed new hydrogen plant.***

Response: Neither of the hydrogen pipeline projects proposed by Air Liquide or Air Products has the potential to be an alternative to the construction of the proposed new hydrogen plant at the Benicia Refinery. Valero plans to construct the new hydrogen plant independent of these projects.

As discussed in Section 4.1.2 of the revised EA, the Benicia Refinery is implementing components of the VIP relating to increased hydrogen production for the purpose of meeting the internal hydrogen needs of the Benicia Refinery independent of Air Liquide's (or Air Products') plans to offer hydrogen to the Benicia Refinery from other sources. Valero's engineering design basis for installation of the new hydrogen production unit is based on supplying the on-site needs of the Benicia Refinery. The Refinery's hydrogen production capacity will not increase beyond the levels analyzed in and approved by the

Certified EIR. Moreover, the Valero may utilize future hydrogen deliveries via the Air Liquide/Air Products pipeline, if constructed, during hydrogen production outages at the Benicia Refinery, whether or not the VIP Amendments are approved. Accordingly, the VIP Amendments and the Air Liquide or Air Products projects are separate and functionally independent projects.

8. *Air emissions data and associated meteorological data available to date from the air quality monitors installed pursuant to the June 4, 2003 settlement agreement.*

Response: Valero recently installed a pollutant monitoring station near the refinery boundary that is operated by BAAQMD. This monitor began collecting ambient concentration data for criteria pollutants and toxic compounds in April 2007.

The table below presents monitoring data provided by BAAQMD that were collected from the start of monitor operations in April through June 2007. Criteria pollutant concentrations are provided on the BAAQMD's website while toxic pollutant data were provided via email from Mr. Eric Stevenson of BAAQMD to ENSR. The table includes the most recent data available for toxic compounds at this monitoring station.

Benicia Monitoring Station Data (Concentrations in ppbv)

Pollutant	4/12/07	4/24/07	5/8/07	5/18/07	5/30/07	6/11/07	6/23/07
Criteria Pollutants							
PM 2.5	NA	16	18	19	15	27	17
Carbon Monoxide	NA	4	3	4	4	3	2
Nitric Oxide	NA	6	3	2	1	4	1
Nitrogen Dioxide	NA	16	21	16	7	14	14
Ozone	NA	39	63	45	41	44	42
Sulfur Dioxide	NA	4	4	2	4	2	2
Toxics							
Benzene	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Carbon tetrachloride	0.1	0.11	0.1	0.1	0.1	0.09	0.09
Ethylene dichloride	ND	ND	ND	ND	ND	ND	ND
Methyl ethyl ketone	0.2	0.2	0.2	0.2	ND	ND	0.2
Perchloroethylene	ND	0.01	0.01	ND	0.01	0.01	0.01
Toluene	0.3	0.3	0.4	0.2	0.3	0.4	0.2
Methyl chloroform	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND	ND	ND	ND
m,p-Xylene	ND	0.3	0.2	0.1	0.2	0.2	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND	ND
Ethylene dibromide	ND	ND	ND	ND	ND	ND	ND
Acetone	2	3.8	4.4	2.4	4.3	2.8	2
1,1,2 Trichloro-trifluoroethane	0.05	0.08	0.06	0.05	0.07	0.05	0.05
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND
1,3-Butadiene	ND	ND	ND	ND	ND	ND	ND
Methyl tertiary-butyl ether	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	0.28	0.27	0.27	0.27	0.26	0.26	0.25
O-Xylene	ND	0.1	ND	ND	ND	ND	ND

NA: Not available (criteria pollutant data not available for 4/12/07)

ND: Concentration below method detection limit

Note: All concentrations in units of parts per billion volume (ppbv)

Valero Refining Co.-CA

51950730

P.O. Box 696000
San Antonio, TX 78269-6000

JPMorgan Chase Bank, N.A.
Syracuse, NY

50-937
213

Date
07/12/2007

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EXACTLY AND**

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ORDER OF

**CITY OF BENICIA
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250 E L ST
BENICIA CA 94510-3239**

VEC A/P DISBURSEMENTS

Michael S. Culmone

VOID AFTER SIX MONTHS
Authorized Signature

⑈51950730⑈ ⑆021309379⑆ ⑆01855950⑈

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P.O. Box 696000 San Antonio TX 78269-6000

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Invoice Date	Invoice Number	Voucher Document	Deductions	Gross amount
07/06/2007	CR T CONNELL	1900036560	0.00	227,019.00
CEAQ Documentation / 2003 permit for VIP				
Sum total			0.00	227,019.00

Payment Document
2002537963

Check Number
51950730

Check Date
07/12/2007

Currency
USD

Payment Amount
*****227,019.00*

BB

Prepared for:
Valero Refining Company – California
Benicia Refinery



Environmental Analysis

Valero Improvement Project Amendments

ENSR Corporation
September 2007
Document No.: 06993-023-300

Prepared for:
Valero Refining Company – California
Benicia Refinery

Environmental Analysis

Valero Improvement Project Amendments

Prepared By

Prepared By

Reviewed By

ENSR Corporation
September 2007
Document No.: 06993-023-300

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List of Abbreviations

$\mu\text{g}/\text{m}^3$	micrograms per cubic meter
AAQS	Ambient Air Quality Standards
AB	Assembly Bill
ABAG	Association of Bay Area Governments
AERMOD	AMS/EPA Regulatory Model, a dispersion model recommended by the USEPA
AF/Yr	acre-feet per year
Air Liquide	Air Liquide Large Industries, U.S. LP
AMS	American Meteorological Society
API	American Petroleum Institute
ATSDR	Agency for Toxic Substances & Disease Registry
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
Benicia Refinery	Valero Benicia Refinery
BMP	Best Management Practices
BPIPPRM	Building Profile Input Program-PRIME
Btu/hr	British thermal units per hour
BUSD	Benicia Unified School District
Cal/EPA	California Environmental Protection Agency
CCAA	California Clean Air Act
CCAR	California Climate Action Registry
Caltrans	California Department of Transportation
CAP	Clean Air Plan
CARB	California Air Resources Board
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CFHU	Catalytic Feed Hydrotreater Unit
City	City of Benicia
CKR	Fluid Coker
CMP	Congestion Management Program
CO	carbon monoxide
CO ₂	carbon dioxide
dBA	decibels above reference noise
DEM	Digital Elevation Model
DNL	Day/night noise level (adds 10 decibels to night time noise)
DPM	diesel particulate matter
Dscfm	dry standard cubic feet per minute
E.O.	Executive Order
EIR	Environmental Impact Report
EMFAC	California Air Resources Board EMISSION FACTors model for vehicle emissions
ESP	Electrostatic precipitator
FCCU	Fluid Catalytic Cracking Unit
FEMA	Federal Emergency Management Agency

List of Abbreviations

GAQM	Guidelines on Air Quality Models (USEPA)
GEP	Good Engineering Practice
gpd	Gallons per day
gpm	Gallons per minute
H ₂ O	Water
H2U	Hydrogen Unit
HARP	Hot Spots Analysis and Reporting Program
HHV	higher heating value
HI	Hazard Indices
HP	Horsepower
HPU	Hydrogen Purification Unit
HRA	Health Risk Assessment
IG	General Industrial
ISC	Industrial Source Complex
ISCST3	Industrial Source Complex – Short Term 3
km	Kilometer
L _{eq}	Equivalent Noise Level
LOS	level of service
m	Meter
MMBtu/hr	million British thermal units per hour
MMscfd	million standard cubic feet per day
MTBE	methyl tert butyl ether
MTC	Metropolitan Transportation Commission
MW	Megawatt
NAD27	North American Datum 1927
NO _x	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NRU	Naphtha Reformer Unit
NSR	New Source Review
O ₂	oxygen
OEHHA	Office of Environmental Health Hazard Assessment
PG&E	Pacific Gas and Electric
PM10	fine particulate matter less than 10 microns in diameter
PMI	point of maximum impact
POCs	precursor organic compounds
ppmv	parts per million by volume
ppmvd	parts per million by volume, dry basis
PS	Pipestill
PSA	Pressure Swing Adsorption
REL	reference exposure level
RFG	Refinery fuel gas
RWQCB	Regional Water Quality Control Board
SCFD	standard cubic feet per day

List of Abbreviations

SCR	Selective Catalytic Reduction
SGU	Sulfur Gas Unit
SNCR	Selective Non-Catalytic Reduction
SO ₂	sulfur dioxide
STA	Solano Transportation Authority
TAC	toxic air contaminants
TBACT	Best Available Control Technology For Toxics
TGU	Tail Gas Hydrogenation Unit
TMDL	Total maximum daily load
Tonnes	Metric Tons
ULSD	ultra low sulfur diesel
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
UWMP	Urban Water Management Plan
Valero	Valero Refining Company – California
VIP	Valero Improvement Project
WWTP	Wastewater Treatment Plant

Executive Summary

This Environmental Analysis outlines proposed changes (VIP Amendments) to the Valero Improvement Project (VIP) which is currently being implemented at the Valero Refining Company – California's (Valero) refinery in Benicia. A certified Environmental Impact Report (EIR) (State Clearinghouse #002042122) was prepared for the original VIP in 2003. A City of Benicia (City) Use Permit (PLN 2002-00022) and Bay Area Air Quality Management District (BAAQMD) Authority to Construct (No. 5846) were also obtained for the project in 2003.

The proposed VIP Amendments analyzed in this document have been primarily designed to further reduce environmental impacts of the original project through implementation of additional energy efficiency, air pollution control, and flare minimization measures. The overall scope and purpose of VIP remains unchanged by the VIP Amendments. Since the time VIP was approved in 2003, Valero has continued to perform detailed engineering and design work for later phases of VIP. In addition to new energy efficiency, air pollution control, and flare minimization elements, VIP Amendments also include some minor clarification of technical details such as the location of construction areas, updated utilization of utilities (natural gas, electricity, water, etc.), and adding a new desalter at the Pipestill (PS) to wash salts and solids from crude oil feedstock.

In the original VIP, a new Main Stack Scrubber was proposed to treat sulfur dioxide (SO₂) emissions from only the Fluid Coker (CKR) Unit. Now, the new Main Stack Scrubber is modified by the VIP Amendments to treat SO₂ from both the CKR and Fluid Catalytic Cracking Unit (FCCU). This will be accomplished by placing carbon monoxide laden gases (CO gas) from the CKR and FCCU into a new, more efficient PS furnace, replacing the PS Helper Furnace proposed in the Certified EIR. Existing furnaces that now receive the FCCU and CKR CO gas will be retrofitted with new low emissions burners and will be reconfigured to be fired only on refinery fuel gas (RFG). The new furnace and scrubber configuration will further reduce emissions of SO₂, nitrogen oxides (NO_x), sulfur trioxide (SO₃), particulate matter, and greenhouse gases (GHG).

The original VIP proposed significant modifications to the existing Hydrogen Unit (H2U) for the purpose of meeting the hydrogen demand of VIP. To meet the same hydrogen demand, the VIP Amendments propose to replace one of the two existing H2U trains with a new, more efficient H2U. The new configuration significantly reduces criteria pollutant and GHG emissions. Additionally, since the new H2U will use refinery fuel gas as a primary feed stock, there will be fewer instances of flaring when the refinery has an over supply of refinery fuel gas. Startup and shutdown of the new H2U will not result in flaring, and there will be no new flare installed as a result of the VIP Amendments.

In addition to reducing emissions, the environmental impacts of the VIP Amendments are expected to be minimal and do not result in new significant impacts nor substantially increase the severity of previously disclosed significant impacts beyond those already identified in the Certified EIR. For example, the VIP Amendments and cumulative projects will not result in an increase in water consumption over the Certified EIR, and there will be negligible impacts to public health/safety, noise, and aesthetics. The VIP Amendments addressed by this environmental analysis will also have the following net reductions when compared to the currently permitted VIP:

- SO₂ emission reduction of more than 2,300 tons per year;
- NO_x emission reductions of more than 170 tons per year;
- GHG emission reductions of between 2,700 and 7,000 Tonnes per year carbon dioxide (CO₂) equivalent; and
- Flaring reductions (not included in the above reductions).

The supporting Environmental Analysis can be used by the City to assess the appropriate approach to satisfying the City's obligations under the California Environmental Quality Act (CEQA). The preliminary analysis of this document suggests that an Addendum to the Certified EIR may be appropriate.

1.0 Introduction

The Valero Refining Company – California (Valero) has prepared this environmental document to amend its current Use Permit application, submitted to the City of Benicia (City) for amendments to Use Permit (PLN 2002-00022) for the Valero Improvement Project (VIP) at the Valero Benicia Refinery (Benicia Refinery). Use Permit PLN 2002-00022 was previously issued in April 2003, and is being amended to reflect certain changes in VIP that result in environmental and technological enhancements. The VIP proposed to implement a series of modifications and additions to the Benicia Refinery to update refinery equipment and to better align it to current market demands.



These amendments include the following changes to the VIP project scope:

- (1) Further reductions to air emissions from the Main Stack;
- (2) Improved energy efficiency and reductions in emissions of greenhouse gases (GHGs);
- (3) Measures to minimize flaring; and
- (4) Minor clarifications to certain technical details of the VIP scope.

For the purposes of this environmental analysis, the collective amendments to the project, as outlined above, will be referred to as the “VIP Amendments”. The VIP Amendments allow Valero to implement project refinements that will better achieve operational efficiency, air emissions reductions, and minimizations of flaring. The VIP Amendments will not increase the permitted capacities of the Benicia Refinery’s process units beyond the levels identified in the Certified EIR and included in current Bay Area Air Quality Management District (BAAQMD) air quality permits and the City of Benicia Land Use Permit.

1.1 CEQA

This environmental analysis document has been prepared as supplemental information to assist the City of Benicia’s Planning Department in its role as the California Environmental Quality Act (CEQA) lead agency for VIP Amendments.

As required by CEQA (California Public Resources Code 21000 *et seq.*) and in compliance with the State CEQA Guidelines (Title 14 California Code of Regulations [CCR] 15000 *et seq.*), this analysis addresses the environmental impact of the installation, construction, and operation of certain modifications to various project components previously approved and certified under the VIP Environmental Impact Report (Certified EIR) (State Clearinghouse #002042122), completed in March 2003 and certified in April 2003. In addition, this analysis considers whether new or substantially more severe impacts would result from refinements to the project, changed circumstances, or new information associated with the proposed project amendments, which were not known and could not have been known with the exercise of due diligence at the time the EIR was certified as complete.

CEQA requires state and local government agencies to consider the environmental consequences of projects over which they retain discretionary authority even after an EIR has been certified. Under certain circumstances, additional CEQA documentation is required. However, Section 21166 of the California Public Resources Code provides that when an EIR has been prepared for a project, no subsequent or supplemental EIR is required unless major revisions to the prior EIR are necessary due to (i) substantial changes proposed in the project, (ii) substantial changes in the surrounding circumstances, or (iii) the availability of new information that was not known when the prior EIR was certified. To implement this provision, Section 15162(a) of the CEQA Guidelines (CCR Title 14) provides that a subsequent EIR be prepared for a project after an EIR has been certified if substantial evidence in light of the whole record supports any of the following conclusions.

15162. Subsequent EIRs and Negative Declarations

- (a) When an EIR has been certified or a negative declaration adopted for a project, no subsequent EIR shall be prepared for that project unless the lead agency determines, on the basis of substantial evidence in the light of the whole record, one or more of the following:
- (1) Substantial changes are proposed in the project which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects;
 - (2) Substantial changes occur with respect to the circumstances under which the project is undertaken which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects; or
 - (3) New information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous EIR was certified as complete or the negative declaration was adopted, shows any of the following:
 - (A) The project will have one or more significant effects not discussed in the previous EIR or negative declaration;
 - (B) Significant effects previously examined will be substantially more severe than shown in the previous EIR;
 - (C) Mitigation measures or alternatives previously found not to be feasible would in fact be feasible, and would substantially reduce one or more significant effects of the project, but the project proponents decline to adopt the mitigation measure or alternative; or
 - (D) Mitigation measures or alternatives which are considerably different from those analyzed in the previous EIR would substantially reduce one or more significant effects on the environment, but the project proponents decline to adopt the mitigation measure or alternative.
- (b) If changes to a project or its circumstances occur or new information becomes available after adoption of a negative declaration, the lead agency shall prepare a subsequent EIR if required under subsection (a). Otherwise the lead agency shall determine whether to prepare a subsequent negative declaration, an addendum, or no further documentation.
- (c) Once a project has been approved, the lead agency's role in project approval is completed, unless further discretionary approval on that project is required. Information appearing after an approval does not require reopening of that approval. If after the project is approved, any of the conditions described in subsection (a) occurs, a subsequent EIR or negative declaration shall only be prepared by the public agency which grants the next discretionary approval for the project, if any. In this situation no other responsible agency shall grant an approval for the project until the subsequent EIR has been certified or subsequent negative declaration adopted.
- (d) A subsequent EIR or subsequent negative declaration shall be given the same notice and public review as required under Section 15087 or Section 15072. A subsequent EIR or negative declaration shall state where the previous document is available and can be reviewed.

If the criteria under Section 15162 would require a subsequent EIR, CEQA Guidelines Section 15164 indicates that an agency may choose to prepare an Addendum, rather than a subsequent EIR, if only minor additions or changes would be necessary to make the previous EIR adequately apply to the project in the changed situation. As described in **Section 3.0** of this document, none of the conditions described in CEQA

Guidelines Sections 15162 or 15163¹ has occurred. Under such circumstances, CEQA Guidelines Section 15164 allows for the preparation of an Addendum as described below:

15164. Addendum to an EIR or Negative Declaration

- (a) The lead agency or responsible agency shall prepare an addendum to a previously certified EIR if some changes or additions are necessary, but none of the conditions described in Section 15162 calling for preparation of a subsequent EIR have occurred.
- (b) An addendum to an adopted negative declaration may be prepared if only minor technical changes or additions are necessary or none of the conditions described in Section 15162 calling for the preparation of a subsequent EIR or negative declaration have occurred.
- (c) An addendum need not be circulated for public review, but can be included in or attached to the final EIR or adopted negative declaration.
- (d) The decision making body shall consider the addendum with the final EIR or adopted negative declaration prior to making a decision on the project.
- (e) A brief explanation of the decision not to prepare a subsequent EIR pursuant to Section 15162 should be included in an addendum to an EIR, the lead agency's findings on the project, or elsewhere in the record. The explanation must be supported by substantial evidence.

As the lead agency under CEQA, the City will consider the potential environmental impacts of the proposed VIP Amendments when it decides whether or not to approve these changes as part of VIP and will select the appropriate method to revise the Certified EIR. The environmental analysis presented in **Section 3** and **Section 4** of this document is intended to assist the City's planning and decision-making process.

The preliminary conclusion of the environmental analysis in this document is that the proposed VIP Amendments, described in detail in **Section 2.0**, neither result in new significant impacts nor substantially increase the severity of previously disclosed significant impacts beyond those already identified in the Certified EIR. Thus, only minor additions or changes to the Certified EIR are necessary, and an addendum to the Certified EIR is appropriate as outlined in CEQA Guidelines Sections 15162 and 15164. An addendum would augment the previously Certified EIR to the extent necessary to address the conditions described in CEQA Guidelines Section 15164.

1.2 Scope of This Document

This document describes the proposed VIP Amendments under consideration and describes the potential incremental environmental impacts of implementing the changes proposed by the VIP Amendments. The following resource topics are addressed in this updated analysis for the VIP Amendments:

- Aesthetics, Visual Quality, Light and Glare
- Air Quality
- Greenhouse Gases (GHGs)
- Biological Resources
- Cultural Resources
- Energy
- Geology, Soils, And Seismicity
- Public Health

1. CEQA Guidelines Section 15163 (a) provides that the lead or responsible agency may choose to prepare a supplement to an EIR rather than a subsequent EIR if:

- (1) Any of the conditions described in Section 15162 would require the preparation of a subsequent EIR, and
- (2) Only minor additions or changes would be necessary to make the previous EIR adequately apply to the project in the changed situation.

- Public Safety
- Hydrology and Water Quality
- Land Use, Plans, and Policies
- Noise
- Public Services
- Transportation and Traffic
- Utilities and Service Systems
- Agricultural Resources
- Mineral Resources
- Population and Housing

For ease of comparison to the original document, the above resource topic areas correspond to those analyzed in the Certified EIR. As a result, this list does not exactly match the current CEQA Guidelines Appendix G outline of suggested resource impact areas to be analyzed for a project. However, with the exception of GHGs, agricultural resources, mineral resources, and population and housing, the other Appendix G resource impact areas were addressed in the Certified EIR under other sections. (For example, the public health and public safety sections include analyses of hazards and hazardous materials impacts, and the public services section includes an analysis of recreation impacts. For completeness, agricultural resources, mineral resources, and population and housing have been added to the analyses of VIP Amendments, even though they were not within the scope of the Certified EIR because the City found that there were no impacts to these resources resulting from VIP.)

Due to increasing attention to the issue of GHG emissions following the passage of AB 32 and other regulatory developments, it is appropriate to include this analysis here. As documented in **Section 3.1.3**, the VIP Amendments will not result in a net increase in GHG emissions. Therefore, this analysis does not reveal a new significant impact related to GHG emissions.

1.2.1 Impact Terminology

The following terminology is used in this environmental analysis to describe the levels of significance of the incremental impacts that could potentially result from the proposed VIP Amendments:

- The Project is considered to have *no impact* on a particular resource topic if the analysis concludes that it will not affect that particular resource.
- An impact is considered *less than significant* if the analysis concludes that the impact will cause no substantial adverse change to the environment and that it will not require mitigation.
- An impact is considered *less than significant with mitigation incorporated* if the analysis concludes that, with the inclusion of mitigation measures to which the applicant has agreed, the impact will cause no substantial adverse change to the environment.
- A potential impact is considered *significant* if the analysis concludes that the impact exceeds applicable regulatory thresholds of significance and cannot be reduced to a less-than-significant level with mitigation.

In assessing the potential impacts of the VIP Amendments, the question is not whether the potential incremental impacts are significant compared with existing physical conditions (i.e., conditions without implementing any part of VIP). Rather, the question is the significance of impacts that would be caused by the proposed VIP Amendments, and comparing these with the level of significance of impacts disclosed in the Certified EIR. This approach is expressly sanctioned by the governing statutory and regulatory provisions and case law. (See CEQA § 21166; CEQA Guidelines § 15162; *Bowman v. City of Petaluma* (1986) 185 Cal.App.3d 1065.)

For consistency, impact assessment methodologies used for the current analysis for the VIP Amendments are the same as those previously employed in the Certified EIR.

1.3 Cumulative Projects

Cumulative projects are assessed under CEQA to determine whether a project's incremental effect when combined with the effects of other projects does not result in a cumulatively considerable impact to the environment.

The following is an updated list of the activities and projects considered in evaluating cumulative impacts of the VIP Amendments, followed by a list of the projects no longer relevant or applicable to the analysis.

Benicia Refinery Projects Independent of VIP and VIP Amendments

Benicia Refinery-associated projects under consideration for the VIP Amendments cumulative impact analysis include the following:

- Operation (construction is completed) of the first unit of the Cogeneration Plant and construction and operation of the second 51 megawatt (MW) unit;
- Treatment of wastewater from the Benicia Asphalt Refinery (formerly referred to as the Huntway Asphalt Refinery);
- Operation of the Naphtha Reformer Unit (NRU) Catalyst Regeneration Facility Project;
- Construction and operation of the proposed Air Liquide Hydrogen Pipeline or the competing Air Products Hydrogen Pipeline; and
- Ongoing refinery maintenance, including future turnarounds.

The following projects unrelated to the Benicia Refinery were identified in the Certified EIR to have construction schedules that could overlap with VIP and are still relevant to the cumulative impact assessment:

- Construction of the Benicia Bridge
- Development of the Seeno Benicia Business Park
- Southampton Tourtelot Development

In addition to those previously analyzed in the Certified EIR, three other projects have been identified by the City of Benicia as possible projects and plans underway in the vicinity of the Benicia Refinery. These projects and plans are:

- The Lower Arsenal Mixed Use Specific Plan
- Downtown Mixed Use Master Plan
- The Marina Area Storm Drain Project

Finally, other projects that were considered in Section 5.0 of the Certified EIR have either been completed (MTBE Phase Out Project, and Light Ends Rail Rack Arm Drains Project) or are no longer under consideration for implementation (Selective Hydrogenation Facilities Project). Therefore, the list of projects considered for the cumulative impact assessment of the VIP Amendments is incrementally different from that considered for the original VIP. **Section 4.2** of this document includes a cumulative impact analysis for the VIP Amendments.

1.4 Organization of This Document

The CEQA Guidelines do not specify the format of environmental analyses. In the absence of a prescribed format, the environmental analysis presented for the VIP Amendments has been organized as follows:

- Section 1.0 **Introduction** identifies the purpose, scope, terminology, and organization of the environmental analysis.
- Section 2.0 **Project Description** describes the specific refinery modifications that comprise the VIP Amendments.
- Section 3.0 **Environmental Checklist** discusses the effects of the proposed VIP Amendments on each resource topic in terms of the impacts identified in the Certified EIR.
- Section 4.0 **Other CEQA Considerations** discusses cumulative impacts of the VIP Amendments with other regional projects, and unavoidable impacts.

An impacts summary table comparing VIP Amendments impacts to the impact levels set by the Certified EIR is provided at the end of each resource topic discussion in **Section 3.0**.

2.0 Project Description

2.1 Summary of VIP Amendments

The VIP Amendments include the following modifications to the scope of VIP as presented in the Certified EIR:

2.1.1 Main Stack Scrubber to Reduce Emissions from the Main Stack

The Main Stack Scrubber evaluated by the Certified EIR provides for treatment of carbon monoxide laden gas (CO gas) from the Fluid Coker (CKR). Under the VIP Amendments, Valero is proposing to treat both CKR and Fluid Catalytic Cracking Unit (FCCU) CO gas in a common scrubber. This approach will achieve significantly greater reductions in sulfur dioxide (SO₂) emissions from the Main Stack than estimated in the Certified EIR. The scrubber to be installed under the VIP Amendments will be a regenerative amine scrubber, utilizing regenerative amine technology, as previously evaluated by the Certified EIR, but will operate at a higher pressure. The high-pressure design will enable a new pre-scrubber which will be installed as part of the VIP Amendments to capture catalyst fines and coke fines (primarily ash). This will allow the scrubber system to provide for the control of particulate emissions instead of the existing electrostatic precipitators (ESPs). Additionally, the pre-scrubber will remove sulfur trioxide (SO₃) which is not removed effectively by the ESPs. As described in the Certified EIR, the amine solution will be regenerated in a scrubber regenerator allowing for the solution's reuse.

The Certified EIR also included a new Pipestill (PS) Helper Furnace with a selective catalytic reduction (SCR) system to reduce nitrogen oxide (NO_x) emissions. The current process design calls for the new PS Furnace to be designed as a high-pressure furnace (to be designated F-105) which will accept CO gas from the FCCU and CKR. F-105 will also use SCR for NO_x emissions control. Particulate emissions downstream of F-105 will be controlled by the pre-scrubber and the regenerative amine scrubber. The existing furnaces F-101 and F-102, which currently combust FCCU and CKR gases, will be converted to firing refinery fuel gas (RFG). Since the modified F-101 and F-102 will be fired on RFG, the existing ESPs will not be needed due to the inherently low level of particulate emissions from combustion of RFG. Therefore, the existing ESPs will be turned off to reduce electrical power demand.

2.1.2 New Hydrogen Unit to Improve Energy Efficiency and Reduce Air Emissions

The currently approved VIP Use Permit provides for an increase in production of an existing hydrogen unit (H2U) and installation of a Pressure Swing Adsorption (PSA) Unit for improved hydrogen purity. In order to capitalize on improved energy efficiency inherent in more modern technology, Valero now plans to shut down one of the two trains of the existing H2Us and construct a new H2U. Benefits of the new H2U include greater system efficiency, decreased emissions per unit of hydrogen produced, and decreased consumption of commercial natural gas in favor of consuming RFG as the feed stock for producing hydrogen. By consuming RFG, the new H2U will improve the refinery's fuel gas balance, which will reduce the incidences of excess fuel gas, and thus, reduce flaring. In addition, the increased energy efficiency of the modern H2U will reduce carbon dioxide (CO₂) emissions and GHGs when compared with the previously planned expansion of one train of the existing hydrogen unit evaluated by the Certified EIR. At this time, Valero does not plan to add the previously approved PSA Unit to the remaining operational H2U train. Omitting this project component will reduce the electrical demand of the VIP Amendments, thereby reducing indirect GHG emissions relative to VIP.

2.1.3 Other Minor Project Modifications

In addition to the pollution reduction, flare minimization, and energy efficiency elements described in the preceding two sections, the VIP Amendments provide clarifications of technical details related to several of the original VIP project components. However, it should be emphasized that the VIP Amendments do not seek additional increases in throughput or production rates beyond those originally assessed by the Certified EIR and authorized under the existing Use Permit issued by the City of Benicia and the Authority to Construct air permit issued by the Bay Area Air Quality Management District (BAAQMD).

The technical basis for these project components is discussed in the Certified EIR with as much detail as was reasonably possible at the time the EIR was certified. Upon completion of further engineering and operational design development, Valero is now able to provide additional technical information on construction, installation, and operation of these components. The additional information gained in design development does not significantly alter the scope of the originally identified project components. Rather it clarifies details pertinent to the technology Valero has selected for process equipment as well as provides additional information that affirms the conclusions regarding environmental impacts.

2.2 Basic Project Information

1. Project Title:

Valero Improvement Project (VIP) Amendments

2. Lead Agency Name and Address:

Community Development Department
City of Benicia
250 East "L" Street
Benicia, CA 94510

3. Contact Person and Phone Number:

Charlie Knox
(707) 746-4280

4. Project Location:

Valero Refining Company – California
Benicia Refinery
3400 East Second Street
Benicia, CA 94510-1005

5. Project Sponsor's Name and Address:

Todd M. Lopez, P.E.
Environmental Manager
Valero Benicia Refinery
3400 East Second Street
Benicia, CA 94510-1005

6. General Plan Designation:

General Industrial 7
Zoning: General Industrial (IG)

7. Description of Project: (Describe the whole action involved, including, but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation. Attach additional sheets if necessary.)

See **Section 2.0** Project Description.

8. Surrounding land uses and setting: Briefly describe the project's surroundings:

Land uses in the vicinity of the Benicia Refinery are characterized by general industrial and low-density residential development, with small areas of medium- to high-density residential, public/quasi public, limited industrial, and parkland.

9. Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement.)

The construction and operation of the VIP Amendments will also require an Authority to Construct and Permit to Operate from the BAAQMD, and necessary building permits for the City's Building Department.

2.3 Project Location

The VIP Amendments will be located within the existing property boundaries of the Benicia Refinery as displayed in **Figure 2.3.1-1**.

Locations of the individual project components within the Benicia Refinery property are shown in **Figures 2.3.1-2** and **2.3.1-3**. **Figure 2.3.1-2** displays the project locations on a plot plan drawing where the various refinery process units are clearly outlined. This figure identifies locations of major project equipment for each project component. It should be noted that some equipment shown in **Figure 2.3.1-2** is currently permitted and is not part of the revision proposed by the VIP Amendments; however, they will be constructed based on the project schedule presented in the VIP Amendments.

Figure 2.3.1-3 displays the project locations on an aerial photograph of the Benicia Refinery. Shaded areas indicate general locations where project improvements will be installed (e.g., Main Stack Scrubber, H2U, other miscellaneous equipment).

Figure 2.1.3-1 Project Location with Property Boundaries

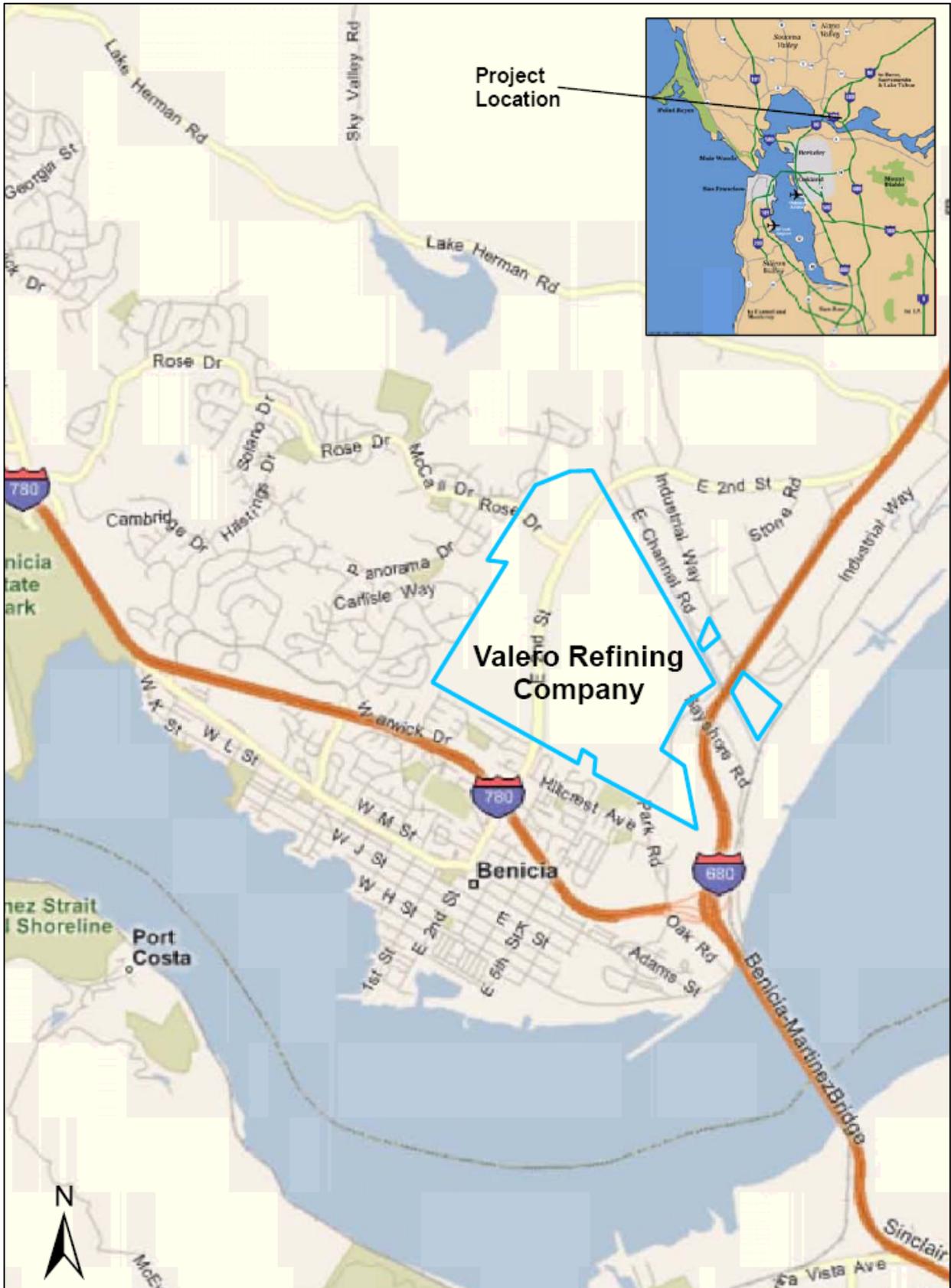


Figure 2.1.3-2 VIP Amendments Equipment Locations

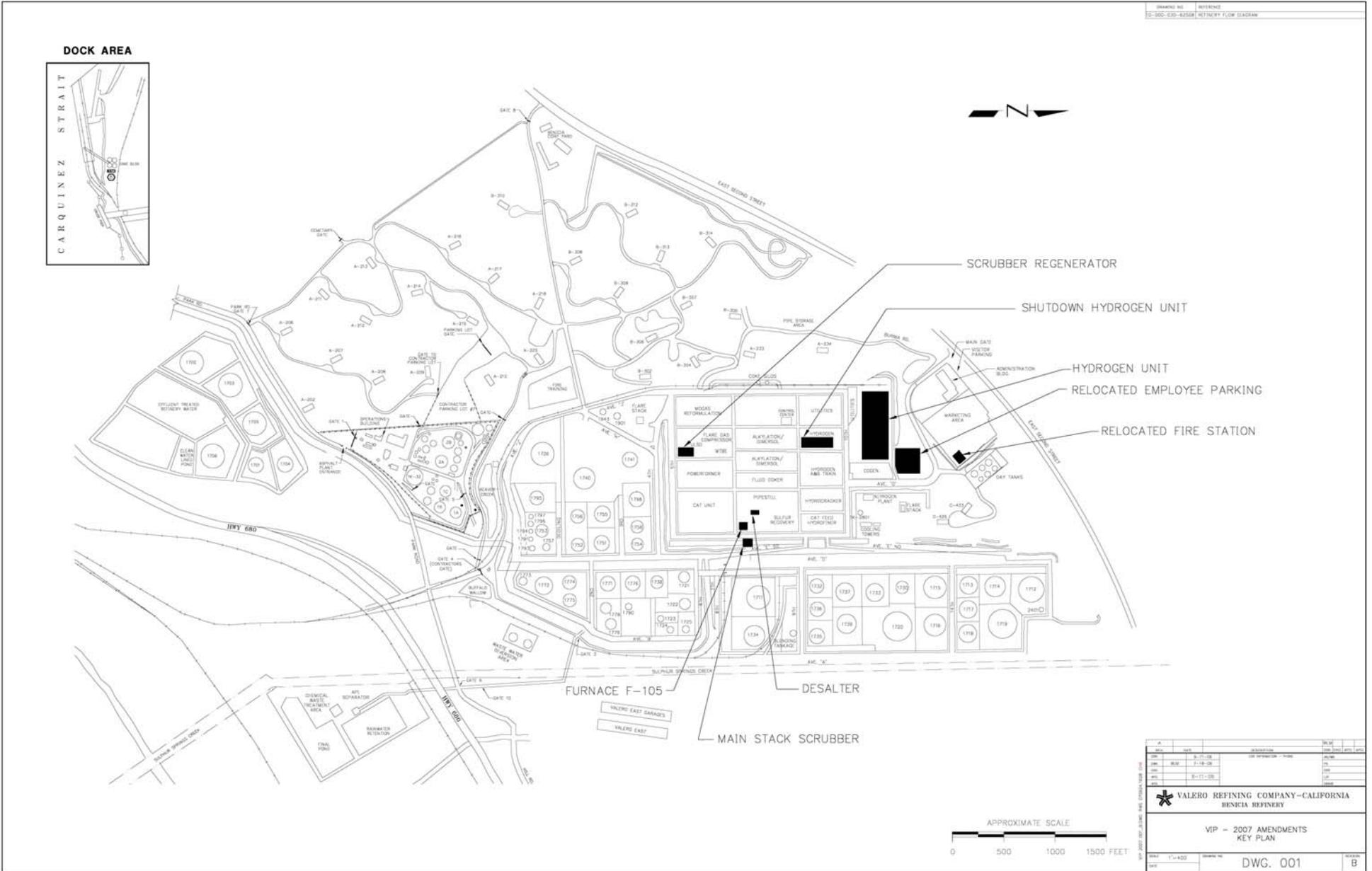
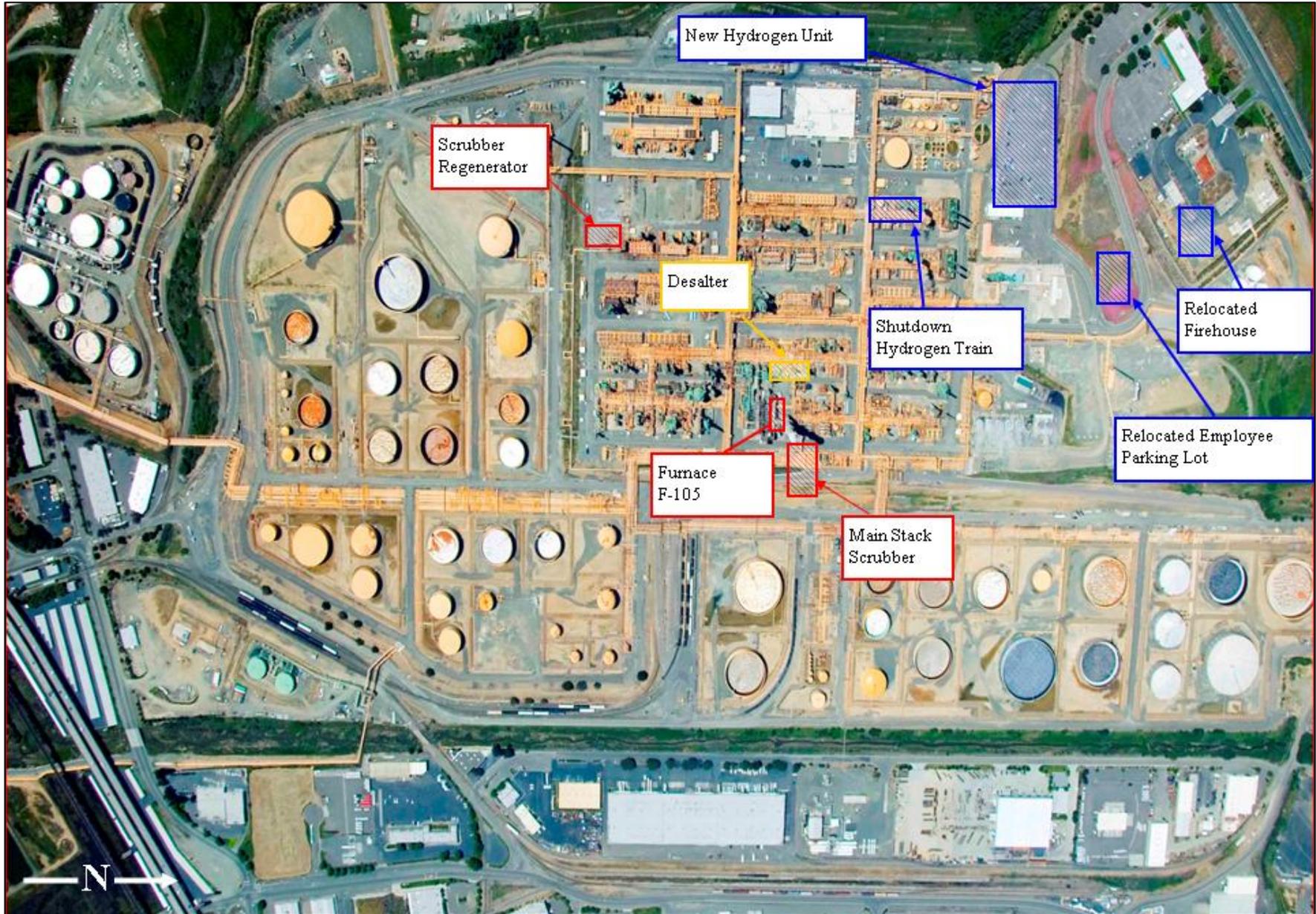


Figure 2.1.3-3 Project Location Aerial Photograph



2.4 Project Components

2.4.1 Introduction

The following discussion of project components amended under this application provides information about equipment and operations presently permitted under the Certified EIR and the modifications proposed under the VIP Amendments. In addition, information relating to the location and specifications of major equipment associated with each project component and a discussion of the associated processes are also included.

Table 2.4.1-1 summarizes VIP Amendment Project elements compared to those in the Certified EIR.

Table 2.4.1-1 VIP Amendments Components Compared to the Certified EIR Components

VIP Amendment Component	Component Description – Certified EIR	Component Description – VIP Amendments
Main Stack Scrubber		
• Fired Heater	Pipestill helper furnace included. Fired on RFG. F-101 and F-102 which feed CO Gas and RFG not modified.	Changed to new furnace (F-105) fueled with CO Gas and RFG and F-101 and F-102 changed to RFG only with no increase in total fired duty. This improves operability of the downstream scrubber for better particulate and sulfur trioxide (SO ₃) removal.
• Unfired Waste Heat Boiler	Not included.	Included to improve overall energy efficiency and reduce water evaporated in Main Stack Scrubber.
• Particulate Removal	ESPs modified to separate flow of CO gas from CKR and CO gas from FCCU	Pre-scrubber vessel included for improved removal of particulates and SO ₃ . The pre-scrubber will replace the ESPs.
• Caustic Polisher	Not included	A caustic polisher section is included with the scrubber upon further engineering to assure efficacious removal of SO ₂ under all conditions.
• SCR for NO _x control at New Furnace	Included in BAAQMD Authority to Construct Permit.	Included.
• Regenerator with Amine Purification	Included	Included
• Exhaust Gas Reheat	Included	Not required since VIP Amendments provides an unfired Waste Heat Boiler to cool gases upstream of the Main Stack Scrubber.
Hydrogen Plant		
• Standalone PSA	Included on existing H ₂ U to improve hydrogen impurity	Not included; the new energy-efficient and lower emitting hydrogen plant will meet the Certified EIR objectives.
• Process Modifications at NRU and Hydrogen Plant	Included to provide 30 MMSCF/day increase in production.	Not included the new energy-efficient and lower emitting hydrogen plant will meet the Certified EIR objectives.
• New Hydrogen Plant	Not included.	Shutdown one of two existing hydrogen trains and replace with a new hydrogen production unit with modern technology. Replacement is 30 MMSCF/day greater than the train shutdown to provide same production level of hydrogen as in Certified EIR. Will include hydrogen purification (e.g., PSA). New technology reduces energy consumption, lowers emissions, improves reliability, and reduces flaring.
Other Project Changes		
• Second Stage Desalter	Not included	Further engineering has determined that an additional desalter vessel is required to meet Certified EIR objectives.
• Increase FCCU air rate by increasing firing rate of C-702 driver (GT-702)	Not included	Increasing air rate to FCCU requires additional input from compressor C-702. This requires increasing the firing rate of gas turbine GT-702 by 70 MMBtu/hr.
• Additional Fugitive Piping Components	Partly Included	As a result of further engineering and proposed process modifications, additional piping components such as pumps, flanges, and valves are required.
• Steam Condensate Recovery	Not included	Reduces water consumption and treatment and improves energy efficiency.

2.4.2 New Main Stack Scrubber

The Certified EIR evaluated installation of a Main Stack Scrubber that utilized regenerative amine technology to control SO₂ emissions from the CKR. The scrubber is permitted in both the City Use Permit and the BAAQMD Authority to Construct. The scrubber project has not been implemented as of the date of filing of this Use Permit application for the VIP Amendments. As stated in the Certified EIR, the primary purpose of the new Main Stack Scrubber is to enhance the Benicia Refinery's capability to control SO₂ emissions from the CKR.

The VIP Amendments propose to modify the design of the Main Stack Scrubber to treat CO gas from both the CKR and the FCCU. This regenerative amine scrubber will use the regenerative amine system described by the Certified EIR. A new process furnace, which is also proposed and described in the Certified EIR, will be reconfigured to optimize the installation, as described in **Section 2.4.2.1** below.

Since the date of certification of the EIR, the United States Environmental Protection Agency (USEPA) initiated a nationwide, broad-based compliance and enforcement initiative involving the petroleum refining industry. In the interest of settlement, like many other refining companies, Valero entered into a Consent Decree with the USEPA (United States, et al, v. Valero Refining Company, et al (W.D. Tex. entered November 23, 2005)). As part of the Consent Decree, Valero agreed to install additional air pollution control equipment and implement other enhancements to air pollution management practices at its refineries to reduce air emissions. Specifically for the Benicia Refinery, Valero agreed to implement a SO₂ adsorbing catalyst additive for the FCCU (referred to as flue gas desulfurization (DeSO_x) catalyst). In addition, Valero agreed to install and begin operation of a regenerative scrubber to control SO₂ emissions from the CKR. In lieu of using DeSO_x catalyst for the FCCU, Valero has elected, with EPA's approval, to install a regenerative scrubber to control SO₂ emissions from the FCCU, in addition to the CKR. The proposed use of a scrubber will result in greater reduction of SO₂ from the FCCU when compared to the use of DeSO_x catalyst.

Accordingly, the amendments presented in this environmental analysis allow Valero to satisfy the Consent Decree FCCU and CKR SO₂ requirements and achieve significantly greater SO₂ reductions than required by the Consent Decree for the Benicia Refinery and originally contemplated under VIP.

2.4.2.1 Amendments to VIP Project Component

Through the VIP Amendments, Valero is revising the scope outlined in VIP to include treating SO₂ from the FCCU and the CKR using the originally proposed Main Stack Scrubber. This approach will achieve greater SO₂ emission reduction than originally estimated under VIP because VIP only anticipated using the scrubber to control a portion of FCCU emissions. Controlling both CKR and FCCU CO gas with the Main Stack Scrubber will reduce SO₂ emissions from the Main Stack by a total of 6,590 tons per year from VIP baseline levels. This will provide a greater net air quality benefit by reducing the ambient concentrations of SO₂ in the region. The Main Stack Scrubber is an air emission control device and by its nature, benefits the environment.

In the existing refinery configuration, the combined CKR and FCCU CO gas is routed to process furnaces F-101 and F-102 for use as fuel to provide process heat to the PS. The exhaust gas from F-101 and F-102 is commingled and routed to ESPs for particulate removal prior to entering the Main Stack along with exhaust gases from the small existing gas-fired furnace F-103 and several other small sources.

VIP proposed to split the CKR and FCCU CO gas streams, so that CKR CO gas would be routed to F-102 and exhausted to the Main Stack Scrubber to remove SO₂. Under the project design proposed for VIP the FCCU CO gas would continue to be routed F-101, then through the ESPs. This exhaust gas would then be commingled with the treated gas from the Main Stack Scrubber and exhaust gas from F-103 and the proposed PS Helper Furnace prior to entering the Main Stack. (Reference Section 3.4.3.5 and Figures 3-14 and 3-15 in the Certified EIR).

The PS Helper Furnace was specified to have a fired heat duty of 240 million British thermal units per hour, higher heating value (MMBtu/hr), and was to have a SCR for NO_x control. The combined heat duty of the

four furnaces vented through the Main Stack (F-101, F-102, F-103, and the Helper Furnace) would under this configuration be 1,081.5 MMBtu/hr including RFG and CKR and FCCU CO gas.

The proposed process design under the VIP Amendments will route the combined CKR and FCCU CO gas into a new PS furnace, to be identified as F-105, replacing the PS Helper Furnace described in the Certified EIR. The F-105 exhaust gas will pass through the SCR, then through an unfired waste heat boiler to recover exhaust gas heat and producing steam, then a wet pre-scrubber that removes particulates and SO₃. After the pre-scrubber, the CKR and FCCU gases will then pass through the regenerative amine scrubber with a caustic polisher to remove SO₂. The cleaned CKR and FCCU gases will then be combined with exhaust gas from F-101, F-102, F-103, and other sources before being discharged from the Main Stack. As described in the Certified EIR, the amine solution from the regenerative amine scrubber will be regenerated in a scrubber regenerator allowing for the solution's reuse.

F-101 and F-102 will be retrofitted with new low emissions burners and will be reconfigured to be fired only on RFG. The exhaust from these furnaces will be combined with the scrubbed exhaust from F-105 and sent to the Main Stack. The permitted capacity of F-105 will be 400 MMBtu/hr, greater than that of the original PS Helper Furnace. However, the permitted combined capacity of F-101, F-102, F-103, and F-105 will be 1,081.5 MMBtu/hr which is the same permitted capacity as identified in the Certified EIR and currently permitted by the BAAQMD.

The Main Stack Scrubber will be constructed within the Refinery Process Block as identified in the Certified EIR. The reconfigured Main Stack Scrubber will be approximately the same dimensions as the scrubber in the Certified EIR. The new F-105 will be constructed in the same location envisioned in the Certified EIR and will be within the PS area of the Refinery Process Block near F-101 and F-102.

2.4.2.2 Major Equipment

The Main Stack Scrubber project will include equipment identified in the Certified EIR, such as an amine scrubber and amine regenerator column of similar size to that previously permitted, support equipment like the amine purification unit to remove impurities, and pumps, piping, valve connections, and instrumentation. In addition, the Main Stack Scrubber Project includes a pre-scrubber, equipment for heat transfer, the new PS Furnace (F-105)(replacing the PS Helper Furnace) with SCR, new low-NO_x burners in F-101 and F-102, and an unfired waste heat boiler.

In addition to the regenerative amine scrubber vessel(s) and the redesigned process furnace, F-105, from the Certified EIR, the primary new equipment associated with the Main Stack Scrubber project not presented in the Certified EIR includes:

- Pre-scrubber;
- Unfired waste heat boiler; and
- Caustic polisher.

The pre-scrubber will be a stand alone vessel of about 30 feet in diameter and 100 feet tall, which is smaller than the Main Stack Scrubber. The unfired waste heat boiler will recover heat to produce steam while cooling the gas prior to entering the scrubber system. The caustic polisher will be adjoined to the top of the regenerative amine scrubber and is provided to assure efficacious removal of SO₂.

Figure 2.1.3-3 shows the proposed locations of the new Main Stack Scrubber, amine regeneration system, and associated equipment.

2.4.2.3 Process Description

PS Furnaces

Under the VIP Amendments design configuration, the CKR and FCCU CO gases will be routed to the new furnace, F-105. F-105 will include RFG burners with a maximum heat duty of 400 MMBtu/hr. These RFG

burners will be used at their maximum capacity only during startup, when no CO gas is being fed to the furnace. The furnace will also be designed to combust a maximum of 330 MMBtu/hr of CO gas, fired duty. While combusting CO gas, the RFG burners will operate at only a fraction of their design capacity to aid in the combustion of the CO gas; therefore, the total fuel combustion capacity of F-105, during start up and operation, will be no more than 400 MMBtu/hr. F-105 will have a forced draft combustion air fan, demanding approximately 1 MW of electricity, to enable high-pressure operation needed for particulate and SO₃ control in the pre-scrubber. The PS Helper Furnace described in the Certified EIR did not need a high-pressure combustion air fan, so this will incrementally increase electric demand by 1 MW relative to the design basis presented in the Certified EIR.

The SCR that was planned for the PS Helper Furnace in the Certified EIR will be used to control NO_x emissions from F-105, which will require ammonia injection. F-101 and F-102 currently use selective non-catalytic reduction (SNCR), which requires ammonia injection for NO_x control. Under the VIP Amendments design, F-101 and F-102 will be converted to use low-NO_x burners without SNCR. The SCR for F-105 will not consume additional aqueous ammonia beyond the projected ammonia use for F-101, F-102, and the PS Helper Furnace identified in the Certified EIR.

As noted above, F-101 and F-102 will be retrofitted with new low-NO_x burners and will be fired only on RFG. The three gas-fired furnaces, F-101, F-102, and F-103, will be limited to a combined fired heat duty of 681.5 MMBtu/hr, which will ensure that the total fired duty of the three furnaces plus the 400 MMBtu fired capacity of F-105 does not exceed the currently permitted heat input rate of 1,081.5 MMBtu/hr. As a result, the combined firing duty of the PS furnaces and scrubber systems will not change as a result of the VIP Amendments.

Main Stack Scrubber

Under the VIP Amendments, the combined CKR and FCCU CO gas will be routed to F-105. The F-105 exhaust gas will pass through the SCR, and after NO_x removal, the gas will pass through an unfired waste heat boiler which will recover heat to produce steam while cooling the gas prior to entering the scrubber system. The Main Stack Scrubber will include a new pre-scrubber which will remove particulates comprised of FCCU catalyst fines and coke fines (primarily ash). Accordingly, the ESPs will no longer be needed. They will not be modified as described in the Certified EIR and instead they will be deactivated. The external shells of the ESPs may remain, but their electrical equipment will not be operational, thereby reducing electrical demand by about 1 MW.

Currently about 800 tons/year of solid waste are recovered from the ESPs. Because the fines will be removed wet instead of dry, the incremental weight of solid waste will increase to approximately 1,600 tons/year. This means an additional 800 tons per year of solid waste will be generated by the Benicia Refinery requiring additional trucking (about one per week) to the waste disposal site. The hazardous constituents of the waste will not change. The increased quantity of waste is solely due to the presence of water and is a result of using the scrubber instead of dry ESPs for particulate control. The current dry solids collected are exempt from being designated a California hazardous waste when they are recycled to a Portland cement kiln as prescribed in California Code of Regulations, Title 22, Section 66261.6(a)(5). After the Main Stack Scrubber project is installed, the wet scrubber solids generated may not be eligible for the recycling exemption. This being true, the wet scrubber solids waste stream will be managed as California hazardous waste.

After the pre-scrubber, the gas is then contacted with a lean amine stream in the amine regenerative scrubber to remove the SO₂. The regenerative amine scrubber generates a rich amine stream laden with SO₂ that is regenerated as described under the Regeneration Facilities heading below. Before being discharged to the Main Stack, the scrubbed gases will pass through a caustic polisher section within the top portion of the scrubber tower. The caustic polisher is included in the VIP Amendments due to further refinement of the engineered design to assure efficacious removal of SO₂ under all conditions. The fans associated with the

scrubber and the new pre-scrubber will be somewhat larger than those anticipated in the Certified EIR, increasing electrical demand from the scrubber by about 1 MW.

Since the Main Stack Scrubber will now treat a combined stream of CKR and FCCU CO gas rather than only treating CO gas from the CKR as originally planned, it will require 90,700 gpd more raw water make-up to replace increased evaporative losses than was evaluated in the Certified EIR. In addition, further engineering has identified the following additional water requirements: water purge from the pre-scrubber (57,600 gpd), caustic polisher purge (14,400 gpd), and the Amine Purification purge (8,600 gpd). The Amine Purification purge was identified and evaluated in the Certified EIR, although the source of water was to be recycled water and the discharge was similarly to be reused. **Table 2.4.2-1** below summarizes the changes to water use by the VIP Amendments.

Table 2.4.2-1 Water Use Summary for VIP Amendments Main Stack Scrubber

Operating Unit	Certified EIR (gallons/day)	VIP Amendments (gallons/day)	Incremental Increase (gallons/day)
Total Main Stack Scrubber – Certified EIR	172,800	--	--
Main Stack Scrubber – VIP Amendments			--
Pre-Scrubber Evaporative Losses		263,500	
Pre-Scrubber Purge		57,600	
Amine Purification Purge		8,600	
Caustic Polisher Purge		14,400	
Un-fired Waste Heat Boiler Blowdown		4,300	
Incremental Increase for Main Stack Scrubber	172,800	348,400	175,600

Incremental battery limits water consumption from the VIP Amendments is offset by a 70 gpm (100,800 gpd) water reduction resulting from the NRU Catalyst Regeneration Facility project, which started up in April 2007 and is currently operational. This is described in **Section 3.1.15** and an analysis of water consumption including consideration of the NRU Catalyst Regeneration Facility water reduction project is provided.

Some of the increased water used by the Main Stack Scrubber equipments represents purges or blowdowns to the Benicia Refinery Wastewater Treatment Plant (WWTP). A qualitative and quantitative summary of the effects of the proposed design basis for the Main Stack Scrubber on wastewater discharges is shown in **Table 2.4.2-2**.

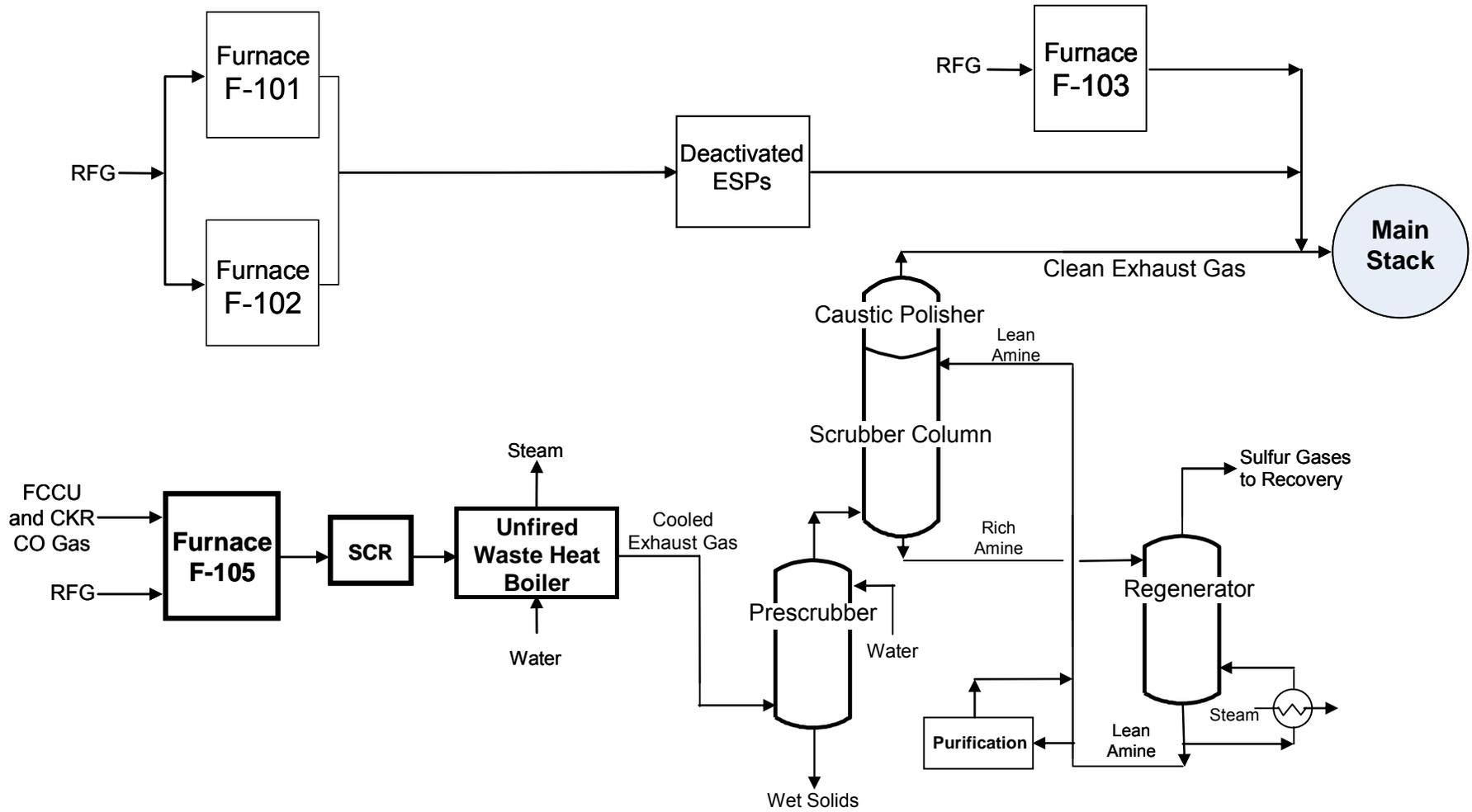
Table 2.4.2-2 Wastewater Discharge Summary to Benicia Refinery WWTP

Operating Unit	Certified EIR (gallons/day)	VIP Amendments (gallons/day)	Incremental Increase (gallons/day)
Total Main Stack Scrubber – Certified EIR	172,800	--	--
Main Stack Scrubber – VIP Amendments			--
Pre-Scrubber Evaporative Losses		263,500	
Pre-Scrubber Purge		57,600	
Amine Purification Purge		8,600	
Caustic Polisher Purge		14,400	
Un-fired Waste Heat Boiler Blowdown		4,300	
Incremental Increase for Main Stack Scrubber	172,800	348,400	175,600

There is also expected to be a minor increase in consumption of caustic, a commonly used chemical at the Benicia Refinery. Delivery of this material and other minor increases in chemicals used at the Benicia Refinery will require a slight increase in truck deliveries associated with the VIP Amendments (less than one per week). Electrical demand from the scrubber system components (not including F-105) will be similar to that estimated in the Certified EIR.

Before entering the Main Stack the treated exhaust gas will combine with F-101 and F-102 exhaust gases, and exhaust gas from the existing small gas-fired furnace F-103 and other minor sources. The Main Stack Scrubber will include minimal additional piping connections and associated equipment and will be located in and adjacent to the Refinery Process Block as envisioned in the Certified EIR. A simplified flow diagram of the existing and proposed Main Stack Scrubber configuration is shown in **Figure 2.4.2-1**.

Figure 2.4.2-1 Existing and Proposed Main Stack Scrubber Flow Diagram



Regeneration Facilities

The rich amine solution containing the absorbed SO₂ will be regenerated, as described in the Certified EIR. The rich amine solution will be piped to a regeneration column where a steam reboiler is used to heat the fluid and desorb SO₂. This creates an SO₂ rich off gas that is routed to the Sulfur Gas Unit (SGU) within the Benicia Refinery for conversion to elemental sulfur. The SGU has the ability to manage this stream within its currently permitted capacity, as the anticipated additional sulfur recovered from this stream represents about one percent of the unit's permitted capacity. The regenerated lean amine will then be pumped back to the regenerative amine scrubber for SO₂ absorption.

A slipstream of the lean amine solution is processed in an amine purification unit to remove impurities. This uses small amounts of chemicals common to the Benicia Refinery. This amine purification purge stream was discussed in the Certified EIR.

2.4.3 Hydrogen Production Energy Efficiency Improvements

In the Certified EIR, Valero proposed to make process modifications in the existing H2U in order to increase hydrogen production capacity and purity and to support hydrofining and hydrocracking operations at the Benicia Refinery. The VIP proposed to enhance the production of hydrogen by implementing the following modifications:

- Switching to a new, more efficient CO₂ absorption fluid used for hydrogen purification;
- Replacing internal tubes in top section of the reformer furnaces so that incoming feed can be pre-heated;
- Modifying the Naphtha Reformer Unit (NRU) including use of a new catalyst and associated equipment modifications; and
- Adding a PSA Unit to purify medium-purity hydrogen streams.

These planned modifications would increase hydrogen production capacity by approximately 30 million standard cubic feet per day (MMscfd) from the existing rated capacity of 160 MMscfd to 190 MMscfd.

In order to meet the Benicia Refinery's hydrogen demand while reducing energy consumption and GHG emissions, Valero is proposing to modify the previous scope of the Certified EIR by shutting down one train of the existing H2U and replacing it with a new, more efficient H2U. This removes the need to implement the replacement CO₂ adsorption fluid and equipment modifications analyzed in the Certified EIR. With the new H2U, the Refinery's hydrogen production capacity will be 190 MMscfd, which is the same as permitted in the Certified EIR. However, because the new H2U will be more efficient and controlled with state-of-the-art air pollution controls, the new configuration will use consume less fuel and have lower air emission rates including reduced rates of GHG emissions.

Valero has also determined that the PSA analyzed in the Certified EIR is no longer needed and will not be built.

2.4.3.1 Amendments to VIP EIR Project Component

Valero has determined that in order to meet internal Benicia Refinery hydrogen needs, and as a way to increase energy efficiency and equipment reliability, a new H2U complete with modern process technology would be the most economical and environmentally beneficial approach to achieving increased hydrogen production up to the capacity projected in the Certified EIR. Therefore, Valero will shut down one of the two trains of the existing H2U and will install a new H2U. This means that the originally proposed use of a CO₂ absorption fluid, modifications to the reformer furnace (i.e., tube replacement), and modifications to the NRU will not be implemented. Valero will decide which existing H2U train to shut down in the future, based on process optimization needs. However, the two existing H2U trains are essentially identical, and decommissioning either H2U train would result in the same operating scenario.

The new H2U furnace will be more thermally efficient than the unit it will replace, thus reducing energy consumption per unit of hydrogen produced and thereby indirectly reducing GHG emissions. Also, the new furnace will be equipped with state-of-the-art-emissions control technology, which will significantly reduce emissions of nitrogen oxides (NO_x). The new H2U will be installed with a Hydrogen Purification Unit (HPU) (e.g., a PSA) to purify the hydrogen produced from this unit.

The H2U furnace will use an SCR to control NO_x emissions. Additional aqueous ammonia will be consumed by the SCR. The aqueous ammonia will be stored in existing aqueous ammonia storage tanks. The existing ammonia storage and handling system is adequate for the additional ammonia use, so additional storage or modifications to the aqueous ammonia delivery system would not be needed, other than the necessary piping connections.

Valero has also determined that the standalone PSA previously analyzed in the Certified EIR to support the existing H2U is no longer economically viable and will not be pursued further. This will reduce the electrical demand of the VIP Amendments by approximately 1 MW.

The Certified EIR permitted an increase in hydrogen production from 160 MMscfd to 190 MMscfd. Under the VIP Amendments, the new Benicia Refinery hydrogen production capacity will not increase beyond 190 MMscfd. **Table 2.4.3-1** shows a hydrogen production summary comparing the Benicia Refinery's pre-VIP hydrogen production capacity to the Certified EIR and the VIP Amendments.

Table 2.4.3-1 VIP Amendments Hydrogen Production Summary

Description	Rated Production Capacity MMscfd
Certified EIR	
Pre-VIP Production Capacity ¹	160
VIP Increase	+30
Certified EIR Projected Total Production Capacity	190
VIP Amendments	
Pre-VIP Production Capacity ¹	160
Shutdown of one H2U Train	-65
New H2U with HPU	+95
Post-VIP Amendments Total Production Capacity	190
Production Increase due to VIP Amendments	
VIP Amendments - Change from Certified EIR	0

1. Pre-VIP production capacity includes both trains of the existing H2U and hydrogen produced by the NRU.

The proposed hydrogen production capacity is sized to solely meet the needs of the Benicia Refinery. However, the Benicia Refinery requires two sources of hydrogen in order to ensure at least a partial supply of hydrogen during periods in which one H2U is down for maintenance or in cases of equipment failure. If all hydrogen supply was cut off, the entire refinery would need to shut down. Therefore, Valero will retain one of its existing H2U trains. Combined with the new H2U, the Benicia Refinery's total hydrogen production capacity would increase to the level proposed in the Certified EIR. When one of the two units is inoperative, the remaining unit will produce enough hydrogen for the refinery to continue operating at reduced capacity.

The new H2U achieves energy efficiency such that Valero plans to maximize its use. The remaining train of the existing H2U will normally be operated at a minimum turndown rate. In this state it can be ramped up as needed to balance hydrogen production to meet refinery needs during occasional instances when the new H2U cannot meet internal demand, the new H2U is down for maintenance, or the new H2U is operating at reduced loads or shutdown due to operational problems.

The Certified EIR envisioned an increase in firing of the two existing H2U furnaces (F-301 and F-351) of 110 MMBtu/hr combined. Because the new H2U will have a greater capacity than the unit it will replace, the 110 MMBtu/hr increase in firing the existing H2U will not take place.

The planned location for the new H2U is currently occupied by an existing employee parking lot, firehouse, and refinery training center. To compensate for the loss of employee parking, the parking lot will be relocated within the Benicia Refinery property, and will be sized to handle about the same number of parking spaces now provided in the existing lot. The relocated parking lot will be two-levels terraced into the gentle sloping area located on currently unused Valero property north of the process block shown by **Figure 2.1.3-3**. The firehouse and training center will be demolished. The staff and equipment in the training center will be relocated to existing buildings at the Benicia Refinery. The firehouse will potentially be relocated to the refinery's Fuels Terminal, or in another area of the refinery that is currently paved or graded. The site of the new H2U may include a retaining wall or other engineered shoring to prevent erosion and other ground movement.

2.4.3.2 Major Equipment

The decision to build a new, more efficient H2U rather than expanding existing H2U capacity causes changes to the list of major equipment envisioned in the Certified EIR for achieving increased hydrogen production. Equipment modifications and installations associated with previously proposed refinery modifications for increased hydrogen production will not be implemented; instead, the following new equipment will be installed:

The new H2U and its associated HPU are expected to include the following major equipment:

- Hydrodesulfurizers (2)
- Steam Drum
- Blowdown Drum
- Hot Condensate Separator
- Cold Condensate Separator
- Reformer Furnace with SCR for NO_x Control
- Forced draft and induced draft fans
- HPU

The steam methane reforming furnace at the new H2U is expected to have a maximum capacity of 980 MMBtu/hr. In addition to these major components, the H2U will include pumps and other rotating equipment that is typical of refinery processes.

Figure 2.1.3-3 shows the proposed locations of the new H2U with a HPU, the relocated employee parking lot, and the potential location for the relocated firehouse. The new H2U will be constructed within an existing employee parking lot to the north of the Refinery Process Block. The new employee parking lot will be a two level structure built into a gentle sloping area northeast of the new H2U. Access to the upper level will be from the uphill side and access to the lower level will be from the downhill side. The planned potential location for the relocated firehouse is within the gravel area in the refinery's Fuels Terminal, to the north of the Refinery Process Block and northeast of the Administration Building.

2.4.3.3 Process Description

The new H2U will be fed primarily with desulfurized RFG and tailgas from the refinery's hydrogen consumers. When RFG is not available in sufficient quantities, the balance of the feed to the new H2U will include natural gas. The gaseous raw materials and steam will be fed to a steam methane reforming furnace that converts the water and hydrocarbon molecules into primarily hydrogen and CO using a solid catalyst housed within internal tubes inside the reformer furnace. After the reforming reaction takes place, the effluent gas stream is fed to a shift reactor that converts excess CO and water to additional hydrogen and CO₂ using a catalyst. The process stream is then fed to the HPU to remove impurities, resulting in a product that is approximately 99% pure hydrogen. The HPU tailgas, containing impurities such as CO, CO₂, and hydrocarbons, is fed to the reformer furnace, where it is mixed with RFG and burned as fuel.

The new H2U will produce more steam than it consumes, and will thereby allow for a reduction in steam production from the existing boilers at the Benicia Refinery. This process synergy represents energy efficiency inherent in the modern technology incorporated in the new H2U. The Certified EIR included a 100 MMBtu/hr increase in firing of the steam generator SG-1032 for additional steam make-up. However, the VIP Amendments and the new H2U will make it unnecessary to generate additional steam, so this increase will not occur. Thus, the VIP Amendments will cause a 100 MMBtu/hr reduction in fuel consumption associated with the same hydrogen production as in the Certified EIR, which will reduce criteria pollutant and GHG emissions.

SG-1032 was chosen for the 100 MMBtu/hr increase in steam production because it is relatively new and efficient compared to other boilers at the Benicia Refinery. Valero may continue to take advantage of the higher efficiency and increase utilization of SG-1032 beyond current operations. In this case, the 100 MMBtu/hr decrease in boiler fuel firing associated with the VIP Amendments will be achieved by reducing the firing at other boilers at the Benicia Refinery.

The new H2U will consume RFG as a primary feedstock. Since the current H2U feedstock is primarily natural gas, the modifications proposed in the VIP Amendments will increase the Benicia Refinery's internal consumption of RFG. Therefore, the VIP Amendments will improve the refinery's RFG balance. A RFG imbalance is created when more RFG is produced by the refinery than is needed by the RFG consumers (furnaces, boilers, gas turbines, and the Cogeneration Plant). When there is an RFG imbalance, the excess RFG must be flared. In an effort to minimize flaring, the Benicia Refinery makes operational changes, including cuts to production rates, in an effort to prevent or minimize occurrences and durations of RFG imbalance and thus prevent or minimize flaring. However, fuel gas imbalances cannot always be prevented or may take a period of time to completely eliminate. Therefore, operations changes and production rate cuts cannot always prevent flaring. As such, any improvement to the Refinery's refinery fuel gas balance (i.e., increased consumption of RFG), will decrease the frequency and duration of flaring.

As with the existing H2U trains, the new H2U will not cause flaring during startup and shutdown of the unit when undergoing turnarounds and other maintenance. Uncommon and infrequent operational upsets and malfunctions at the H2U can result in flaring from the existing refinery flares at either the existing or new H2U. The occurrence of operational upsets and malfunctions at the new H2U are expected to be less frequent than at the older H2U train that will be shut down. Therefore, the new H2U is expected to reduce any flaring that could be caused by H2U upsets and malfunctions. The new H2U will not be constructed with a new flare.

The new H2U will include forced draft and induced draft fans, and gas compressors, which will collectively demand approximately 4 MW of electricity. The electrical demand of the H2U to be shut down is approximately 0.5 MW. Since Valero will forego building the PSA projected in the Certified EIR, the projected 1 MW from that unit will not be required. Overall, the H2U production elements of the VIP Amendments will result in an increase in the Benicia Refinery's electrical demand of approximately 2.5 MW compared to the design basis outlined in the Certified EIR.

The existing hydrogen production configuration is depicted in **Figure 2.4.3-1**. **Figure 2.4.3-2** illustrates the proposed hydrogen system configuration, including the new H2U. The H2U block represents the new H2U and contains its own dedicated downstream PSA unit or other hydrogen purification technology. The resultant hydrogen from the existing H2U and the new H2U is used in a variety of process units throughout the Benicia Refinery to remove impurities from process intermediates and finished products.

Figure 2.4.3-1 Existing Hydrogen Production Configuration

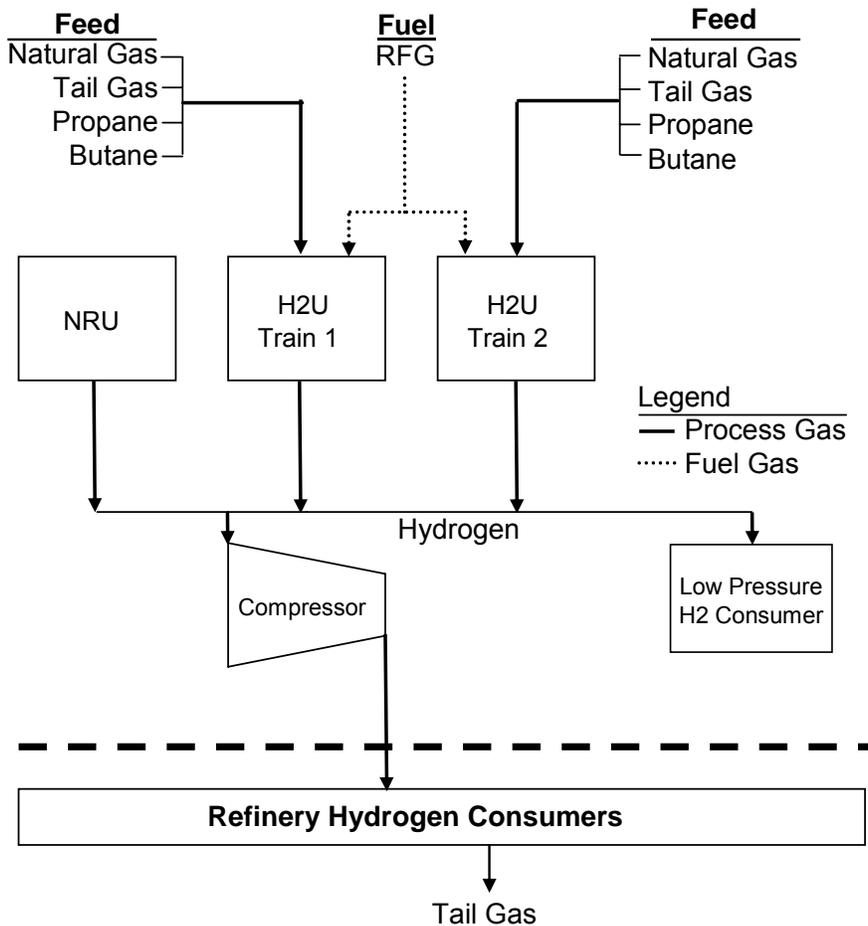
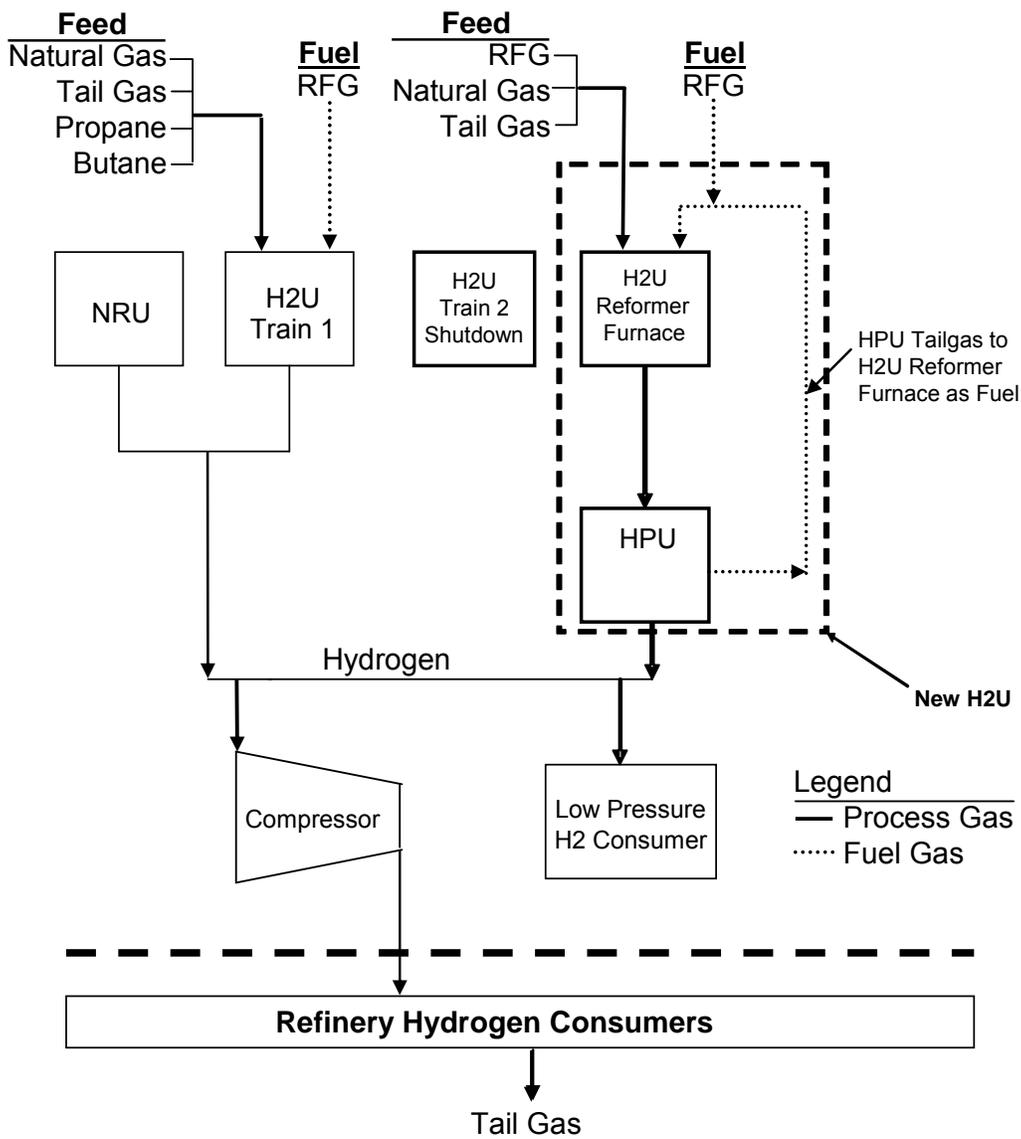


Figure 2.4.3-2 VIP Amendments Hydrogen Production Configuration



2.4.4 Other Minor Project Changes

Since the time VIP was approved in 2003, Valero has continued to perform detailed engineering and design work for later phases of VIP. As a result, amendments or points of clarification are needed to meet the specific operating scenarios planned at the Benicia Refinery. These amendments pertain to only a few VIP project components and are discussed below. VIP project components that are not discussed in this section remain unchanged from the Certified EIR.

2.4.4.1 Amendments to VIP Project Components

Desalter

Valero has determined that an additional desalter vessel is needed to adequately remove salts and solids from the crude feedstock. The additional desalter vessel will be installed in the Refinery Process Block near the PS and existing desalter. The additional desalter vessel will be approximately 12 feet in diameter and 80 feet long, and will use existing process or recycled water streams and will therefore, not increase raw water consumption or discharge to the WWTP. The desalter and other miscellaneous process changes may increase the Benicia Refinery's electrical demand by approximately 1.5 MW.

FCCU Modifications

The Certified EIR envisioned modifications to the FCCU to increase operational flexibility and allow the FCCU to operate at a nominal process rate of 75,000 barrels per day or higher on occasion, as compared to the present rate of 72,000 barrels per day. Increasing the process rate will require increasing the air rate at the compressor C-702, which will be accomplished by increasing the firing rate of the existing gas turbine GT-702 by approximately 70 MMBtu/hr. This increase in fired duty was not included in the Certified EIR, and has been incorporated into the analyses for the VIP Amendments. This change requires no physical modifications to GT-702, and the VIP Amendments will not include any changes to the FCCU or increases to FCCU processing capacity beyond that which was described in the Certified EIR.

Other Process Changes

In keeping with the theme of improving energy efficiency with the VIP Amendments, the Benicia Refinery is proposing to implement a Steam Condensate Recovery Project. Rather than allowing hot steam condensate to be discharged to process sewer, this project will recover steam condensate for use as boiler feed water. This project will reduce raw water consumption, reduce discharges to the WWTP, reduce energy usage, and reduce both raw water treating and wastewater treating expense. Although the actual energy savings have not been quantified, the project is expected to reduce raw water consumption (and discharge to the WWTP) by over 21,500 gpd (15 gpm). The analyses in this EA document are conservatively based on achieving the minimum project objectives.

The minor modifications for the new second stage desalter vessel and other VIP Amendment components will require additional piping for liquid and gas streams. The piping will include components such as valves, pumps, and flanges, which will increase fugitive emissions of precursor organic compounds (POC) by approximately 3 tons per year.

It should be noted that the Certified EIR includes several project components that collectively allow the Benicia Refinery to increase crude throughput capacity and optimize process operations. These components in the Certified EIR include:

- PS modifications to increase crude oil processing capacity by approximately 25 percent;
- FCCU Feed Flexibility modifications to increase feed rate and process different feeds;
- CKR modifications to process additional feed;
- Increased capacity to remove and recover sulfur;
- Hydrofining optimization changes;

- Modification to maximize hydrocracking, alkylation, and reforming capacity;
- Modifications to optimize fractionation processes;
- Modifications to the wastewater treatment facility; and
- Added support facilities and infrastructure.

The Certified EIR includes project components that increase the processing capacity of various process units such as the PS, the CKR, and the FCCU. The VIP Amendments do not change the previously approved and permitted throughput increases described in the Certified EIR.

2.4.4.2 Major Equipment

The new desalter will include the following equipment:

- Desalter vessel
- Heat exchange equipment; and
- Pumps, valves, flanges, and piping.

Figures 2.1.2-2 and 2.1.3-3 show the location of the new desalter vessel.

The Steam Condensate Recovery Project will install new steam traps, valves, piping, instrumentation, flash drums, heat exchangers and condensate tanks to collect steam condensate. These components will be installed throughout the Benicia Refinery and thus are not shown on **Figures 2.1.2-2 and 2.1.3-3**.

2.4.4.3 Process Description

The following is a brief description of the desalting process:

Desalter

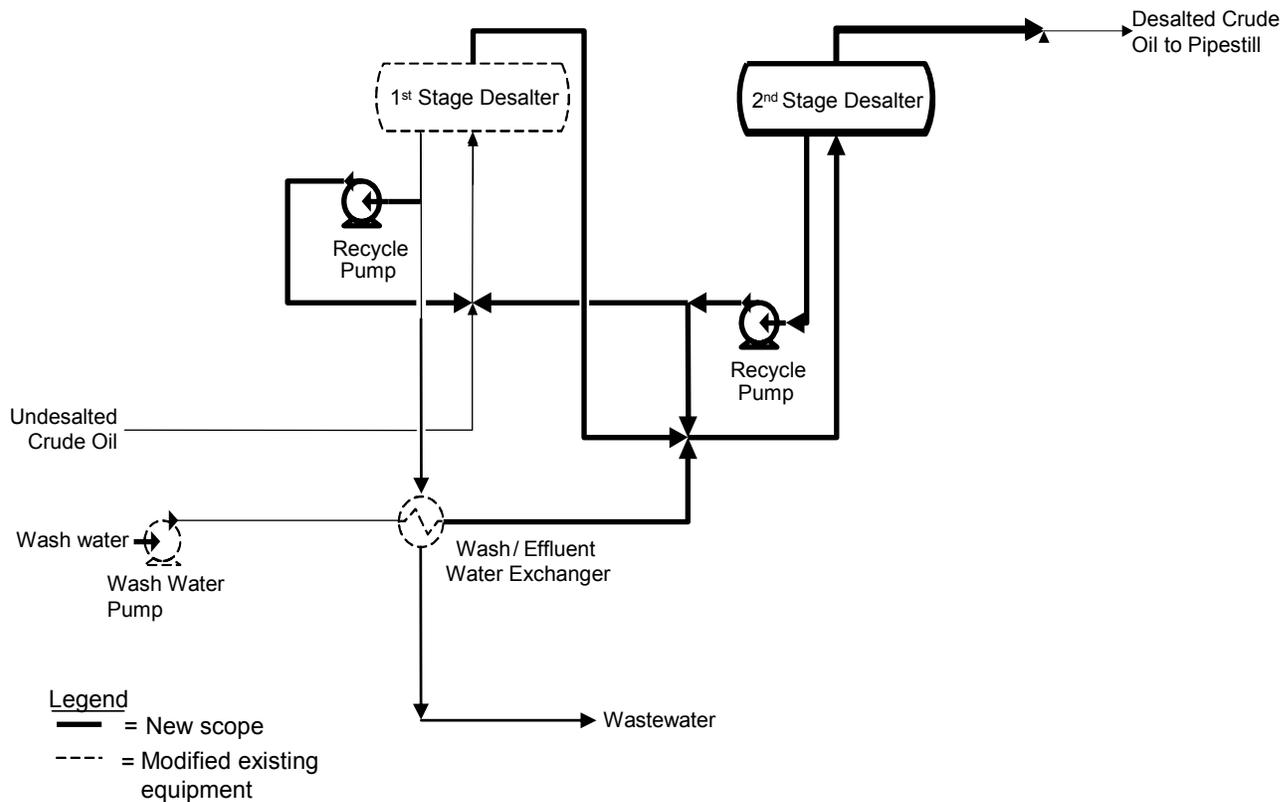
The Benicia Refinery currently operates a single-stage desalter unit to wash salts and solids from crude oil feedstock prior to feeding it to the PS for primary separation. The second-stage desalter proposed in the VIP Amendments will be installed downstream of the existing desalter to provide an additional washing cycle to the existing process. The second-stage desalter will operate in a similar manner to the existing desalter. Additional pumps, valves, flanges, and piping associated with the second-stage desalter will be connected to existing equipment within the Refinery Process Block. The new second-stage desalter will use existing process or recycled water streams and will therefore, not increase raw water consumption. Since the wash will be a recycled stream, it will also not increase water discharged to the Benicia Refinery WWTP.

Figure 2.4.4-1 displays a simplified process flow diagram of the existing Benicia Refinery desalting process with the addition of the new second-stage desalter vessel.

Steam Condensate Recovery Project

Unrecovered steam condensate is currently disposed of in the process sewer or disposed to grade which may then flow to the process sewer. Unrecovered steam condensate is also believed to infiltrate electrical cable trenches and cause electrical cable failures. This project will install new steam traps, valves, piping, instrumentation, flash drums, heat exchangers and condensate tanks to collect steam condensate. This equipment will be dispersed throughout the Benicia Refinery. All components are much smaller than other VIP Amendment Project components. The Steam condensate will be collected, passed through a coalescer to remove hydrocarbons, and then polished to remove dissolved and suspended solids to produce a condensate stream that can be directed to the boiler feedwater system.

Figure 2.4.4-1 Simplified Process Flow Diagram for Desalter



2.5 Construction of VIP Amendments

2.5.1 Schedule

As requested by the City of Benicia, a revised schedule for all VIP project components, including the VIP Amendments, is provided in **Table 2.5.1-1**. Construction activities related to the proposed VIP Amendments will take approximately three to five years and will use the existing workforce in the area.

Table 2.5.1-1 Project Schedule

VIP Component ²	Start Engineering	Order Long Lead Equipment	Begin Site Preparation	Start Construction	Startup
Crude Unit Expansion to greater than 135 MBD	N/A	N/A	N/A	N/A	Jan 2008
Increased firing rates of existing Combustion Sources (3.4.3.11)	N/A	N/A	N/A	N/A	Jan 2008
FCCU Expansion, increased C-702 air rate (3.4.3.2 and Amendments)	N/A	N/A	N/A	N/A	July 2008
Crude Tanks (3.4.3.15)	Jan 2006	April 2007	April 2007	Sept 2007	Dec 2008
Main Stack Scrubber (3.4.3.5 and Amendments)	April 2007	Jan 2008	Jan 2008	July 2008 ¹	Mar 2010
Hydrogen Unit (3.4.3.6 and Amendments)	Sept 2006	July 2008	Jan 2008	July 2008 ¹	Mar 2010
HCNHF Diolefin Reactor (3.4.3.7)	Jan 2008	Jan 2009	Oct 2009	Jan 2010	Mar 2011
Wastewater Modifications (3.4.3.13)	Jan 2008	Jan 2009	Oct 2009	Jan 2010	Mar 2011
Increased Sulfur Removal and Recovery (3.4.3.1, 3.4.3.4, and Amendments)	April 2007	July 2009	Oct 2009	Jan 2010	July 2011
Crude Unit Expansion up to 165 MBD and Furnace (3.4.3.1 and 3.4.3.11)	April 2007	July 2009	Oct 2009	Jan 2010	July 2011
Other Hydrofining Towers and Optimization (3.4.3.7)	April 2007	July 2009	Oct 2009	Jan 2010	July 2011
New Fractionation Towers and Fractionation Modifications (3.4.3.10)	April 2007	July 2009	Oct 2009	Jan 2010	July 2011
Expand CKR, Cat Light Ends, and Silos (3.4.3.4, 3.4.3.10, and 3.4.3.14)	Jan 2010	Jan 2011	Oct 2011	Jan 2012	Mar 2013
Butamer (3.4.3.8)	Jan 2012	Oct 2012	Oct 2012	Jan 2013	Mar 2014
FCCU Expansion, new electric driver for C-702 (3.4.3.2)	Jan 2012	Oct 2012	Oct 2012	Jan 2013	Mar 2014
CFHU Guard Reactor (3.4.3.9)	Jan 2012	Oct 2012	Oct 2012	Jan 2013	Mar 2014
Optimize Hydrocracker, Alkylation, Dimersol, and Reforming (3.4.3.8)	Jan 2012	Oct 2012	Oct 2012	Jan 2013	Mar 2014
RO unit for boiler feed water (3.4.3.13)	Jan 2012	Oct 2012	Oct 2012	Jan 2013	Mar 2014

Note:

1. Critical path is receipt of Benicia Land Use permit and BAAQMD authority to construct air permit.
2. Sections of the Certified EIR are listed in conjunction with the VIP Amendments

2.5.2 Construction Areas

Most construction will take place in the Refinery Process Block. Construction within the Refinery Process Block was previously analyzed in the Certified EIR. However, construction of the new H2U will occur in a contiguous area just west of the Refinery Process Block, where an employee parking lot currently exists and a firehouse will be relocated to the Fuels Terminal located to the northeast of the administration building. These locations are still within the central area of the Benicia Refinery and will not present different considerations regarding construction than those previously analyzed and addressed in the Certified EIR.

During construction, measures will be taken to avoid species, habitat, and sensitive biological resources. During construction of the new H2U, silt fencing shall be erected around the construction zone. Fueling and maintenance of construction equipment and vehicles will occur greater than 50 feet from the drainage ditch.

2.5.3 Demolition, Excavation and Grading

An existing 6,000 square foot firehouse as well as an existing training building located within the future location of the new H2U will be demolished as part of the VIP Amendments. No other new demolition is planned. A retaining wall or other shoring will be constructed at the site of the new H2U.

An estimated 50,000 to 100,000 cubic yards of soil will be excavated for the project, with the majority associated with site grading for parking to replace that lost due to construction of the H2U. No soil would be imported for the project, and no soil would be exported from the site except if legally required to dispose of contaminated soil at a Class I (hazardous) waste facility or to a Class II landfill for non-hazardous soil classified as designated waste. At this time, the quantity of soil that would have to be sent to a Class I or Class II facility is not known. The remainder of the soil, if any, would be used on site for grading.

2.5.4 Construction Traffic and Parking

Construction traffic and parking for the VIP Amendments will be conducted in a similar fashion to that identified and previously analyzed in the Certified EIR without substantial changes. The traffic analysis presented in **Section 3.1.14** reviews potential incremental impacts to local roadways due to the VIP Amendments.

2.5.5 Construction Labor Force

The construction labor force associated with the VIP Amendments is not expected to exceed that which was presented and previously analyzed in the Certified EIR. The operation of the proposed VIP Amendments will not directly or indirectly induce population growth because the construction workforce will only temporarily utilize a construction workforce and will use the existing workforce in the area.

2.6 Post Project Operations Permanent Personnel

Valero anticipates the VIP Amendments may require up to 30 additional permanent personnel, beyond the 20 permanent personnel envisioned in the Certified EIR, to operate the new and modified facilities. The incremental increase of permanent personnel can be attributed to clarification of operational details related to the scrubber regeneration operations, and the new H2U. The traffic analysis presented in **Section 3.1.14** reviews potential impacts to local roadways due to the incremental increase of 30 permanent personnel.

3.0 Environmental Checklist

Each subsection below provides supplemental information associated with the VIP Amendments. For those resource areas covered by the CEQA “Appendix G” checklist, this information is presented addressing items found on a CEQA “Appendix G” checklist. These discussions are followed by a presentation in tabular format of all environmental impacts originally identified in the Certified EIR, the stipulated mitigations associated with the Certified EIR, and a comparison of the incremental impacts associated with the VIP Amendments to the impacts identified in the Certified EIR. Please note that the discussion presented in the last three subsections for agricultural resources, mineral resources, and population and housing are topics that were not within the scope of in the Certified EIR, because VIP was not considered to affect these resources. Since these are found on the CEQA “Appendix G” checklist; tabular entries have been included in these three topics for completeness. Also, due to increasing attention to the issue of GHGs and climate change following the passage of AB 32 and other regulatory developments, this analysis presents an impact analysis of the potential GHG impacts associated with the VIP Amendments.

3.1 Project Impact Analysis

The Certified EIR analyzed the potential for environmental impacts of project components designed to increase production rates and optimize the Benicia Refinery’s operations, such as expanded PS capacity, FCCU feed flexibility, CKR expansion, increased sulfur removal and recovery capacity, upgrades to the Wastewater Treatment Plant (WWTP), and various modifications to support facilities and infrastructure. The VIP Amendments do not seek additional increases in throughput or production rates beyond those originally assessed by the Certified EIR and authorized under the existing Use Permit issued by the City of Benicia and the Authority to Construct air permit issued by the BAAQMD. Rather, the VIP Amendments provide clarifications of technical details including construction, installation, and operation information related to several of these project components, as described in **Section 2.0**. The additional information gained in design development does not significantly alter the scope of the originally identified project components. Rather it clarifies details pertinent to the technology Valero has selected for process equipment as well as provides additional information. The following sections provide an analysis of the potential for impacts associated with this additional information and affirms the conclusions regarding environmental impacts presented in the Certified EIR. As was common practice with regard to other EIRs prepared at the time, the Certified EIR did not include an analysis of GHG emissions. Due to increasing attention to this issue following the passage of AB 32 and other regulatory developments, it is appropriate to include this analysis here; therefore, the analysis is provided in **Section 3.1.3**.

Certain impact analyses, including the biological resources, cultural resources, geology and seismicity, land use plans and policies, agricultural resources, mineral resources, and the storm water-related impacts associated with the hydrology and water quality section, are dependent on the location of project components. The Certified EIR analyzed locations of the Benicia Refinery including the Refinery Process Block and areas adjacent, the area to the northeast of the Refinery Process Block, the Tank Farm area, the Refinery WWTP, and open areas within the refinery boundary. The Certified EIR included a discussion of project impacts, relevant to locations of the VIP Amendments, with regard to equipment to be located within and adjacent to the Refinery Process Block, the WWTP, and the open areas of the refinery in each project impact sub-topic section. For the VIP Amendments located within these areas, as described in the Project Description, information from the Certified EIR is applicable to the VIP Amendments. For project components of the VIP Amendments located outside of these areas, new site-specific information and incremental impact analysis is provided.

3.1.1 Aesthetics

a. *Would the project have a substantial adverse effect on a scenic vista?* **No**

A visual and aesthetics analysis was conducted to assess the effects of the refinery improvements associated with the VIP Amendments. The analysis utilized the same assessment methodologies and impact significance criteria employed by the Aesthetics, Visual Quality, and Light and Glare sections of the Certified EIR. This included use of computer-generated visual simulations illustrating “before” and “after” conditions at the project site as viewed from several of the same vantage points selected for the original analysis. New areas of the Southampton housing development have been constructed since the VIP was approved; therefore, an additional vantage point from a representative point in this area was illustrated as well.

Effects on Scenic Vistas

The visual qualities of the Benicia Refinery and surrounding areas are fully described in Sections 4.1.2.2 and 4.1.2.3 of the Certified EIR., Section 4.1.2.3 in particular describes the key public view corridors in the vicinity of the Benicia Refinery. Scenic view corridors were identified by the Certified EIR. These include the portion of Interstate- 680 (I-680) between Morrow Lane and the Benicia Bridge, which the Solano County General Plan designates as a “scenic street and gateway”, and the California Department of Transportation (Caltrans) vista point located at I-680 and Lake Herman Road, approximately ¾ mile northeast of the Benicia Refinery. The portion of I-680 near the vista point is also designated as a visual “gateway” in the City of Benicia’s General Plan.

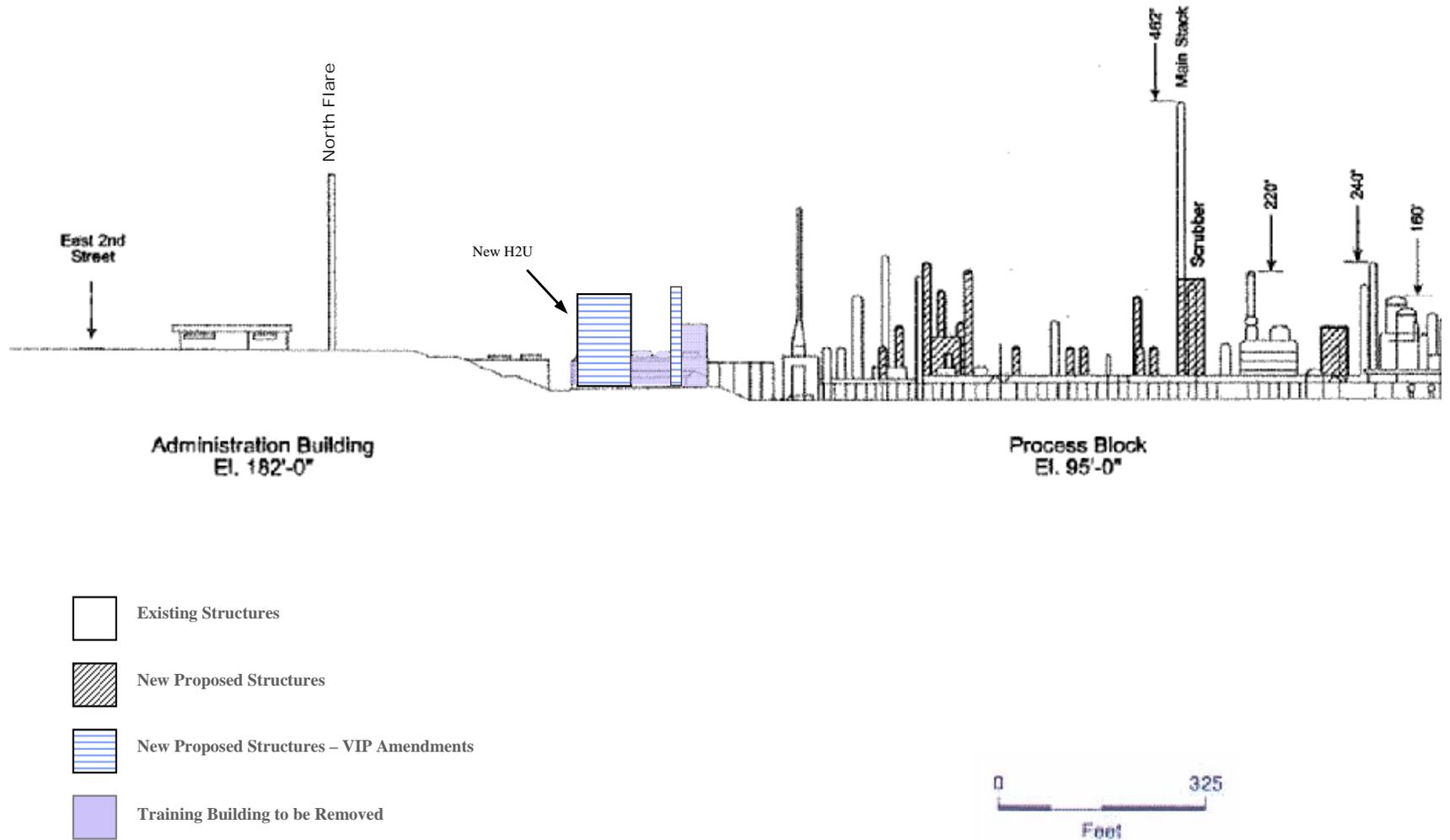
All of the elevated features of the equipment associated with the VIP Amendments will be constructed within or in the general vicinity of the Refinery Process Block, which is located in the interior of the Benicia Refinery’s plot plan. Overall, the VIP Amendments would add new structures ranging in height from 30 to 150 feet. The tallest of these is the new H2U with hydrogen purification equipment, which would be placed in a parking lot just north of the main Refinery Process Block. The H2U’s most prominent features would be the reformer furnace and the reformer furnace vertical stack, estimated to extend to heights of 130 feet and 150 feet, respectively. The reformer furnace would appear as a rectangular structure, with a slightly pitched roof. The HPU may be comprised of up to 10 cylindrical vessels each estimated at 30 feet in height, and one tail gas surge drum which will extend to 130 feet, nearly the same height as the reformer furnace. The remaining structures and project components such as the desalter and the steam condensate recovery components are considered lesser visual features. The aesthetic impact associated with the addition of PS Furnace, F-105 was formerly evaluated in the Certified EIR under the project component heading the Pipestill Helper Furnace. The Certified EIR also evaluated the addition of a cylindrical scrubber vessel having approximate dimensions of 150 to 200-feet in height by 25-feet in diameter. The Main Stack Scrubber vessel in the VIP Amendments will be about the same size. The additional pre-scrubber vessel to be added by the VIP Amendments will be up to 30-feet in diameter and 100 feet in height and accordingly visually less significant than the Main Stack Scrubber vessel. The pre-scrubber placed contextually within the existing visual character of the Refinery Process Block will not alter the existing visual character of the refinery. The relocated firehouse will be of similar size in height to the building currently located within the Fuels Terminal, would not be visible from scenic vistas, and would be designed to be consistent with the visual character of the Fuels Terminal. No substantial changes in visual design features are proposed as part of the VIP Amendments. An updated section schematic of the Benicia Refinery illustrates the relationship of the VIP Amendments structures to the features previously evaluated by the Certified EIR.

Figure 3.1.1-1 shows a horizontal view schematic of the major pieces of equipment proposed in the Certified EIR and the equipment changes associated with the VIP Amendments, e.g. installation of a new H2U.

From I-680, the hills to the north and south of the Refinery Process Block screen views from both the highway lanes immediately south of the Lake Herman Road interchange and the Benicia-Martinez Highway Bridge. Only the existing 462-foot main stack and the tops of elevated towers and flare stacks in the Refinery Process Block in excess of 200 feet are visible when viewed from the Caltrans vista point.

The tallest components of the equipment included in the VIP Amendments are the new H2U and associated HPU components. Due to intervening terrain, none of these structures would be visible from the Morrow Lane to Benicia Bridge segment of I-680 or from the Caltrans vista point. Thus, since the VIP Amendments would not alter existing views from the designated scenic viewpoints by adding any visible new structures, no impacts to scenic vistas are anticipated.

Figure 3.1.1-1 Horizontal View Schematic of VIP Amendments



Effects on Other Views

Although not visible from scenic segments of I-680 or the Caltrans vista point, several elements of the VIP Amendments can be seen from other viewing points investigated in the Certified EIR, including Viewpoint 3 looking north from East 5th Street near Hillcrest Avenue, and Viewpoint 5 looking southeast from Gallagher Drive at Panoramic Drive. These potential viewing points occur in terraced neighborhoods at a lateral elevation to the Refinery Process Block (in the case of Hillcrest Avenue) or are located in a superior position (in the case of Gallagher Drive). In both instances, views of the Refinery Process Block are typically limited to the outermost ring of residential development or glimpses created by gaps in residential buildings or through street portals. The potential for visual impacts to these areas was investigated by recreating and updating the computer simulations originally performed for the Certified EIR.

Figure 3.1.1-2 depicts the view from approximately the same location as Viewpoint 3 (from East 5th Street near Hillcrest Avenue looking north) in Figure 4.1-6 of the Certified EIR. The viewpoint shows a northerly view of the existing Refinery Process Block, with parked cars, yards, and driveways dominating views from the center of the street in the foreground. In the mid-ground, the Refinery Process Block appears in the distance with the tall, slender towers and flare stacks rising from the center. As noted in the Certified EIR, the Benicia Refinery from this distance appears as a coherent and contained operation subsumed by the surrounding landscape.

Figure 3.1.1-3 depicts changes to this view resulting from the erection of equipment associated with the VIP Amendments. The only visible change to the view is the introduction of the new 130-foot H2U and 150-foot reformer stack in the mid-ground. These appear together as a rectangular form and slender tower structure in the left mid-ground, and are shapes that are visually consistent with other structures in the Benicia Refinery and other elements in the same view. Their height does not extend above other elements of the Refinery Process Block nor alter the silhouette of the Benicia Refinery in its subordinate position against the existing horizon line created by distant ridgelines. The overall visual effect attributable to the VIP Amendments would be a slight but noticeable increase in the mass of the refinery infrastructure, resulting from the introduction of the new H2U into a minor portion of the total panorama. The proposed equipment would be similar in height to existing equipment, would be constructed in already industrialized areas of the refinery property, and be similar in appearance to structures already present. No new structures cross the horizon line. Thus, impacts on views from Viewpoint 3 are considered less than significant.

Figure 3.1.1-4 depicts the view from approximately the same location as Viewpoint 5 (from Gallagher Drive at Panoramic Drive looking southeast) in Figure 4.1-8 of the Certified EIR. Views from this vantage point are residential in nature, with houses, sidewalks, trees, and streets dominant in the foreground. The taller elements of the Refinery Process Block are visible in the distant mid-ground, extending above residential rooflines. Although viewed by the outer tier of residences along Gallagher Drive, the equipment associated with the VIP Amendments does not appear in the simulation presented in **Figure 3.1.1-5** due to the residences themselves screening the vista from public viewing points on the street. For the outer row of property owners, it is likely that the H2U's reformer furnace would appear as an addition to the Refinery Process Block. However, the reformer furnace would not extend above the existing skyline created by the distant hillside, nor would it be the tallest Refinery Process Block feature in the view (e.g., the Main Stack is approximately 460 feet tall). The location and dimensions of the reformer furnace vertical stack would allow it to blend in with existing stacks, and HPU vessels 1 and 2 would appear in front of the reformer furnace from this viewpoint. Therefore, the reformer furnace, reformer furnace vertical stack, and HPU vessels 1 and 2 would not have a substantial adverse effect on the view from Viewpoint 3.

The primary access road leading into the residential neighborhoods is Rose Drive, an east-west thoroughway that connects East 2nd Street to I-780 in western Benicia. Rose Drive affords relatively expansive southwest facing views of the entire Refinery Process Block from areas near the intersection with East 2nd Street. See **Figure 3.1.1-6** for a representative baseline view of the Benicia Refinery to a motorist or pedestrian descending Rose Drive. The tallest elements of the existing Refinery Process Block are partly seen against a background of other industrial components in the mid-ground. As depicted in the computer simulation provided by **Figure 3.1.1-7**, the H2U would only be intermittently visible from points along this road. A roadside berm and existing vegetation (including mature trees and shrubs) frequently block views of the Benicia Refinery as Rose Drive descends to East 2nd Street. Since the H2U would appear only in partial, intermittent views from the southeast-bound side of the road (where drivers and downhill walkers on the sidewalk would face the refinery) and would be consistent with existing visible structures, it is not considered to have a significant visual impact.

Figure 3.1.1-8 depicts a view from Addison Court, within the Southhampton housing development, a location not evaluated in the Certified EIR. This viewpoint looking southeastward from Addison Court toward the Benicia Refinery Process Block is from the public right-of-way of Addison Court. As shown in the figure, the viewpoint location area is currently being developed with single-family residences. Currently, portions of the Refinery Process Block are visible from this location, though it is not as prominent as the view seen from other viewpoints evaluated in the Certified EIR. This is due to the larger geographical distance between Addison Court and the Refinery Process Block, when compared to the distances from other evaluated viewpoints to the Refinery Process Block. As depicted in the computer simulation in **Figure 3.1.1-9**, the H2U would be slightly visible from this viewpoint. However, once the residences in this area have been constructed, it is highly likely that view corridors from this location would be such that publicly accessible views of the Refinery Process Block would be blocked to a greater degree than is the case under existing conditions. Under future residential buildout conditions, views of the Refinery Process Block would include the tops of refinery vertical stacks and most likely would not include views of the H2U.

Visits to a number of locations throughout the residential area indicated that views of the proposed facilities from nearby locations would likely be similarly screened by terrain. Despite the visibility of the H2U from the backyards of homes along Allen Way, it is likely that the plant would not be seen from public viewpoints located at lower elevations on Gallagher Drive and along Allen Way. From these locations, much of the Refinery Process Block is obscured by the hillside on which the homes sit. As such, the line of sight extends above and beyond the Refinery Process Block, rather than directly at it.

Figure 3.1.1-2 Existing view from East 5th Street near Hillcrest Avenue looking north



Figure 3.1.1-3 KOP 3 Simulation view from East 5th Street near Hillcrest Avenue looking north

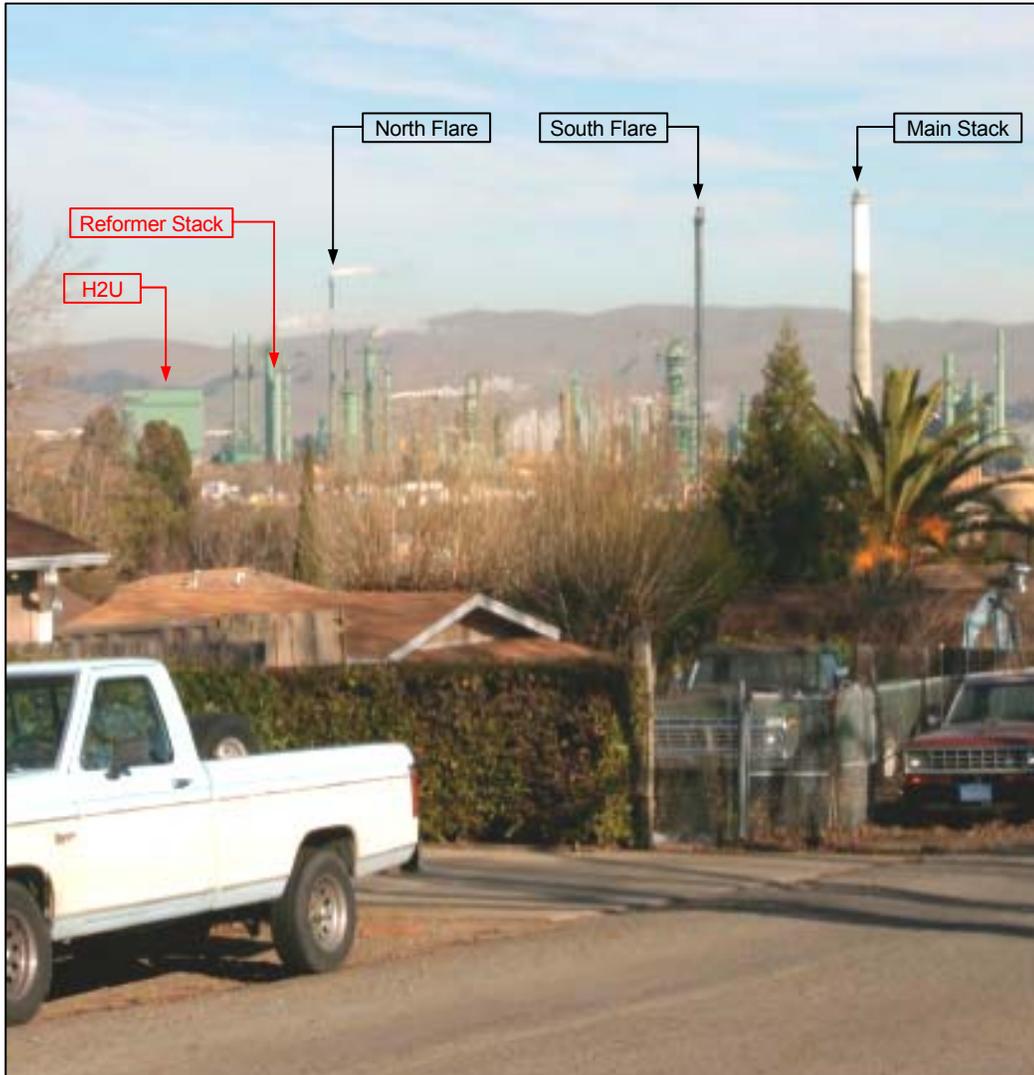


Figure 3.1.1-4 KOP 5 Existing view from Gallagher Drive at Panoramic Drive looking southeast



Figure 3.1.1-5 KOP 5 Simulation view from Gallagher Drive at Panoramic Drive looking southeast

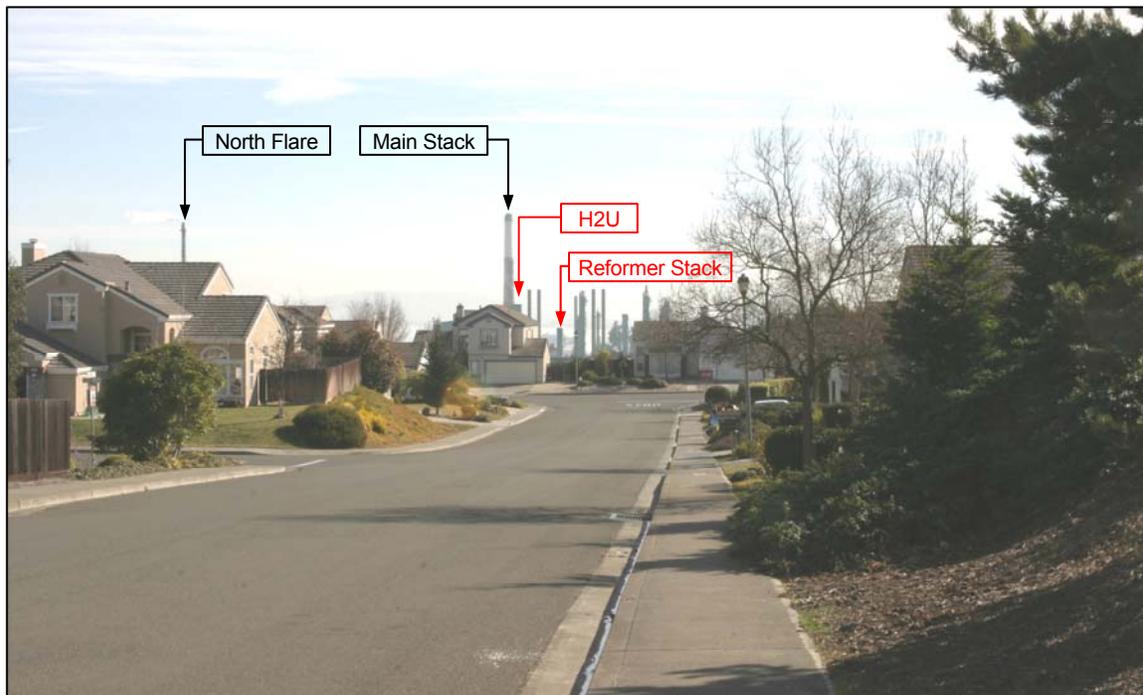


Figure 3.1.1-6 Existing view from Rose Drive looking southwest



Figure 3.1.1-7 Simulation view from Rose Drive looking southwest



Figure 3.1.1-8 Existing view from Addison Court looking southeast

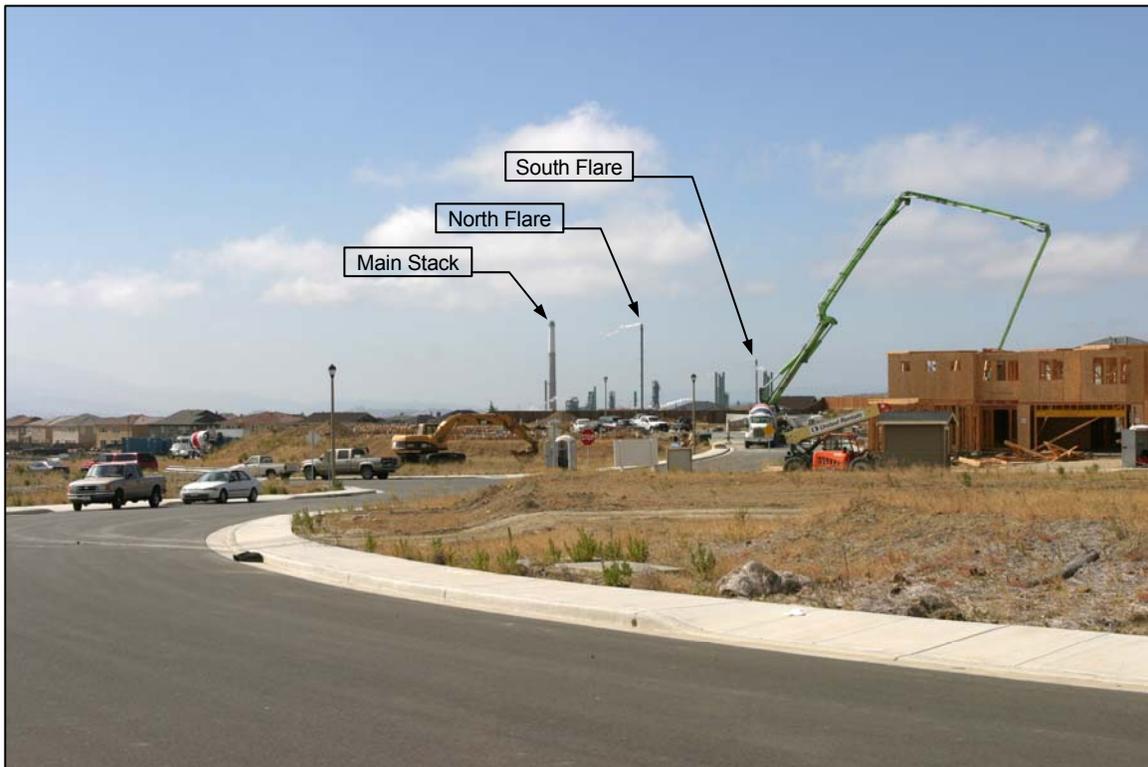


Figure 3.1.1-9 Simulation view from Rose Drive looking southwest



Figure 3.1.1-10 Existing view from Addison Court looking southeast

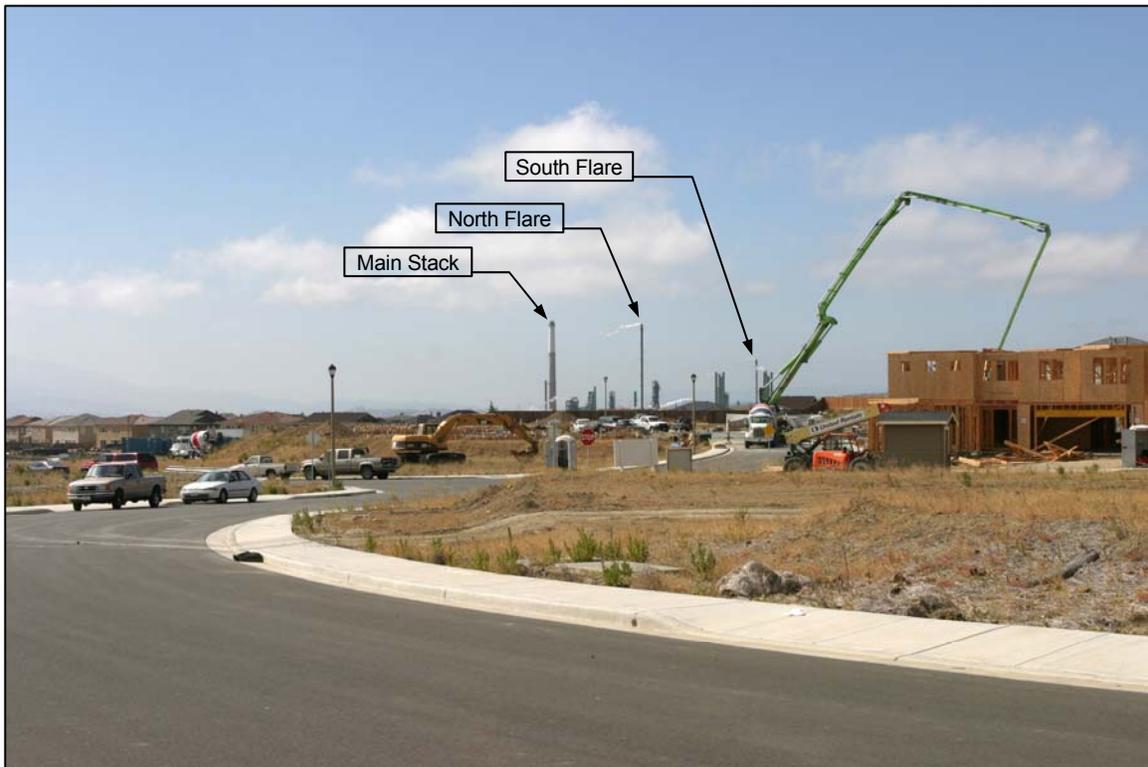
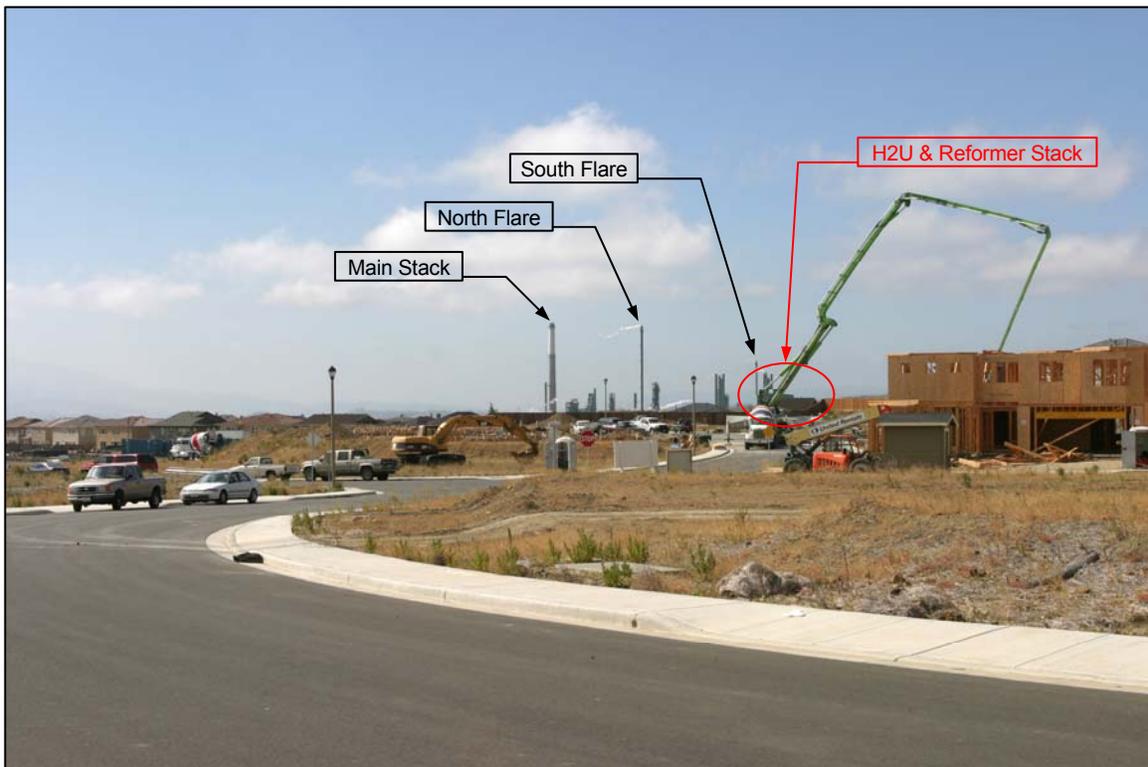


Figure 3.1.1-11 Simulation view from Addison Court looking southeast



Other Project Components

Other project components to be located in the Refinery Process Block include a desalter vessel, a pre-scrubber, and modifications to the proposed Main Stack Scrubber. Because of the nature of the industrial landscape within the Refinery Process Block and the relative dimensions of the additional equipment, views of these modifications will be obscured or visually insignificant in the context of the visual character of the Refinery Process Block.

A new parking lot and a firehouse will be constructed to the north of the Refinery Process Block. Based on the size and location of the parking lot and the firehouse, they will not be visible from vantage points outside the Benicia Refinery.

Water Vapor Plume Visibility

The Certified EIR evaluated the potential for formation of a visible water vapor plume from the 460-foot-tall Main Stack after the scrubber was installed. This was estimated to occur for about 28 hours per year, with three hours occurring during daylight, non-fog hours. Hourly periods of night time, precipitation, fog, and 100 percent relative humidity (RH) hours are typically excluded because a plume would either not be visible or difficult to distinguish against the background conditions.

Since the Main Stack Scrubber will handle off gases from both the FCCU and CKR, larger amounts of sulfur compounds will be removed. In addition, stack gas volume, stack exit temperature, and moisture content will be different than the case modeled for the Certified EIR. These factors required a reanalysis of the effect on the potential for the Main Stack to emit a visible water vapor plume.

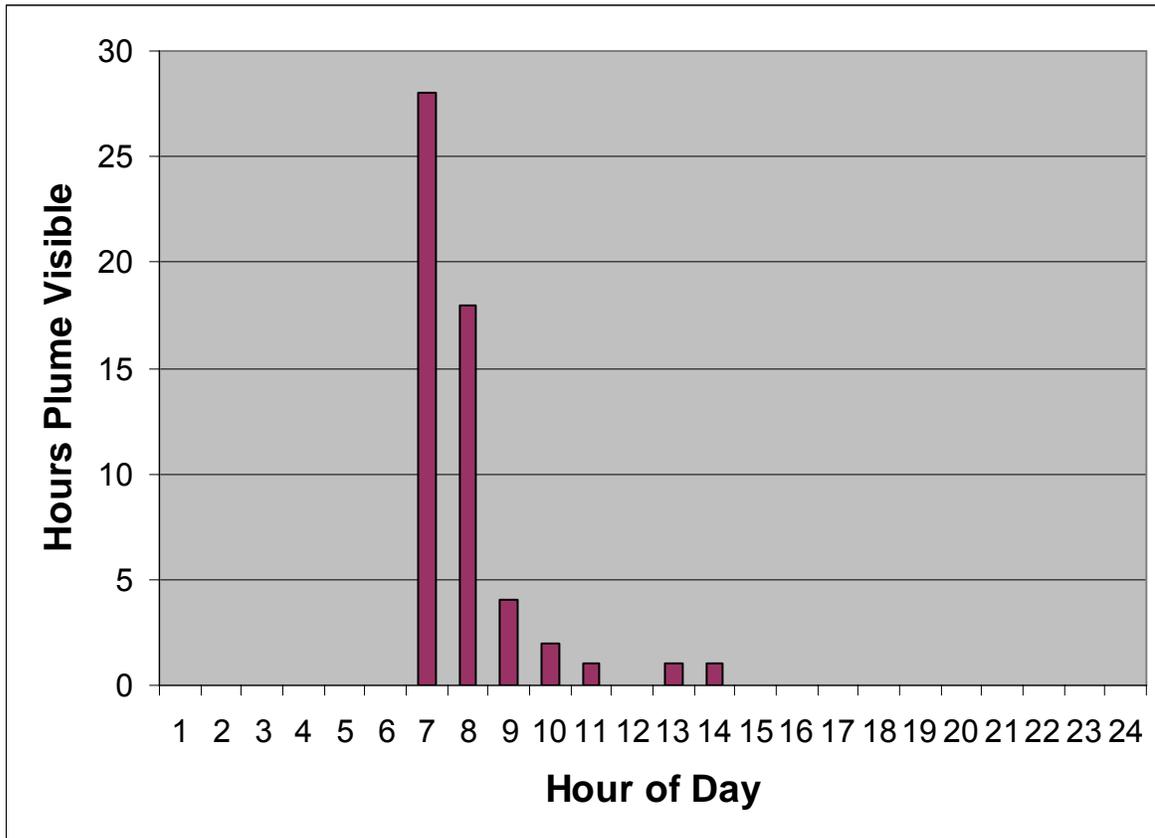
ENSR [2007] (see **Appendix A**) used conservative modeling approaches and site-specific meteorological data to estimate this potential. Practical engineering controls will be provided to reduce potential for visible water vapor formation. The visible water vapor plume is now projected to occur no more than 55 daylight, non-fog hours per year and 493 total hours per year. The projected frequency of visible pluming is presented in **Table 3.1.1-1**

Table 3.1.1-1 Vapor Plume Modeling Results - Frequency

Case	Hours per Year with Visible Plume	Days per Year with Visible Plume
All Hours	493	93
Daytime Only, Excluding Hours of precipitation, fog and 100% Relative Humidity (RH)	55	36

The median plume length is estimated to be 40 meters (m) (131 feet), with 90 percent of the plumes less than or equal to 60 m (197 feet). Typically these plumes are projected to be visible from the Main Stack at sunrise and disappear shortly thereafter as demonstrated in **Figure 3.1.1-12**.

Figure 3.1.1-12 Distribution of Modeled Visible Plumes – Daytime Hours (Excluding precipitation, fog or 100%RH)



The modeling analysis also concluded that based on the full year of meteorological data, there were no times where plumes would touch ground except during times of 100 percent RH. These conditions would occur mostly during times of ambient fog or precipitation. As a result, such water vapor plumes would not be identifiable against the background.

As described in the Certified EIR, a water vapor plume will most likely form during ambient conditions of fog, rain, or 100% RH. Water vapor plumes would not be expected to be visible against the background sky during such ambient conditions. After the VIP Amendments, water vapor plumes are predicted to occur 1.6% of the daylight hours per year without fog, rain, or 100% RH. In addition, these water vapor plumes would be visible only during short periods of time after sunrise. The plumes would originate at a height well above the ground and would not touch the ground or roadways since the maximum plume length is less than the stack height. Therefore the presence of visible water vapor plumes is considered to be less than significant because the frequency and duration of plume visibility would still be very limited. The plumes would not impact the ground at times when fog is not already present and would not interfere with motorists.

b. Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway? No

The proposed VIP Amendments would not substantially damage scenic resources because they would not be visible in or from any area where such resources exist. The new facilities will be located within the footprint of the existing Benicia Refinery, which does not presently contain scenic resources (e.g. trees, rock outcroppings, and historic resources). I-680, in the vicinity of the proposed VIP Amendments, is not designated as a designated scenic corridor and is not subject to any state-mandated requirements related to visual conditions.

c. *Would the project substantially degrade the existing visual character or quality of the site and its surroundings? No*

The H2U and HPU equipment proposed as part of the VIP Amendments would be located within the Refinery Process Block. The reformer furnace vertical stack and HPU vessels would be compatible in shape, scale, and color to other visual conditions in the surrounding area. The pre-scrubber when placed contextually within the existing visual character of the Refinery Process Block will not alter the existing visual character of the refinery.

A new parking lot and a firehouse will be constructed to the north of the Refinery Process Block. Based on the size and location of the parking lot and the firehouse, they will not be visible from vantage points outside the Benicia Refinery and they would be designed to be consistent with the visual character of the refinery.

As discussed above in subsection a, the scrubber currently being proposed for the Main Stack will provide a slight, but insignificant increase in the potential for a visible water vapor plume. This water vapor plume would appear similar to the plumes that currently occur on site from cooling towers.

d. *Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area? No*

The H2U would have lighting on the staircases and the roof of the reformer furnace. The light fixtures would be similar to those on the nearby crude oil storage tanks and be directed down to provide safe access to the tank. When viewed from off site, the additional lighting would blend in with lighting in the rest of the Refinery Process Block and would not create a new source of substantial light or glare that would adversely affect day or nighttime views in the area. In conformance with **Use Permit Condition No. 12** (Planning Commission Resolution No. 03-5) for the VIP, the design of proposed exterior lighting fixtures shall comply with requirements of City of Benicia Zoning Ordinance Section 17.70.240 D.2, and shall be submitted to the City for approval.

1. Aesthetics, Visual Quality, Light and Glare

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would the proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would the proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.1-1: VIP would add new equipment and facilities to developed, industrial portions of the refinery. These new facilities, which could potentially alter the visual character of the setting, could be seen from public view corridors such as I-680, a designated scenic corridor. This would be a less than significant impact.	Less than Significant.	No Mitigation Required. Use Permit Condition 11: All equipment installed as part of VIP shall be painted to blend with the refinery's overall color scheme. Any paint colors other than the existing green and gold shall be submitted to the Community Development Department in advance for approval.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments components will be painted to blend with the refinery's overall color scheme. Further, in views from public viewpoints in the surrounding residential neighborhoods, the proposed structures would not substantially differ in height, scale, or character from previously existing structures.	No significant effects previously identified.
Impact 4.1-2: Refinery operations could cause flaring events. This impact would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	Not applicable to the proposed VIP Amendments.	Not applicable to the proposed VIP Amendments.
Impact 4.1-3: Operation of the proposed new scrubber could create vapor plumes visible to surrounding residents and motorists. This impact would be less than significant.	Less than Significant	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. New significant effects were not identified.	No. Although an increase occurs in the potential for visible steam vapor plumes, this is not deemed to be significant.
Impact 4.1-4: The proposed development would introduce new lighting on-site. This impact would be less than significant.	Less than Significant.	No Mitigation Required. Use Permit Condition 12: The design of proposed exterior lighting fixtures, and drawings showing the plans for installation shall comply with requirements of Zoning Ordinance Section 17.70.240 D.2, and shall be submitted to the Community Development Director or designee in advance for approval.	No Mitigation Required. Less than Significant.	No. Any proposed exterior lighting fixtures and drawings showing the plans for installation will comply with requirements of Zoning Ordinance Section 17.70.240 D.2, and will be submitted to the Community Development Director or designee in advance for approval.	No significant effects previously identified.

1. Aesthetics, Visual Quality, Light and Glare

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would the proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would the proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.1-5: The reasonably foreseeable projects at the Valero Refinery would expand the industrial appearance of the overall complex. However, none of the changes associated with individual projects would be expected to substantially affect visual resources. As such, the projects would be expected to produce a less than significant cumulative visual quality impact.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments within the existing Refinery Process Block would not cause the cumulative visual impact to become significant.	No significant effects previously identified.
Impact 4.1-6: Other non-refinery cumulative projects, together with VIP and other Benicia Refinery projects, would combine to alter the general appearance of the southeast portion of the City. 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.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments within the existing Refinery Process Block would not cause the cumulative visual impact to become significant.	No significant effects previously identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Interviews, Valero personnel, January 2007.

Resolution 03-4, City of Benicia Planning Commission, A Resolution of the Planning Commission of the City of Benicia Approving a Use Permit for the Valero Certifying the Final Environmental Impact Report, Adopting CEQA Findings and Adopting a Mitigation Monitoring and Reporting Program for the Valero Improvement Project (PLN2002-00022).

Resolution 03-5, City of Benicia Planning Commission, A Resolution of the Planning Commission of the City of Benicia Approving a Use Permit for the Valero Improvement Project (PLN2002-00022).

ENSR, Visible Plume Modeling Report for Valero Benicia Refinery, August 2007.

3.1.2 Air Quality

a. *Would the project conflict with or obstruct implementation of the applicable air quality plan? No*

Under the California Clean Air Act (CAA) nonattainment classifications, the San Francisco Bay Area Air Basin is classified as a "serious" nonattainment area for ozone. (The state classification system for nonattainment areas uses the designations "Moderate", "Serious", "Severe", and "Extreme".) The air basin had been classified a "moderate" nonattainment area for CO, but the air basin was redesignated an attainment area for the State CO standard in 1994. Thus, the CAA's planning requirements for CO nonattainment areas no longer apply to the Bay Area.

The *Bay Area 1997 Clean Air Plan* (CAP) was prepared pursuant to the 1988 CAA. Prepared by the BAAQMD in cooperation with the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG), its main objective is to attain state air quality standards for ozone. The CAP presents a comprehensive strategy to reduce ozone precursor emissions (i.e. NO_x and POC) from stationary, area, and mobile sources. The CAP includes a specific measure which encourages cities and counties to develop and implement local plans, policies, and programs to reduce auto use and improve air quality. The most recent CAP was published in 2000 as a triennial update of the 1997 CAP. Since 2000, the CAP has been replaced with the Bay Area Ozone Strategy; the most recent version is the 2005 Ozone Strategy.

The 2005 Ozone Strategy strives to reduce emissions by implementing additional and more stringent stationary source control measures. These include measures to control emissions from surface coating and solvent use, fuels/organic liquids storage and distribution, refinery and chemical processes, combustion of fuels, and other industrial/commercial processes. The 2005 Ozone Strategy indicates how the BAAQMD will attain the State ozone standard by the earliest practicable date. The control measures outlined in the 2005 Ozone Strategy include: (1) additional control measures for existing stationary sources; (2) a permitting program that will result in no net increase in emissions from new stationary sources; (3) provisions for indirect source controls; and (4) transportation control measures.

As with the VIP elements proposed in the Certified EIR, the VIP Amendments will conform with the 2005 Ozone Strategy, as all new equipment subject to BAAQMD permitting requirements will employ state-of-the-art pollution control technologies and, thus, be consistent with the provision to install additional control measures. Further, the new equipment is subject to New Source Review (NSR) requirements of the BAAQMD's permitting program, including the requirement to provide emission offsets for any NO_x or POC emission increase from stationary sources and, thus be consistent with the no net increase provision (2) of the 2005 Ozone Strategy, which requires that new projects will result in no net increase in emissions from new stationary sources.

b. *Would the project violate any air quality standard or contribute substantially to an existing or projected air quality violation? No*

In order to determine the air quality impact of the VIP Amendments, the emissions resulting from the project are compared to the emissions estimated in the Certified EIR. The net change in emissions is then compared to the previously established BAAQMD significance thresholds to determine the significance of the impacts.

The VIP Amendments will result in net reductions in the Benicia Refinery's operational air emissions of NO_x, SO₂, and fine particulate matter less than 10 microns in diameter (PM₁₀) when compared to the emissions predicted for the VIP in the Certified EIR. For the purposes of this analysis, fine particulate matter smaller than 10 microns in diameter is also assumed to be less than 2.5 microns in diameter (PM_{2.5}). Therefore, emissions of PM_{2.5} are numerically equal to emissions of PM₁₀. The VIP Amendments may cause an increase in CO emissions of 62.9 tons per year and an increase in POC emissions of 2.9 tons per year when compared to the emissions predicted for the VIP in the Certified EIR. As demonstrated below, neither of these increases represents a significant impact.

With the VIP Amendments, the Main Stack Scrubber will abate SO₂ emissions from the FCCU and the CKR, achieving substantially greater reductions in SO₂ emissions than abating the CKR alone, as was described in the design basis in the Certified EIR. Under the VIP Amendments design basis the CKR and FCCU CO gas will be routed into the new CO furnace, F-105. This furnace will be subject to BACT for all criteria pollutants, which will require lower emissions than the existing CO furnace configuration. The existing CO furnaces F-101 and F-102 will be modified to fire exclusively RFG, and will be retrofitted with low-NO_x burners. The new configuration will result in a decrease in emissions from the Main Stack relative to VIP.

The new H2U Reformer Furnace will utilize state-of-the-art SCR emission control technology to further reduce NO_x emissions. In addition, the new H2U will produce up to 100 MMBtu/hr of high-pressure steam for process needs, which the existing H2U does not produce. The air quality impacts evaluated in the Certified EIR included emissions from a 100 MMBtu/hr increase in firing of one of the refinery's steam generators (for example SG-1032). The steam produced by the new H2U will offset the need for this increased fuel, while still consuming the same quantity of energy projected for hydrogen production in the Certified EIR. The new H2U proposed for the VIP Amendments will thereby result in a reduction in fuel combustion at the Benicia Refinery of 100 MMBtu/hr relative to VIP. The new H2U will also be a significant new consumer of RFG, both as a feedstock to the steam-methane reformer reaction and as a fuel consumer. This increased consumption of RFG will improve the refinery's fuel gas balance by decreasing the incidences of oversupply of RFG, thereby reducing incidences of flaring and periods when the refinery is required to reduce processing rates to correct fuel gas imbalances.

Implementing the increase in FCCU capacity permitted by VIP will require an increase in the fired duty of the gas turbine, GT-702, which provides power to the compressor C-702. GT-702 will not be physically modified, but will operate at an average firing rate that is 70 MMBtu/hr greater than current operations. This increase in firing rate at GT-702 was not analyzed in the Certified EIR. This change in firing rate will not increase the permitted capacity of the FCCU beyond what was included in VIP. The increase in firing is required to fully implement the projects identified in the Certified EIR which are still part of the design basis, and is included here to ensure that all impacts from previously permitted changes are fully assessed.

The increase in firing rate of GT-702, combined with the decrease in firing of one or more steam generating units described above, will reduce the Benicia Refinery's average refinery fuel gas combustion by 30 MMBtu/hr relative to VIP, which will result in a decrease in air emissions associated with refinery fuel combustion.

The VIP Amendments will also require a slight increase in trucking to deliver additional chemicals and to haul hazardous waste to a licensed facility. Valero estimates that one additional truck trip per week will be required for these shipments. This will cause an insignificant increase in indirect air emissions from mobile sources, as discussed later in this section.

To determine if the VIP Amendments will incrementally violate air quality standards or contribute substantially to an existing or projected air quality violation, changes in direct and indirect operational emissions from VIP are estimated and compared to BAAQMD mass significance thresholds. Emissions of CO are also modeled and compared to the BAAQMD concentration-based CO significance threshold. Emission estimates for the insignificant direct and indirect operational emissions, and the CO modeling analysis are discussed below. A more complete discussion of the potential emissions associated with the VIP amendments can be found in **Appendix B**.

Construction Emissions

Construction-related emissions are generally short-term in duration, but must be evaluated because they can have the potential to cause adverse air quality impacts. PM₁₀/PM_{2.5} are the pollutants of greatest concern with respect to construction activities. PM₁₀/PM_{2.5} emissions can result from a variety of construction activities, including excavation, grading, demolition, vehicle travel on paved and unpaved surfaces, and vehicle and equipment exhaust. Construction-related emissions can cause increases in localized concentrations of PM₁₀/PM_{2.5}. Particulate emissions from construction activities can lead to adverse health effects as well as nuisance concerns, such as reduced visibility and soiling of exposed surfaces.

Construction PM10/PM2.5 emissions can vary greatly depending on the level of activity, the specific operations taking place, the equipment being operated, local soils, weather conditions and other factors. Despite this variability in emissions, experience has shown that there are a number of feasible control measures that can be reasonably implemented to substantially reduce PM10/PM2.5 emissions from construction activities.

The BAAQMD's approach to CEQA analyses of construction impacts is to emphasize implementation of effective and comprehensive control measures rather than detailed quantification of emissions (BAAQMD 1999). Therefore, construction emissions are not estimated for this Use Permit application.

Consistent with BAAQMD guidance, and also consistent with the Certified EIR, the VIP Amendments will focus on implementing feasible PM10/PM2.5 control measures for construction activities. These designated feasible control measures identified by the BAAQMD are listed in Table 2 of the BAAQMD CEQA Guidelines (BAAQMD 1999). Following implementation of feasible control measures indicated in Table 2 of the Guidelines (as appropriate, depending on the size of the project area), the air pollutant emissions from construction activities would not have a significant adverse impact to air quality.

The construction activities are expected to be similar in nature and magnitude to the activities described in the Certified EIR, and the impacts described and mitigation measures proposed will be the same as described in the Certified EIR. The VIP Amendments are not expected to create any additional construction emissions.

Operational Mass Emissions

Several elements of the VIP Amendments will emit criteria pollutants. A brief summary of the emission calculation methodology is provided below, along with source-specific summaries of operational emissions. A comprehensive discussion of the air emissions with detailed emission calculations is provided in **Appendix B**. Post-VIP Amendment project emissions are compared to the post-VIP emission rates discussed in the Certified EIR. Incremental emissions are then compared to the BAAQMD's CEQA significance thresholds to determine whether the incremental contribution of the proposed VIP Amendments will have a significant impact on air quality.

Main Stack Emissions

The Certified EIR anticipated the installation of a scrubber to control SO₂ emissions from the CKR unit. As part of the VIP Amendments, Valero will install a Main Stack Scrubber which will control SO₂ emissions from the FCCU in addition to the CKR. This will result in substantially greater SO₂ emission reductions than estimated for VIP. In addition, Valero will install a new PS furnace, F-105, to combust the CO gas from the CKR and FCCU. This new furnace will be equipped with emission controls to minimize pollutant emissions. The existing furnaces F-101 and F-102, which currently combust the CO gases from the CKR and FCCU, will be converted to fire exclusively RFG. The Main Stack also exhausts emissions from a small gas-fired furnace, F-103; operation of this furnace will not change. The Main Stack emissions following the implementation of the VIP Amendments are compared to the emissions proposed in VIP in **Table 3.1.2-1**.

Table 3.1.2-1 Main Stack Emissions – Change from VIP

	Main Stack Emissions (Tons/Year)				
	NO _x	SO ₂	PM10/ PM2.5	POC	CO
Net Increase over Certified EIR	-48.0	-2,331.2	2.1	0.0	10.7

In the Certified EIR, Main Stack POC emissions were estimated to be 6.5 tons/year. However, this estimate was based on the results of a single source testing event, consisting of three fifty minute test runs, averaged to obtain a POC hourly emission rate. Subsequent testing has shown that this test was not representative of

typical Main Stack POC emissions; the emission rate is estimated to be 16.1 tons/year. Valero submitted an application to BAAQMD in October 2006 to correct the emissions. For the purposes of determining whether or not there is an incremental increase in POC emission related to the VIP Amendments, the emission rate from subsequent additional testing was used. Main Stack POC emissions are not expected to change as a result of the VIP Amendments.

Combustion Emissions From Non-Main Stack Sources

The VIP Amendments include the installation of a new H2U and the decommissioning of one of the existing H2U trains. The new H2U has a higher overall thermal efficiency than the plant it replaces. The higher overall thermal efficiency is realized primarily in the production of high-pressure steam as a byproduct. Due to this production of steam in the new H2U, an increase in the firing of a steam generator (for example SG-1032), which was projected to occur in VIP, will not be necessary to meet the Benicia Refinery’s steam requirements.

As noted, the new H2U will have a greater hydrogen production capacity and larger reformer furnace than the plant it replaces; however, the Benicia Refinery’s hydrogen production capacity will not increase above the 190 million standard cubic feet per day (MMscfd) proposed for VIP, and the refinery fuel gas consumption for the production of hydrogen will be at the level proposed for VIP (approximately 1,010 MMBtu/hr). For this application, Valero has evaluated emissions from H2U furnaces based on a likely scenario for actual operation of the unit. The following basis was used to develop this emission estimate:

1. One existing H2U furnace is shut down, a net reduction in firing rate of 450 MMBtu/hr (historic average firing rate).
2. The remaining existing H2U furnace operates at 50 percent of maximum load (equal to 302.5 MMBtu/hr), a net reduction of 147.5 MMBtu/hr when compared to historic usage of 450 MMBtu/hr.
3. New H2U furnace operates to supply balance of 1,010 MMBtu/hr H2U furnace load – it will operate at 707.5 MMBtu/hr.

Valero will decide which existing H2U train to shut down in the future, based on Valero’s process optimization needs. However, the two existing H2Us are identical, and decommissioning either H2U train would result in the same emissions scenario.

As noted above, the 100 MMBtu/hr increase in firing demand from SG-1032 identified in VIP is not required, resulting in a 100 MMBtu/hr decrease in incremental emissions from VIP. The 110 MMBtu/hr increase in firing of existing H2U furnaces F-301 and F-351, which was projected for VIP, will not occur (one will be shut down and the other will operate at reduced loads under the VIP Amendments). However, GT-702 will require an increase in firing duty of 70 MMBtu/hr to provide additional air to the FCCU that was not identified in the Certified EIR. Despite this increase, as noted above, this does not increase FCCU permitted capacity.

Detailed combustion emission calculations are provided in **Appendix B**. The VIP Amendments combustion emissions were compared to the emissions for the operating scenario described in the Certified EIR. The results of this comparison are presented in **Table 3.1.2-2**. This table only addresses emissions from combustion sources that do not vent through the Main Stack; the Main Stack sources are addressed separately at the beginning of this section.

Table 3.1.2-2 Non-Main Stack Combustion Source Emissions - Change from VIP

Project	Incremental Firing MMBtu/hr	Incremental Emissions (tpy)				
		NO _x	SO ₂	PM10/PM2.5	POC	CO
Net Increase over Certified EIR	-30	-123.6	3.2	-10.9	-0.1	52.2

The VIP Amendments will increase the refinery’s consumption of RFG which will result in a reduction of flaring at the Benicia Refinery. The existing H2U consumes natural gas as its primary feedstock. The new H2U proposed as part of the VIP Amendments will consume RFG as a primary feedstock. The decommissioning of one train of the existing H2U and replacing its production by operating the new H2U will, therefore, increase the amount of RFG used in producing hydrogen. This increase in usage of RFG will minimize instances of RFG imbalance, which results when more RFG is produced than is needed by the refinery’s fuel combustion equipment. When there is an RFG imbalance, the excess RFG must be flared. Therefore, improving the RFG balance by installing the new H2U as an RFG consumer will result in fewer flaring events. The emission reductions from the change in flaring have not been quantified.

Fugitive Emissions

The methodology used to calculate future fugitive emissions resulting from the VIP Amendments is the same methodology used in the original VIP. Fugitive emissions are based on 2005 actual emissions measured in accordance with EPA and BAAQMD leak detection regulations. Emissions are calculated using the facility-specific emission factors presented in the document entitled “Environmental Analysis – Valero Benicia Refinery Proposed Refinements to VIP,” submitted to the City of Benicia on December 15, 2006.

Valero has estimated that the VIP Amendments will result in up to an additional three tons per year of fugitive POC emissions from sources such as flanges, valves, and pump seals beyond what was included in the Certified EIR. The annual emission rate is divided by 365 days per year to determine daily project emissions. **Table 3.1.2-3** presents fugitive POC emissions as compared to the Certified EIR.

Table 3.1.2-3 Fugitive Emissions – Change from VIP

Project	POC Emissions Tons/Year
Net Increase over Certified EIR	3.0

Storage Tank Emissions

The VIP Amendments will have no impact on storage tank throughput or emissions.

Indirect Operational (Off-site) Emissions

The VIP Amendments project elements will result in up to two additional truck trips per week on average beyond that which was analyzed by URS and presented in the Certified EIR. This is due to the delivery of additional chemicals and the transportation of additional wet solid waste from the scrubber and additional aqueous ammonia deliveries for the new H2U emissions controls.

Truck exhaust emission factors were developed based on the latest version of the California Air Resources Board Emission Factors model (EMFAC 2007) for the BAAQMD airshed (CARB 2002). Entrained road dust emission factors were derived from CARB Methodology 7.9 (CARB 1997). Emissions are calculated based on these emission factors and the total predicted travel distance within the Bay Area air basin defined by the BAAQMD regional boundary. All trucks are assumed to travel a route from the Benicia Refinery south on Interstate 680 (I-680) to Interstate 580 (I-580) East, exiting the BAAQMD boundary near Tracy, California. The total travel distance predicted for the VIP Amendments is shown in **Table 3.1.2-4**.

Table 3.1.2-4 Additional Vehicle Activity for VIP Amendments

Truck Route	Trucks/Week	Miles R/T	Total Trucks/Year	Total Miles/Year
BAAQMD Boundary to Valero	2	100	104	10,400
Totals	2	100	104	10,400

Indirect operational emissions are shown in **Table 3.1.2-5**. The calculations of daily delivery truck exhaust and entrained road dust emissions are provided in **Appendix B**.

Table 3.1.2-5 Indirect Operational Emissions – Change from VIP

Project	Incremental Emissions (tpy)				
	NO _x	SO ₂	PM10/ PM2.5	POC	CO
Net Increase over Certified EIR	0.18	0.0002	0.01	0.01	0.1

Summary of Operational Emissions

The incremental emissions of the VIP Amendments relative to the emissions in the Certified EIR are compared to the BAAQMD's CEQA annual mass-based significance thresholds in **Table 3.1.2-6**. The BAAQMD thresholds are the same significance thresholds used in the Certified EIR. As shown in **Table 3.1.2-6**, emissions of NO_x, PM10/PM2.5, and SO₂ will incrementally decrease relative to the Certified EIR following implementation of the VIP Amendments. Emissions of POC may increase slightly (2.9 tons/year) relative to VIP. This increase is well below the BAAQMD significance threshold. Emissions of CO may increase by about 63 tons/year from VIP levels. There is no mass-based significance threshold for CO; instead, BAAQMD guidance stipulates that impacts should be evaluated using air dispersion modeling. As shown in **Table 3.1.2-6**, the change in CO emissions as a result of the VIP Amendments will not cause a significant impact. VIP and the VIP Amendments combined will result in a decrease in emissions for all criteria pollutants. Therefore, the VIP Amendments will not substantially increase the severity of previously disclosed significant impacts beyond those already identified in the Certified EIR. Accordingly, the VIP Amendments will not have a significant adverse impact with respect to federal or state Ambient Air Quality Standards (AAQS) for which the area is in nonattainment status.

Table 3.1.2-6 VIP Amendments Emission Summary

Source Type	Emissions (tons per year)				
	NO _x	SO ₂	PM10/ PM2.5	POC	CO
Certified EIR (ref. Table 4.2-12)					
Post-VIP Emissions	1,939.1	2,799.3	235.5	303.7	761.2
VIP Amendments Change from VIP					
Main Stack	-48.0	-2,331.6	2.1	0.0	10.7
Combustion Sources	-123.6	3.2	-10.9	-0.1	52.2
Fugitive Emissions	0.0	0.0	0.0	3.0	0.0
Mobile Source Emissions	0.2	0.0	0.0	0.0	0.1
Post-VIP Amendments Emissions	1,767.6	470.9	226.7	306.6	824.1
CEQA Evaluation					
VIP Amendments Net Increase Over Certified EIR	-171.5	-2,328.4	-8.8	2.9 ¹	62.9 ¹
CEQA Significance Threshold	15	NA	15	15	NA
Significant?	No	No	No	No	No

1. Emissions of POC and CO decrease for the combined VIP and VIP Amendments projects.

Localized Air Quality Analysis for Operational Emissions

The BAAQMD CEQA Guidelines (BAAQMD 1999) require evaluation of the project emissions of CO to determine if the emissions would have a detrimental impact to local ambient air quality. For NO_x, PM10/PM2.5, and POC, the BAAQMD's annual mass significance thresholds serve as a surrogate for an air quality analysis. The BAAQMD does not have either concentration-based or mass-based significance thresholds for SO₂ emissions.

The analysis of CO emissions was conducted in accordance with the U.S. Environmental Protection Agency (USEPA) Guidelines on Air Quality Models (GAQM; as incorporated in Appendix W of 40 Code of Federal Regulations [CFR] Part 51) and the BAAQMD modeling guidelines "Permit Modeling Guidance, May 2005". Air quality impacts from project emissions under normal operating conditions were compared to the State and National AAQS. A summary of the modeling procedure is provided below; a complete discussion of the analysis is provided in **Appendix C**.

Modeled Parameters

CO emissions from the new H2U were included in the model. Historical CO emissions from the existing H2U were modeled with a negative emission rate to reflect the reduction of impacts achieved by decommissioning the unit. The furnace with the lowest reported emissions was modeled to ensure that emission reductions were not overestimated. This analysis presents a conservative estimate of the impacts, as it assumes that the new H2U operates at full load, without accounting for the reduction in utilization of the remaining H2U.

In addition to a 10.7 ton/year increase in CO emissions from the Main Stack (which includes the new PS Furnace, F-105), the addition of the scrubber to the Main Stack will change the temperature, moisture content and the exit velocity of the Main Stack exhaust. These changes alter the dispersion characteristics of the emissions and could potentially affect downwind ambient CO concentrations at ground-level receptors. To

represent the changes to emissions and stack discharge characteristics, the Main Stack was modeled with an air dispersion model as two co-located sources. One of the sources is described as the Main Stack with an emission rate after implementation of the proposed VIP Amendments. Stack parameters that will be present after the scrubber is installed were used. The other source is described as the Main Stack with the emission rate predicted in the Certified EIR entered as a negative number. Stack parameters from the Certified EIR were used.

Emissions associated with the changes in incremental firing of other combustion sources, including GT-702 and SG-1032, were not included in the modeling, as the overall emissions from these sources are lower than in VIP.

Modeling Approach

The USEPA QAQM prescribes a set of approved models for regulatory applications for a wide range of source types and dispersion environments. The AERMOD model is used to assess air quality impacts for the VIP Amendments. AERMOD is a state-of-the-art dispersion model that incorporates modeling improvements for applications involving building downwash and complex terrain. AERMOD is the model recommended by the USEPA for general use and it has replaced the Industrial Source Complex – Short Term 3 model. The latest version of AERMOD (07026), the AERMET (06341) meteorological preprocessor, and the AERMAP (06341) terrain preprocessor were used for this analysis.

In order to assess the maximum pollutant concentrations for one-hour and eight-hour CO impacts, AERMOD was applied with one year (2005) of meteorological data from two sites: the Valero Administration Building monitoring station (Station # 8704) and the Valero Warehouse Met Station (Station # 8702). These sites are both near the modeled sources. The Valero Administration Building Met Station is located in the northwest portion of the facility and is closest to the sources modeled. One year (2005) of wind speed, wind direction and temperature data taken from the on-site meteorological towers, National Weather Service cloud data from Buchanan Field Airport in Concord, California, and concurrent upper air data from Metropolitan Oakland International Airport in Oakland, California, obtained from BAAQMD, were processed with AERMET. The maximum concentrations were always highest when using the Administration Building meteorological dataset, so the reported AERMOD results are from evaluations using the Administration Building meteorological dataset.

A comprehensive Cartesian receptor grid extending to approximately 12.4 miles (20 kilometers [km]) from the refinery's Main Stack was used in the AERMOD modeling to resolve the maximum ground-level pollutant concentrations. This receptor grid is sufficient to resolve the maximum impacts and identify any significant impact area(s).

The Cartesian receptor grid consists of the following receptor spacing:

- Fenceline to 9,842 feet (3,000 m) at 328-foot (100-m) increments;
- Beyond 9,842 feet (3,000 m) to 16,400 feet (5,000 m) at 656-foot (200-m) increments;
- Beyond 3.1 miles (5 km) to 6.2 miles (10 km) at 1,640-foot (500-m) increments;
- Beyond 6.2 miles (10 km) to 12.4 miles (20 km) at 3,280-foot (1,000-m) increments

Discrete receptors were placed approximately every 164 feet (50 m) along the Benicia Refinery fenceline for increased resolution of impacts along the facility boundary.

The AERMAP modeling domain corresponds to a 3.1-mile (5-km) buffer beyond the receptor grid, which provides sufficient resolution of the hill height scale required for each receptor. Terrain elevations from 7.5-minute Digital Elevation Model (DEM) data were acquired from the United States Geological Survey (USGS) and were processed with AERMAP to develop the receptor terrain elevations and corresponding hill height scale required by AERMOD. All of the DEM files are from Universal Transverse Mercator (UTM) Zone 10 and referenced to North American Datum 27 (NAD27).

The USEPA modeling guidelines require the evaluation of the potential for physical structures to affect the dispersion of emissions from stack sources, termed “Good Engineering Practice” (GEP). A GEP stack height analysis was performed for stacks associated with the VIP Amendments in accordance with USEPA’s GEP stack height guidelines (USEPA, 1985). The GEP stack height for the proposed stacks was determined using the USEPA Building Profile Input Program-PRIME (BPIP-PRM version 04274) that performs the GEP calculation for a multi-building complex on a stack-by-stack basis. Additionally, BPIP-PRM calculates the effects of building downwash on plume dispersion; these effects are then incorporated into AERMOD.

The Main Stack GEP height was calculated using BPIP-PRM to be 231.5 feet (70.6 m). The actual heights of all other modeled sources are less than the GEP stack heights calculated by BPIP-PRM, including the stack height of the H2U furnace to be decommissioned, therefore, the actual stack height is used in the modeling analysis.

Modeling Results

As shown in **Table 3.1.2-7**, potential CO emissions associated with the proposed VIP Amendments will not cause or contribute to an exceedance of the State AAQS. Based on the modeling analysis, the proposed VIP Amendments will not substantially increase the severity of the impact of CO emissions. Accordingly, the proposed VIP Amendments will not have a significant adverse impact on ambient air quality.

Table 3.1.2-7 Ambient Air Quality Impacts Analysis Results for Normal Operations

Pollutant	Averaging Period	Maximum Predicted Impact (µg/m ³)	Background Conc. (µg/m ³) ¹	Total Conc. (µg/m ³)	California AAQS (µg/m ³)	Exceed AAQS?
CO	1-hour	20	4,639	4,659	23,000	No
	8-hour	7	3,931	3,938	10,000	No

1. The background level is the highest value from the years 2004-2006 reported in the CARB database for the closest monitoring site, Tuolumne Street in Vallejo, California. Values of parts per million by volume (ppmv) were converted into micrograms per cubic meter (µg/m³) using BAAQMD guidelines.

c. Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)? No

According to the BAAQMD CEQA Guidelines, any proposed project that would individually have a significant air quality impact would also be considered to have a significant cumulative air quality impact. For any project that does not individually have significant operational air quality impacts, the determination of significant cumulative impact is based on an evaluation of the consistency of the project with the local general plan and of the general plan with the regional air quality plan.

In the Certified EIR, VIP was determined to have a less-than-significant impact on regional air quality, and would not contribute to a significant adverse cumulative impact. The VIP Amendments would result in further reductions in emissions of NO_x, SO₂, and PM₁₀/PM_{2.5} as compared to VIP. The VIP Amendments will have an increase in POC and CO emissions when compared to VIP. However, as demonstrated in **Table 3.1.2-6**, POC emissions will not result in a significant impact because the annual mass emission increase is below the CEQA significance threshold. Additionally, CO emissions will not result in a significant impact because emissions from the project will not cause or contribute to an AAQS violation (**Table 3.1.2-7**). Thus, the VIP Amendments will not cause a significant air quality impact.

Because the proposed VIP Amendments do not have significant operational air quality impacts, the determination of significant cumulative impact is based on an evaluation of the consistency of the project with the local general plan and of the general plan with the regional air quality plan. The appropriate general plan for the VIP Amendments is the City of Benicia General Plan, and the appropriate regional air quality plan is the 2005 Ozone Strategy. The VIP Amendments would be consistent with the 2005 Ozone Strategy as discussed above in the response to checklist question **a**.

The implementation of the VIP Amendments would be consistent with the City of Benicia General Plan. Specifically, the Community Health and Safety provisions of the General Plan include the following:

1. Goal 4.9: Ensure clean air for Benicia residents
2. Policy 4.9.1: Establish whether a significant air pollution problem exists in Benicia and the City's role in resolving it
3. Goal 4.10: Support improved regional air quality
4. Policy 4.10.1: Support implementation of the BAAQMD CAP

The VIP Amendments would not result in a significant air quality impact. Thus, the project is consistent with these policies of the General Plan. Based on compliance with the applicable General Plan and 2005 Ozone Strategy, the proposed VIP Amendments would not contribute to a significant cumulative impact.

d. Would the project expose receptors to substantial pollutant concentrations? No

The VIP Amendments may result in a slight increase of toxic air contaminants (TAC) compared to VIP. The new H2U will emit gaseous and particulate TAC as products of combustion, though the shutdown of one H2U train will result in reductions of TAC emissions. New piping components in hydrocarbon service will emit organic TAC as fugitive emissions. Trucks associated with the operation of the VIP Amendments will emit diesel particulate matter (DPM) along the transport routes.

A project is considered significant if predicted cancer risk exceeds ten excess cancer cases per million exposed persons (ten in one million or 10×10^{-6}), or if either chronic non-carcinogenic or acute hazard indices (HI) exceed 1.0 at any off-site receptor. Two Health Risk Assessments (HRAs) were conducted to determine if the VIP Amendments would incrementally expose sensitive receptors to substantial TAC pollutant concentrations. One HRA was performed for TAC emissions from the normal operation of stationary sources at the refinery, and a second, separate HRA was performed for the DPM emissions from trucks along the truck transport route.

The HRA for stationary sources included TAC emissions from the new H2U furnace and fugitive volatile TACs from piping components. TAC emission estimates from the H2U furnace assumed continuous operation at the furnace's maximum capacity. The HRA did not account for reductions in TAC emissions from the decommissioned H2U furnace (F-301 or F-351) in order to provide a conservative evaluation of health risks.

Emissions of TACs from the Main Stack (F-101, F-102, F-103, and F-105) are not expected to change from the Certified EIR because the changes being proposed do not represent an increase in fuel combustion. In addition the operation of the Main Stack Scrubber will not contribute any additional TAC emissions. Therefore, TAC Emissions from the Main Stack were not included in the stationary source HRA. Emissions from other combustion sources will decrease relative to VIP (100 MMBtu/hr decrease for SG-1032, and 70 MMBtu/hr increase for GT-702, or a net reduction of 30 MMBtu/hr), and were also not included in the HRA.

As demonstrated by both the stationary source and mobile source HRAs, the incremental TAC emissions from the VIP Amendments would not cause a significant adverse impact as explained in **Section 3.1.8, Public Health**. Accordingly, impacts to public receptors from the VIP Amendments will remain insignificant. The HRAs are described in more detail in **Section 3.1.8, Public Health**.

e. *Would the project create objectionable odors affecting a substantial number of people?* No

During construction of the project, diesel fuel will be combusted in the construction equipment, asphalt may be used for the access roads and parking areas, and paint may be applied to protect the equipment and structures. These activities may emit odors; however, given the short-term nature of the emissions and the distance to the nearest off-site receptors, odors from construction activities are not expected to cause an objectionable odor to off-site receptors.

The Main Stack Scrubber will reduce SO₂ emissions from the refinery beyond the reductions previously quantified in the Certified EIR. The emission reductions will further reduce any potential odors from the refinery Main Stack. The Main Stack Scrubber will use an amine-based reagent for SO₂ emission reductions. This reagent is similar to materials currently used at the Benicia Refinery, and will not be exposed to ambient air during normal operations. The use of this material is not expected to contribute significantly to off-site odors.

The H2U furnace will burn RFG and HPU tailgas. Existing furnaces F-101 and F-102 will combust RFG. Combustion byproducts from these gaseous fuels are not known to cause objectionable odors. The CO-laden gases combusted by the new furnace F-105 will be the same gases currently combusted by F-101 and F-102. Combustion of gaseous fuels in the furnaces installed or modified as part of VIP Amendments will therefore, not cause odorous impacts beyond what was analyzed in the Certified EIR.

The SCR proposed for NO_x emissions control at the new H2U and the new furnace F-105 will use aqueous ammonia as the reducing agent. The aqueous ammonia will be stored in a pressurized tank that will emit no ammonia vapors under normal operating conditions and, consequently, is not expected to cause objectionable odors. The ammonia slip in the furnace exhaust is not expected to exceed 10 ppmv. The odor threshold for ammonia is about 5 ppmv (Agency for Toxic Substances & Disease Registry (ASTDR)). However, because of the buoyancy of the heated exhaust emissions, the dispersion of emissions over distance, and the distance from the stack to the nearest receptor (the closest that a receptor could be would be at the fence line, more than 2,000 feet from the stack), ammonia slip emissions are not expected to cause a detectable odor.

Based on these factors, odor impacts from the VIP Amendments will remain insignificant.

2. Air Quality

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would the proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would the proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
<p>Impact 4.2-1: Construction activities associated with project construction would generate short-term emissions of criteria pollutants, including suspended and respirable particulate matter and equipment exhaust emissions.</p>	<p>Significant</p>	<p>Mitigation Measure 4.2-1a: During construction, Valero shall require the construction contractor to implement the following dust control procedures to maintain project construction-related impacts at acceptable levels.</p> <ul style="list-style-type: none"> • Water all active construction areas at least twice daily. Watering should be sufficient to prevent airborne dust from leaving the site. Increased watering frequency may be necessary whenever wind speeds exceed 15 miles per hour. Reclaimed water should be used whenever possible. • Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard (i.e., the minimum required space between the top of the load and the top of the trailer). • Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites. • Sweep all paved access roads, parking areas and staging areas at construction sites daily. Sweep City streets (with water sweepers using reclaimed water if possible) at the end of each day if visible soil material is carried onto adjacent paved public roads. • If construction activities for any project component or group of components undergoing simultaneous construction will occur on a construction site greater than four acres in area, Valero shall require the construction contractor to implement the following enhanced dust control procedure: <ul style="list-style-type: none"> • Hydroseed or apply (non-toxic) soil stabilizer to inactive construction areas (previously graded areas inactive for ten days or more). • Enclose, cover, water twice daily, or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.) • Limit traffic speeds on unpaved roads to 15 mph. • Install sandbags or other erosion control measures to prevent silt runoff to public roadways. • Replant vegetation in disturbed areas as quickly as possible. 	<p>Less than Significant With Mitigation.</p>	<p>No. The construction activities under the VIP Amendments are substantively similar to activities described in VIP, and the expected impacts described and mitigation measures proposed will be the same as described in the Certified EIR.</p>	<p>No. The construction impacts associated with the VIP Amendments will be less than significant as a result of the previously identified mitigation measures.</p>

2. Air Quality

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would the proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would the proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
		<p>Mitigation Measure 4.2-1b: To mitigate impact of construction equipment exhaust emissions, the project sponsor shall require its construction contractors to comply with the following requirements:</p> <ul style="list-style-type: none"> • Construction equipment shall be properly tuned and maintained in accordance with manufacturers' specifications. • Best management construction practices shall be used to avoid unnecessary emissions (e.g., trucks and vehicles in loading and unloading queues would turn their engines off when not in use). <p>Any stationary motor sources (such as generators and compressors) located within 100 feet of any residence shall be equipped with a supplementary exhaust pollution control system as required by the BAAQMD and CARB. In such cases, the project sponsor shall require construction contractors to mitigate diesel emission by measures such as the use of catalyzed diesel particulate filters, use of ULSD fuel, and/or use of USEPA and CARB 1996 certified diesel engines.</p>	Less than Significant with Mitigation.	No. The construction activities under the VIP Amendments are substantively similar to activities described in VIP, and the expected impacts described and mitigation measures proposed will be the same as described in the Certified EIR.	No. The construction impacts associated with the VIP Amendments will be less than significant as a result of the previously identified mitigation measures.
Impact 4.2-2: Operational activities associated with the implementation of the proposed project could lead to increase in regional air pollutant emissions into the air basin.	Significant	<p>Mitigation Measure 4.2-2: As a condition of approval of the use permit for VIP, Valero must implement the Light Ends Rail Rack Arm Drains project.</p> <p>Use Permit Condition 2: This approval is based in part on representations of the applicant, consistent with conditions of approval expected to be imposed by the BAAQMD, that there will be no net increase in overall refinery emissions as a result of VIP. The BAAQMD proposed conditions include emission limitations, based on the three-year baseline emissions reported to the BAAQMD by Valero for purposes of this project, to insure there will be no net increase in emissions as a result of VIP. A change in the project, or in the proposed BAAQMD conditions of approval, such that the project facilities would result in such a net emission increase shall require a use permit amendment with associated CEQA review.</p>	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments would result in a reduction in facility emissions of NO _x , SO ₂ , and PM10/PM2.5 relative to the Certified EIR. There will be a less-than-significant increase in POC emissions. While there will be an increase in CO emissions, modeling analysis demonstrates that the increase does not cause a violation of AAQS, and will not have a significant	No. The VIP Amendments will not cause a substantial increase in already identified significant effects.

2. Air Quality

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would the proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would the proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
		<p>Use Permit Condition 3: Valero shall provide the City with copies of any application to the BAAQMD for a new Authority to Construct or any amendment to an existing Authority to Construct for any part of VIP, so that the City may evaluate the proposals for consistency with the scope of the use permit approval and the Certified EIR analysis. The documents shall be provided at no cost to the City.</p> <p>Use Permit Condition 4: Valero shall provide the City with copies of its emissions reports to the BAAQMD whenever such reports are requested by the City to evaluate whether VIP is being constructed or operated consistent with Condition 1. Reasons for such a request may include, but are not limited to, approval by the BAAQMD of a new or amended Authority to Construct for any part of VIP. The documents shall be provided at no cost to the City.</p> <p>Use Permit Condition 14a: Valero shall construct and operate the Main Stack Scrubber at the same time that the sulfur plant expansion is constructed.</p> <p>Use Permit Condition 14b: Notwithstanding any BAAQMD permit conditions that may allow higher crude rates without such restriction, the refinery shall not operate more than a total of 1,096 consecutive or non-consecutive days at crude rates above 135,000 barrels per day and/or with the third air blower in operation without installing and operating the scrubber. If the scrubber is not completed and operating by the deadline, the refinery shall not process more than 135,000 barrels of crude per day, and shall deactivate the third air blower, if operating, until such time as the scrubber is in operation.</p>		<p>adverse impact. As the impacts evaluated in the Certified EIR were less than significant, the VIP Amendments will not result in a significant adverse impact.</p> <p>As shown above, the net emission change due to the proposed project does not exceed the BAAQMD's significance thresholds for annual mass emissions for any criteria pollutant, and does not cause an exceedance of the federal or California AAQS.</p>	

2. Air Quality

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would the proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would the proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.2-3: Operational activities associated with the implementation of the proposed refinements to VIP could lead to increase in odorous emissions. This would be a less than significant impact.	Less than Significant.	No Mitigation Required.	No Mitigation Required.	No. The proposed project elements are not expected to cause odor issues.	No significant effect previously identified.
Impact 4.2-4: The proposed refinements to VIP, along with other ongoing and approved projects would lead to a net reduction in emissions relative to the baseline levels. This would constitute a net air quality benefit.	Environmental Benefit.	No Mitigation Required.	No Mitigation Required.	No. The VIP Amendments, along with other ongoing and approved projects would lead to a net reduction in NO _x , SO ₂ , and PM10/PM2.5 emissions relative to the Certified EIR. The VIP Amendments would also result in a decrease in emissions associated with flaring.	Not Applicable. This item is an Environmental Benefit, not an impact.

References:

Agency for Toxic Substances & Disease Registry, Medical Management Guidelines for Ammonia, <http://www.atsdr.cdc.gov/mhmi/mmq126.html>

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Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

Interview, Valero personnel, January 2007.

South Coast Air Quality Management District, Rule 1156, Further Reductions of Particulate Emissions from Cement Manufacturing Facilities, November 2005.

United States Environmental Protection Agency, Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations) (EPA-450/4-80-023R), 1985.

United States Environmental Protection Agency, User's Guide for the Industrial Source Complex (ISC3) Dispersion Models (EPA-454/B-95-003b), September 1995.

United States Environmental Protection Agency Guidelines on Air Quality Models, 1978.

URS Corporation, Valero Improvement Project, Air Emission Calculations: Baseline and Project Emissions June 2002.

3.1.3 Greenhouse Gases

3.1.3.1 Introduction,

Recently there has been an increase in public attention to climate change and global warming issues, at the international, federal, state and even the local level. In California, this attention has included calls for CEQA documents to incorporate analysis and mitigation of climate change impacts from project contributions to greenhouse gas (GHG) emissions. However, neither CEQA nor the CEQA Guidelines provide any guidance as to the appropriate significance thresholds or analytic methodology for the potential contribution to global climate change impacts that might be attributable to the GHG emissions of individual projects. In the absence of established thresholds, project impact and mitigation analysis is premature, in which case the Guidelines instruct that the lead agency “should note its conclusions and terminate discussion of the impact.” CEQA Guidelines § 15145.

Nevertheless, in light of the importance of this topic, an evaluation of GHG emissions under the VIP Amendments was completed. The analysis demonstrates that the VIP Amendments will result in a net decrease in GHG emissions. Accordingly, even in the absence of established significance thresholds and methodology, it can be concluded that the project will not contribute to an increase in GHG emissions which are linked to climate change.

3.1.3.2 Climate Change – Environmental Setting

Global climate change has been described as alterations in weather features such as temperature, wind patterns, precipitation, and storms, which occur across the Earth as a whole. Global temperatures are modulated by naturally occurring components in the atmosphere capturing heat radiated from the Earth’s surface, which in turn warms the atmosphere. This phenomenon is known as the “greenhouse effect.” GHGs are gases that trap heat in the atmosphere. CO₂ and methane are the GHGs that are emitted in the greatest quantities from human activities. Emissions of CO₂ are largely by-products of fossil fuel combustion, whereas methane results from off-gassing associated with agricultural practices and landfills. By some accounts it is thought that enhancement of the greenhouse effect can occur when concentrations of these gases from human activities exceed the natural concentrations in the atmosphere.

3.1.3.3 Legal and Regulatory Background

The following is a brief synopsis of some of the on-going legal and regulatory developments related to climate change and GHG impacts, which to date do not provide any guidance as to the appropriate significance thresholds or analytic methodology for the analyzing the potential contribution to global climate change impacts or GHG emissions of individual projects.

1. Federal Law

In April 2007, in *Massachusetts v. U.S. Environmental Protection Agency*, 127 S. Ct. 1438 (2007), the U.S. Supreme Court held that carbon dioxide is an “air pollutant” subject to regulation by the U.S. EPA under the federal Clean Air Act. In response to that decision, EPA has announced that it will initiate rulemaking efforts with regard to reduction of GHG emissions from new motor vehicles.

2. State Law

SB 527. Enacted in 2001, SB 527 formed the California Climate Action Registry (CCAR). CCAR is a non-profit voluntary registry for GHG emissions. When organizations become participants, they agree to register their GHG emissions, along with indirect emissions from electricity use. Valero is a member of CCAR.

AB 1493. Enacted in 2002, AB 1493 directs the California Air Resources Board (CARB) to develop and implement regulations that achieve the “maximum feasible reduction” of GHG emissions from passenger vehicles, light-duty trucks and other noncommercial vehicles. Pursuant to AB 1493, in 2004 CARB approved regulations limiting the amount of greenhouse gases released from motor vehicles.² California has requested that the U.S. EPA waive preemption of its state motor vehicle emission control standards pursuant to the federal Clean Air Act. The U.S. EPA has indicated that it will make a decision on California’s waiver request by the end of 2007.

Executive Order S-3-05. This 2005 Executive Order establishes GHG emission reduction targets for California:

- By 2010, reduce greenhouse gas emissions to 2000 levels
- By 2020, reduce greenhouse gas emissions to 1990 levels
- By 2050, reduce greenhouse gas emission to 80 percent below 1990 levels

AB 32. California Global Warming Solutions Act of 2006. AB 32 establishes statewide greenhouse gas reduction targets, requiring:

- California to reduce its greenhouse gas emissions to 1990 limits (as determined by the CARB by January 1, 2008) by 2020.
- GHG emission standards to be implemented by 2012.
- CARB to develop an implementation program and adopt greenhouse gas control measures “to achieve the maximum technologically feasible and cost-effective greenhouse gas emission reductions from sources or categories of sources.”

SB 1368. Enacted in 2006, this bill requires the California Public Utilities Commission and California Energy Commission to establish GHG performance standards for electric power generation utilities.

Executive Order S-1-07. This 2007 Executive Order establishes a Low Carbon Fuel Standard:

- By 2020, fuel providers (including refiners, blenders, producers, and importers) must reduce their average “carbon intensity” by 10%.
- This reduction is expected to result in replacement of 20% of on-road gasoline consumption with lower-carbon fuels and lead to the addition of seven million alternative fuel or hybrid vehicles on California roads.

CEQA. Pursuant to CEQA, the purpose of an environmental impact report is to identify the significant environmental effects of a project (if any), to identify alternatives to the project, and to indicate the manner in which those significant effects can be mitigated or avoided. (Cal. Pub. Res. § 21002.1(a)). “Significant effect” is defined as a “substantially or potentially substantial, adverse change in the environment.” (§ 21068). To date, no significance thresholds have been established for assessing the contribution of an individual project’s GHG emissions to a significant impact on climate change and global warming.

SB 97. Enacted in August 2007, SB 97 requires the Office of Planning and Research to develop guidelines for the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions by July 1, 2009, and the Resources Agency to adopt those guidelines by January 1, 2010.

2. These regulations are the subject of pending litigation by the automotive industry on federal preemption grounds.

3.1.3.4 Project-Related GHG Emissions

As previously stated, neither CEQA, the CEQA Guidelines, nor on-going legal and regulatory developments provide any methodology for analysis of the potential contribution to climate change impacts from the GHG emissions of individual projects, nor do they provide any thresholds for determining the significance of such impacts or for mitigating impacts determined to be significant. Under SB 97, such guidelines are not required to be adopted until 2010. Thus, achieving the purpose of CEQA analysis, i.e., identifying significant environmental effects and mitigating or avoiding those effects to a level of insignificance, is not possible at this time.

Nevertheless, in order to address this important emerging issue, the changes in direct and indirect emissions of GHGs from the Benicia Refinery as a result of the VIP Amendments are addressed in this section. The analysis demonstrates that the VIP Amendments will result in a net decrease in GHG emissions.

As illustrated in **Table 3.1.2-2**, combustion of gaseous fuels will decrease due to the increased efficiency of the H2U furnace. As presented in **Section 3.1.6**, the Benicia Refinery's electrical demand will increase by approximately 5 MW relative to VIP which will cause an increase in indirect emissions of GHGs from off-site power plants. Finally, as shown in **Table 3.1.2-4**, there will be an increase in truck traffic associated with the VIP Amendments, relative to VIP. These trucks will emit GHGs in addition to criteria pollutants.

The changes to the Benicia Refinery's GHG emissions as a result of the VIP Amendments were estimated using two independent sources of emission factors. Both sources are currently being used to estimate GHG emissions from petroleum refineries, though neither has been widely accepted as the standard.

For one analysis, GHG emissions changes from fuel combustion and electrical demand were estimated using emission factors presented in the American Petroleum Institute's (API) *Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industries* (API 2004). Carbon dioxide (CO₂) emissions from mobile sources were estimated using the EMFAC2007 model (CARB 2002). Mobile source emissions of the GHGs nitrous oxide (N₂O) and methane (CH₄) were estimated using emission factors and methods presented in the *Compendium*.

The other estimate of GHG emission changes used emission factors and protocols developed by the California Climate Action Registry (CCAR), a non-profit, voluntary registry for GHG emissions. Under this analysis, emission changes due to fuel combustion were estimated using emission factors presented in the CCAR General Reporting Protocol Version 2.2 (CCAR 2007). Emission changes associated with electrical demand were estimated using CCAR protocols and emission factors specific to the Pacific Gas & Electric (PG&E) service area as presented in the Emissions & Generation Resource Integrated Database (EGRID 2006). As in the *Compendium*-based analysis, CO₂ emissions from mobile sources were estimated using EMFAC2007. Mobile source N₂O and CH₄ emissions were estimated using CCAR emission factors and protocols.

Table 3.1.3-1 presents the changes in GHG emissions resulting from the VIP Amendments, relative to VIP, using each of the calculation methods summarized above. GHG emissions are expressed in metric tons per year CO₂ equivalent (Tonnes/year CO₂-e). Using either set of emission calculation factors and procedures, the VIP Amendments will result in a decrease in GHG emissions compared to VIP. Of the two methods, the CCAR calculations are presumed to be a better basis for CEQA analyses as they better represent the actual GHG emissions from power plants in California.

Table 3.1.3-1 Changes in Greenhouse Gas Emissions from VIP to VIP Amendments

Source	Emissions Tonnes/year CO₂-e	
	API Compendium	CCAR
Fuel Combustion (30 MMBtu/hr reduction)	-14,902	-16,828
Electrical Consumption (5 MW increase)	12,071	9,745
Mobile Sources (Heavy-Duty Trucks, 52,624 mi/yr)	101	101
Net Increase over Certified EIR	-2,731	-6,983

This analysis demonstrates that the VIP Amendments will result in a net decrease in GHG emissions. The refinery remains committed to further reductions of GHG emissions as may be required under regulations now being developed.

3. Greenhouse Gases

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would the proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would the proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
None – GHGs not analyzed in Certified EIR	N/A	Not Applicable	Not Applicable	No. GHG emissions will decrease as a result of the proposed project, so there will be no significant effect.	No. GHG emissions will decrease as a result of the proposed project, so there will be no increase in any already identified significant effects.

References:

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UN Intergovernmental Panel on Climate Change, Climate Change 2007 – The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report of the IPCC, (2007).

3.1.4 Biological Resources

- a. *Would the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service? No***

The Certified EIR (EIR Section 4.3) addressed records of candidate, sensitive, and special-status species identified within the area bounded by the Carquinez Strait, uplands north of I-680, and the coast between Southampton Bay and Goodyear Slough. A focused list of special-status species with the potential to occur in or near the Benicia Refinery was compiled from these records and was included in the Certified EIR in Table 4.3-1. Specific locations that the Certified EIR evaluated for biological impacts included the Benicia Refinery Process Block and adjacent developed land, the WWTP, the area to the northeast of the Refinery Process Block, the Tank Farm, and open areas of the Benicia Refinery. Within these areas, no candidate, sensitive or special-status species or habitats for species were identified (EIR Section 4.3.2), except for habitat in the area of the Tank Farm. Since none of the improvements associated with the proposed VIP Amendments are to be located within the Tank Farm, habitat of the Western Pond Turtle, Curved-foot hygrotus diving beetle, California tiger salamander, Tricolored blackbird, Suisun Song Sparrow, and California red-legged frog in the area of the Tank Farm is not anticipated to be disturbed. Additionally, two biological surveys conducted for the refinery in 1988 and 1991 did not identify any special-status plant species or suitable habitat (EIR Section 4.3.2).

To address specific effects from the VIP Amendments on biological resources within areas not previously determined to be affected, site-specific updates to the information presented in the Certified EIR (EIR Section 4.3.2) were undertaken. The site-specific updates are included as **Appendix D** of this application. These site-specific assessments were conducted in the area designated for the new H2U location, the relocated employee parking lot, and in an alternative potential location for the relocated firehouse. The relocated firehouse location is not currently planned for the location addressed in the site specific assessment; however, the assessment is included for completeness as it was evaluated as an alternative location.

The relocated firehouse is currently planned for location in the northeast corner of the facility northeast of the Administration Building, in the Fuels Terminal. The Fuels Terminal is a paved and gravel area with routine truck traffic. All construction activities associated with the relocated firehouse are to occur within the Fuels Terminal. No suitable habitat for special-status plant or wildlife species is present in the Fuels Terminal.

The new H2U will be constructed in the existing employee parking lot. Due to the heavily developed and disturbed nature of this area, no suitable habitat for special-status plant or wildlife species is present.

The site-specific survey of the relocated employee parking lot, which will be a two-level lot terraced into the gentle sloping area located on currently unused Valero property north of the Refinery Process Block, found that the area consists of ice plant (*Mesembryanthemum crystallinum L.*) and various annual grasses. No suitable habitat for any of the special-status species or any special-status species were documented or observed to occur in this area.

- b. *Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations, or by the California Department of Fish and Game or US Fish and Wildlife Service? No***

As described in the Certified EIR (EIR Section 4.3.2), the habitat types located within the Benicia Refinery included non-native grassland, freshwater emergent wetland (and pond), riparian, and estuarine open water. The open areas of the Benicia Refinery contain non-native grasslands. The freshwater emergent wetland was described in the Tank Farm area. The riparian habitat was described in the area of Sulphur Springs Creek and in drainage swales located within the Benicia Refinery. Estuarine open water habitat was described as the waters of Suisun Bay, which accept the WWTP outfall. According to the Certified EIR, patches of habitat observed within the refinery boundaries are too small to support a full suite of species identified for those habitats (EIR Section 4.3.2).

The WWTP, through planned modifications addressed in the Certified EIR, would treat additional wastewater loading from the VIP Amendments including unfired scrubber waste heat boiler blowdown and miscellaneous water usage. These streams will have typical characteristics of other refinery wastewater streams and thus will be effectively treated by the WWTP. The pre-scrubber purge and caustic polisher purge may alter the WWTP discharge characteristics due to the increases of nickel, vanadium, aluminum, and sulfates. As required by its current NPDES permit and consistent with the Certified EIR in implementing VIP components and the VIP Amendments, the Benicia Refinery will in consultation with the San Francisco Bay Regional Water Quality Control Board (RWQCB) determine whether a technical study of potential loading impacts will be required to address the mass increase of pollutants proposed to be discharged and propose new treatment process units, if necessary, to maintain water quality in Suisun Bay. Therefore, the VIP Amendments will be designed to be protective and will not have a substantial adverse effect on sensitive natural communities in Suisun Bay.

The majority of the project components for the VIP Amendments are located in highly disturbed and developed areas within the existing industrial footprint of the Benicia Refinery. This includes the Refinery Process Block and adjacent developed land. Due to the heavily disturbed and developed nature of the refinery, no suitable habitat for special-status plant or wildlife species was described in the Certified EIR as present within these areas (EIR Section 4.3.2). VIP Amendments project components located within the Refinery Process Block and adjacent developed land are the desalter, the pre-scrubber, and Main Stack Scrubber. The H2U and firehouse will be in a developed area of the Benicia Refinery outside of the process block. The only new project component not located within the existing industrial footprint of the Benicia Refinery is the new employee parking lot. A site-specific survey was conducted in the areas outside of the Refinery Process Block for the purpose of this Use Permit application and is provided in **Appendix D**.

According to observations, the area proposed for the relocated employee parking lot is located in a gentle sloping area located on currently unused Valero property north of the Refinery Process Block. The area proposed for the parking lot area mainly consists of ice plant (*Mesembryanthemum crystallinum* L.) and various annual grasses. No riparian habitat or sensitive natural communities were observed in this area.

c. *Would the project have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means? No*

As set forth in the Certified EIR, construction and operation of VIP does not fall under the jurisdiction of the federal Clean Water Act (CWA), as no fill of jurisdictional wetland is expected. Similarly, no such fill is planned for the VIP Amendments. Work associated with the VIP Amendments has also been designed to avoid impacts on certain patches of habitat observed near the project area described below.

The site-specific survey identified a drainage ditch that is approximately 6 feet wide and several hundred feet long to the north of the proposed new H2U location. The ditch appears to have been constructed to capture the minimal runoff from an adjacent berm. The drainage ditch extends west through an approximately eight-inch culvert and continues for several hundred feet down the slope where it drains into a tributary to Sulphur Springs Creek. No special-status species or habitat was observed in the constructed drainage ditch. However, the Sulphur Springs tributary to which the ditch drains contained cattail (*Typha sp.*), rush (*Juncus sp.*), and willow (*Salix sp.*) species. Wildlife detected or observed at this site included Pacific tree frog (*Hyla regilla*) and house finch (*Carpodacus mexicanus*). The drainage ditch could be considered an unvegetated water and, as such may fall under the jurisdiction of the U.S. Army Corps of Engineers (USACE) who regulate waters of the U.S. and wetlands under Section 404 of the Clean Water Act. Construction of the new H2U will avoid the drainage ditch.

d. *Would the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites? No*

According to the Certified EIR (EIR Section 4.3.2), the project areas (Refinery Process Block and adjacent developed land, the area to the northeast of the Refinery Process Block, and the WWTP area) are not utilized by native, resident, or migratory birds, fish, or wildlife species, nor are these areas within established native resident or migratory wildlife corridors. The Certified EIR (EIR Section 4.3.2) also indicates that construction and operation in these areas would not impede the use of native wildlife nursery sites. The proposed VIP Amendments project locations outside of the Refinery Process Block and adjacent developed land include the area to the northeast of the Refinery Process Block, and the WWTP. These areas were observed as part of the previous analysis. No locations of proposed VIP Amendments components have the potential to be used as a native wildlife nursery and the proposed VIP Amendment project components would not interfere with the movement of native or migratory wildlife or with established wildlife corridors.

e. *Would the project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance? No*

The development identified in the Certified EIR was determined to be consistent with the City's General Plan policies addressing Open Space and Conservation Resources (EIR Section 4.3.2). As with VIP, the majority of the development of the proposed sites for the VIP Amendments are located within the Refinery Process Block and adjacent developed land and other areas of the Benicia Refinery that do not contain native trees, such as oaks, or other significant vegetation protected by local policies or ordinances. Therefore, the VIP Amendments would not conflict with any local policies or ordinances protecting biological resources.

f. *Would the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan? No*

The VIP Amendments project components are located outside the area addressed in the Suisun Marsh Protection Plan. The discharge from the Benicia Refinery WWTP occurs within the Marsh Protection Area. As described above the VIP Amendments may alter the WWTP discharge characteristics; however, the VIP Amendments will be designed to be protective and will not have a substantial adverse effect on sensitive natural communities in Suisun Bay. See **Sections 3.1.10 and 3.1.15(a)** below, for more detailed discussion of wastewater treatment.

4. Biological Resources					
Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.3-1: Potential disturbance of western pond turtle and California red-legged frog could occur during construction at the Tank Farm retention pond site.	Significant.	<p>Mitigation Measure 4.3-1: Unless protocol surveys during the period May 1 through November 1 establish that the retention ponds are not occupied by either species, the modification of any Tank Farm retention pond shall be preceded by a period of at least six months during which the pond is drained and minimal water allowed to collect in the basin. If such pond drying is not possible, the project shall adhere to the following mitigation protocols:</p> <p>At least 45 days prior to working at the site, Valero shall notify City and a City-designated biologist to ensure that no work occurs without appropriate pre-construction surveys 48 hours before work begins. Notification shall be in writing and clearly define proposed construction schedule such that pre-construction surveys can be completed.</p> <p>The City-designated biologist shall be present at all times during construction at the ponds, and as required during construction at the ponds, and as required during construction near non-sensitive areas, as an on-site monitor to detect frogs or pond turtles which may enter the area of disturbance.</p> <p>If a California red-legged frog is identified in the project construction zone during pre-construction surveys or construction, no work in the immediate area can begin (or ongoing construction shall be halted) until the USFWS Sacramento Field Office is contacted and concurs that the project will not result in harm or harassment to the species. Western pond turtles may be relocated to suitable habitat by the City-designated biologist.</p>	Less than Significant with Mitigation.	No. Not part of the VIP Amendments project areas. This impact addresses potential species located within the Tank Farm area.	No. Not part of the VIP Amendments project areas. This impact addresses potential species located within the Tank Farm area.

4. Biological Resources					
Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.3-2: Potential disturbance of special-status and protected native birds (e.g., tricolored blackbird and Suisun song sparrow) during the breeding season could occur at the Tank Farm retention ponds.	Significant.	Mitigation Measure 4.3-2: Construction at the Tank Farm shall be limited to the non-breeding season for most birds, <i>i.e.</i> , all work shall occur September through February. Alternatively, if construction must occur during the breeding season, all vegetation that could be used for nesting shall be removed during the September through February period preceding construction.	Less than Significant with Mitigation.	No. Not part of the VIP Amendments project areas. This impact addresses potential species located within the Tank Farm area	No. The Tank Farms are not part of the VIP Amendments project. This impact addresses potential species located within the Tank Farm area. Construction near the top of the levee for Sulphur Springs Creek would not potentially disturb the Suisun Song Sparrow. The timing of the spanned crossing will not conflict with nesting or breeding periods.
Impact 4.3-3: Potential impacts to special status fisheries could occur with additional water discharges into Suisun Bay or from increased ship traffic associated with increased refinery capacity. The Suisun Marsh Protection Plan (BCDC, 1976) requires that the disposal of wastewater from any existing outfall follow the permit conditions from water quality oversight agencies. Therefore, by continued compliance with discharge requirements of the refinery's National Pollutant Discharge Elimination System (NPDES) permit this impact is less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The Benicia Refinery will in consultation with the San Francisco Bay Regional Water Quality Control Board (RWQCB) determine whether a technical study of potential loading impacts will be required to address the mass increase of pollutants proposed to be discharged and propose new treatment process units, if necessary, to maintain water quality in Suisun Bay. Therefore, the VIP Amendments will not affect the discharge.	No significant effects previously identified.

4. Biological Resources					
Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.3-4: Potential impacts to special status fisheries could occur with additional water discharges from other non-refinery industrial projects, together with cumulative refinery projects. By continued compliance with the discharge requirements of the refinery's NPDES permit this impact is less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The Benicia Refinery will in consultation with the San Francisco Bay Regional Water Quality Control Board (RWQCB) determine whether a technical study of potential loading impacts will be required to address the mass increase of pollutants proposed to be discharged and propose new treatment process units, if necessary, to maintain water quality in Suisun Bay. Therefore, the VIP Amendments will not affect the discharge.	No significant effects previously identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Interview, various Valero personnel, January 2007.

Resolution 03-4, City of Benicia Planning Commission, A Resolution of the Planning Commission of the City of Benicia Approving a Use Permit for the Valero Certifying the Final Environmental Impact Report, Adopting CEQA Findings and Adopting a Mitigation Monitoring and Reporting Program for the Valero Improvement Project (PLN2002-00022).

Resolution 03-5, City of Benicia Planning Commission, A Resolution of the Planning Commission of the City of Benicia Approving a Use Permit for the Valero Improvement Project (PLN2002-00022).

3.1.5 Cultural Resources

a. *Would the project cause a substantial adverse change in the significance of a historical resource as defined in 15064.5 of the CEQA Guidelines? No*

According to the CEQA Guidelines (Section 15604.5 (a) (3)), generally a resource shall be considered to be “historically significant” if it meets the criteria for listing on the California Register of Historic Resources. Records searches and surveys have been conducted throughout the Benicia Refinery and are documented in the Certified EIR. As discussed in the Certified EIR, one potential historical resource was identified on site that was designated as P-48-000516, or the Benicia Arsenal Igloo Bunker #C-425, located to the northeast of the Refinery Process Block. Disturbance of Bunker #C-425 is not expected as a result of the VIP Amendments, as this area is not in proximity to construction activity.

No other such historic resources are known to be present at the Benicia Refinery. However, there is always the potential that ground-disturbing activities, such as those planned as part of VIP Amendments, could uncover unknown resources with cultural significance. Accordingly, adherence to Mitigation Measure 4.4-1 of the Certified EIR will ensure that impacts to cultural resources remain less than significant.

b. *Would the project cause a substantial adverse change in the significance of an archaeological resource pursuant to 15064.5 of the CEQA Guidelines? No*

The Certified EIR did not identify any significant archaeological resources at the site. However, the development of the proposed VIP Amendments project elements could uncover unknown archaeological resources during construction. Accordingly, adherence to Mitigation Measure 4.4-1 of the Certified EIR will ensure that impacts to archaeological resources remain less than significant.

c. *Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature? No*

The Certified EIR did not identify any significant paleontological resources or unique geologic features within the existing footprint of the Benicia Refinery. As described in the Certified EIR, development, including construction and grading within the Benicia Refinery, could uncover unknown paleontological resources. As such, this potential impact could occur with the project elements of the VIP Amendments, which occur within the existing footprint. Accordingly, adherence to Mitigation Measure 4.4-1 of the Certified EIR will ensure that impacts to unknown paleontological resources or unique geologic features remain less than significant.

d. *Would the project disturb any human remains, including those interred outside of formal cemeteries? No*

As described in the Certified EIR, there is the potential that human remains could be unearthed during grading activities within the existing Benicia Refinery footprint. As such, the additions and modifications associated with the development of the proposed VIP Amendments within the existing refinery footprint could potentially unearth human remains. Accordingly, adherence to Mitigation Measure 4.4-1 of the Certified EIR will ensure that impacts remain less than significant. Additionally, if human remains are discovered, Section 15064.4 (e) (1) of the CEQA Guidelines would be implemented.

5. Cultural Resources

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
<p>Impact 4.4-1: Construction of the refinery modifications may cause substantial adverse changes to the significance of currently unknown cultural resources.</p>	<p>Significant.</p>	<p>Mitigation Measure 4.4-1: Pursuant to CEQA Guidelines 15064.5(f), “provisions for historical or unique archaeological resources accidentally discovered during construction” shall be instituted. Therefore, 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 Valero shall consult with a qualified archaeologist or paleontologist to assess the significance of the find. If any find is determined to be significant, representatives of Valero and the qualified archaeologist and/or paleontologist shall meet to determine the appropriate avoidance measures or other appropriate mitigation. All significant cultural materials recovered shall be subject to scientific analysis, professional museum curation, and a report prepared by the qualified archaeologist according to current professional standards.</p>	<p>Less than Significant with Mitigation.</p>	<p>No. Implementation of the previously identified mitigation measures will prevent any substantial increase in already identified impacts due to changes in the project.</p>	<p>No. No significant effects previously identified with mitigation measures.</p>

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Interviews, Valero personnel, January 2007.

Resolution 03-4, City of Benicia Planning Commission, A Resolution of the Planning Commission of the City of Benicia Approving a Use Permit for the Valero Certifying the Final Environmental Impact Report, Adopting CEQA Findings and Adopting a Mitigation Monitoring and Reporting Program for the Valero Improvement Project (PLN2002-00022).

Resolution 03-5, City of Benicia Planning Commission, A Resolution of the Planning Commission of the City of Benicia Approving a Use Permit for the Valero Improvement Project (PLN2002-00022).

3.1.6 Energy

- a. *Would the project encourage activities that result in the use of large amounts of fuel or energy?*
No

As described in the Certified EIR, VIP would add 23-megawatts (MW) to the Benicia Refinery's current electrical demand of 50 MW. The VIP Amendments would require an additional 5 MW above VIP projected demand. The increased energy demand for the VIP Amendments is associated with the new H2U and equipment involved with the scrubber regeneration process. **Table 3.1.6-1** presents a summary of the changes to the Benicia Refinery's electrical demand as a result of the VIP Amendments.

Table 3.1.6-1 Refinery Electrical Demand

Project	Electrical Change (MW)
Main Stack Scrubber	
Scrubber - larger fans due to increased flow	1
F-105 - Forced Draft combustion fan	1
Shut-down ESPs	-1
Hydrogen Unit	
New H2U	4
Shut-down H2U	-0.5
PSA Not Built	-1
Other Modifications	
Desalter and Misc Process Changes	1.5
Change from VIP	5

The construction of the VIP Amendments will result in a net increase in demand of 5 MW over post-VIP conditions. This increase in demand would be supplied through existing transmission lines from the PG&E electrical grid, and would be well within PG&E's reserve capacity. According to the California Energy Commission's (CEC) most recent five year outlook (CEC, 2006) the CA ISO Northern Region has more than adequate resources to maintain a reserve margin above 5% (approximately 1,190 MW) through 2010. The additional 5 MW demand for electricity from the VIP amendments would not result in a substantial burden on existing reserve electrical capacities, or require modification of existing distribution systems, and would, therefore, not result in a significant impact.

Overall combustion of gaseous fuels (primarily RFG) at the Benicia Refinery, after the implementation of the VIP Amendments, will be lower than the usage projected in the Certified EIR. Increased thermal efficiency of the new H2U furnace will result in reduced energy consumption per unit of hydrogen produced. The new H2U will also generate more steam than it consumes, which will eliminate the need for increased usage of the Benicia Refinery's steam generators projected in the Certified EIR. This reduction in need for production of steam will be partially but not entirely offset by an increase in firing rate of GT-702. The PS furnaces (F-101, F-102, F-103, and F-105) will collectively combust the same amount of fuel as anticipated in the Certified EIR. Therefore, the VIP Amendments will not significantly increase fuel or energy consumption.

The VIP Amendments will reduce the Benicia Refinery's consumption of natural gas. The existing H2U consumes natural gas as its primary feedstock. The new H2U proposed as part of the VIP Amendments will feed primarily RFG. Thus, decommissioning of one train of the existing H2U and replacing its production by operating the new H2U will reduce the amount of natural gas used in producing hydrogen.

b. Would the project use fuel or energy in a wasteful or inefficient manner? No

The new H2U furnace proposed as part of the VIP Amendments will primarily be fueled by RFG and HPU tailgas, and will also use RFG as a process feed. This increased RFG demand will reduce the Benicia Refinery's demand for natural gas and also result in the productive use of refinery fuel gas by reducing refinery fuel gas imbalances. In the absence of the VIP Amendments, an excess of RFG may result in flaring and necessitate reducing process unit rates in order to lower RFG production. The H2U will generate steam as a byproduct of its operations, without increasing fuel consumption for hydrogen production beyond the level projected in the Certified EIR. As discussed in **Section 2.4.3.3**, the Certified EIR anticipated that one of the Benicia Refinery's steam generators, such as SG-1032, would be fired at an increased rate of 100 MMBtu/hr. As a result of the VIP Amendments, this firing rate increase will no longer be necessary. The new H2Us steam production will allow the Benicia Refinery's steam demands to be met without additional firing of existing boilers, resulting in an overall energy savings. This will be partially offset by an increase in firing rate of the gas turbine GT-702 by 70 MMBtu/hr, described in **Section 2.4.4.1**. Overall, the VIP Amendments will reduce the Benicia Refinery's combustion of gaseous fuels by an average of 30 MMBtu/hr relative to the Certified EIR.

An important objective of the proposed VIP Amendments is to reduce energy consumption, increase hydrogen supply, and improve refinery fuel gas balance within the Benicia Refinery.

6. Energy

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.5-1: Operation of VIP facilities would increase electricity consumption. This impact is less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments represent negligible incremental electricity consumption which is offset by new cogeneration capacity; therefore, the VIP Amendments would not cause a significant impact.	No significant effects previously identified.
Impact 4.5-2: Operation of VIP facilities would increase natural gas and other fuels consumption. This impact would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments represent an incremental reduction in fuels consumption; therefore, the VIP Amendments would not cause a significant impact.	No significant effects previously identified.
Impact 4.5-3: Implementation of VIP along with other projects at the Benicia Refinery will result in a net reduction in electrical demand during normal operating conditions, when the cogeneration unit is operating. This impact would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments represent negligible incremental change in electrical demand; therefore, the VIP Amendments would not cause a significant impact.	No significant effects previously identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

Interviews, Valero personnel, January 2007.

Resolution 03-4, City of Benicia Planning Commission, A Resolution of the Planning Commission of the City of Benicia Approving a Use Permit for the Valero Certifying the Final Environmental Impact Report, Adopting CEQA Findings and Adopting a Mitigation Monitoring and Reporting Program for the Valero Improvement Project (PLN2002-00022).

Resolution 03-5, City of Benicia Planning Commission, A Resolution of the Planning Commission of the City of Benicia Approving a Use Permit for the Valero Improvement Project (PLN2002-00022).

3.1.7 Geology and Seismicity

a. Would the project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

- i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning 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? No**
- ii) Strong seismic ground shaking? No**
- iii) Seismic-related ground failure, including liquefaction? No**
- iv) Landslides? No**

The Benicia Refinery is located in the seismically active San Francisco Bay region, which is situated on a plate boundary marked by the San Andreas Fault System and several northwest trending active and potentially active faults. The Certified EIR (EIR Section 4.6.2.2) concluded that there are no known active faults that pass through the Benicia Refinery property, so fault slip is not considered a potential geologic hazard capable of causing damage to equipment at the Benicia Refinery. The nearest active fault to the Benicia Refinery is the Concord-Green Valley fault, as shown on Figure 4.6-1 in the Certified EIR. The Concord-Green Valley fault runs northwesterly and is located approximately 1.5 miles east of the Benicia Refinery. The potential for substantial adverse effects from rupture of an earthquake fault is minimal.

Seismic hazards include ground shaking, liquefaction, lateral spreading, and landslides. As identified in the Certified EIR (EIR Section 4.6.2.2), there is the potential for seismic ground shaking that could result in injuries to persons or structural damage to the VIP improvements. Such conditions could also be encountered with the construction and operation of the proposed VIP Amendments.

Due to the relatively flat terrain of the majority of the Benicia Refinery, the potential for landslides is low. The proposed location for the new H2U, the area proposed for the new employee parking lot, and the relocated firehouse are north of the Refinery Process Block. The H2U will be constructed on a flat plain near the foot of slope to the north and atop a slope to the south. The new employee parking lot will be built in a benched location within the more gentle slope northeast of the H2U. The relocated firehouse will be constructed at the top of a constructed benched location to the northeast of the administration building atop a slope to the south. The bedrock material of the slope is mudstone with a reported out of slope dip of 20 to 60 degrees to the southwest, as discussed in the Geotechnical and Geologic Assessment (URS May 2002). The downhill slope south of the H2U will be equipped with a retaining wall or other engineered shoring and the parking structure will help to locally stabilize the gentle sloping area. Although both areas have the potential to be affected by landslides due to the proximity of a slope to the north, the design features will reduce the likelihood of such an occurrence.

Adherence to Mitigation Measures 4.6-1a through 4.6-1e of the Certified EIR, to address these potential impacts associated with the proposed VIP Amendments, would ensure that these potential impacts remain less than significant.

b. Would the project result in substantial soil erosion or the loss of topsoil? No

The development of the new and modified equipment for the VIP Amendments will mostly take place on relatively flat terrain and should not result in soil erosion or loss of topsoil. The new employee parking lot will be built in a benched location and could create the potential for soil erosion or loss of topsoil. These issues are standard design considering and will be addressed in the design development process for the parking lot, which will be designed to minimize the potential for soil erosion. As described in the Certified EIR, appropriate design and construction measures in accordance with federal, state, and local regulation will be used to design and construct the VIP Amendments. Proper design of the VIP Amendment components consistent with standards specified in the Certified EIR will ensure that soil erosion impacts remain insignificant.

c. *Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse? No*

Most of the VIP Amendments involve equipment installations in the Refinery Process Block. This includes equipment such as the Main Stack Scrubber equipment, F-105, the pre-scrubber, and the desalter vessel. Impacts associated with building within and adjacent to the Refinery Process Block were previously discussed in the Certified EIR. Work sites outside the Refinery Process Block and adjacent land include the new H2U just north of the Refinery Process Block, the new employee parking lot, and the area designated for relocation of the firehouse. These areas were assessed in the Geotechnical and Geologic Assessment (URS May 2002) and were discussed in the Certified EIR.

According to information in the Certified EIR, none of the areas in which VIP Amendments equipment will be constructed are located on a geologic unit or soil that has a high risk of instability due to being situated along existing and filled stream and flood plains or tidal and submerged areas.

As discussed in the Geotechnical and Geologic Assessment, a 3- to 5-foot-thick layer of loose, wet, poorly sorted sand roughly 10 to 15 feet beneath the ground surface is present beneath the southeastern half of the proposed H2U installation site. Subsurface soils in the southwestern part of the site consist of up to approximately 15 feet of clay fill. Because of the presence of the loose, wet sand layer, this area has the potential for liquefaction, lateral spreading, and subsidence. However, as described in the Geotechnical and Geologic Assessment, since this is a limited layer of loose soils, the effect can be eliminated by either removal of the layer or placing foundations on piers into bedrock or other stable soils. Based on the Geotechnical and Geologic Assessment, the bedrock material in the area of the H2U is competent and has good foundation bearing capacity. Also engineered shoring will occur in the area of the H2U. With these provisions in design, the potential for liquefaction, lateral spreading, and subsidence at the proposed H2U location is considered very low.

The new employee parking lot will be built uphill and would tend to reduce the potential for landslides once constructed. The relocated parking lot will be constructed a top a flat area above a slope to the south and would be designed and constructed to minimize the potential for instability. Please refer to part a. of this section for further discussion on the potential of landslides.

As described in the Certified EIR, adherence to Mitigation Measures 4.6-1a through 4.6-1e of the Certified EIR will ensure that there are no construction or operational impacts attributable to lateral spreading, subsidence, and liquefaction. Adherence to these mitigation measures would ensure that these potential impacts remain less than significant for the VIP Amendments as well.

d. *Would the project 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? No*

As described in the Certified EIR, the southern portion of the Benicia Refinery, which includes the WWTP, is located on unconsolidated estuarine and alluvial sediments. Soils with expansive characteristics may have formed over the alluvial soils. Mitigation Measures 4.6-1a through 4.6-1e of the Certified EIR were proposed to ensure that there would be no impacts as a result of construction and operation of VIP project components. No VIP Amendments project components are located in the WWTP area. Nevertheless, adherence to mitigation measures 4.6-1a through 4.6-1e for the VIP Amendments will ensure that any potential impacts remain less than significant, even if the expansive soils are encountered.

- e. ***Would the project 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? No***

No septic tanks are proposed as part of the proposed VIP Amendments. Wastewater generated by project improvements will be managed using the Benicia Refinery's existing infrastructure, including interconnects with the facility's existing wastewater collection and treatment system. No soils related constraints are anticipated.

7. Geology and Seismicity

VIP EIR Impact	VIP EIR Pre-Mitigation Significance	Condition of Approval/ VIP EIR Mitigation Measure	VIP EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
<p>Impact 4.6-1: In the event of a major earthquake in the region, seismic ground shaking could potentially injure persons at the project site due to structural damage or structural failure. Ground shaking could potentially expose persons and property to seismic-related hazards, including localized liquefaction, related ground failure and seismically-induced settlement.</p>	<p>Significant.</p>	<p>Mitigation Measure 4.6-1a: Seismic design consistent with current professional engineering and industry standards shall be used in construction for resistance to strong ground shaking, especially for lateral forces. The implementation of the seismic design criteria as required by the California Building Code will reduce the potential for structural failure, major structural damage, and loss of life, and reduce the primary effects of ground shaking on structures and infrastructures to generally acceptable level. At a minimum, the California Building Code requirements or a more stringent building code shall be followed during design and construction of all elements of VIP. Additional requirements recommended by the project California Certified Engineering Geologist or Geotechnical Engineer, based on site-specific studies and specific project requirements, shall be followed, and become part of the project specifications.</p>	<p>Less than Significant with Mitigation.</p>	<p>No. The proposed VIP Amendments would not cause any new significant impacts due to changes in the project, as these amendments will be mitigated utilizing the same mitigation measures identified in the Certified EIR.</p>	<p>No. Implementation of the previously identified mitigation measures will prevent any substantial increase in already identified impacts due to changes associated with the VIP Amendments.</p>
		<p>Mitigation Measure 4.6-1b: Appropriate grading and design, in accordance with the California Building Code requirements or a more stringent standard, shall be used to reduce the secondary effects of ground shaking on structures and infrastructure. Subsurface site conditions shall be investigated for all project facilities to identify poor foundation materials that may be susceptible to the effects of liquefaction, lateral spreading, and differential settlement. Poor foundation materials shall be removed prior to construction or be subjected to ground improvement techniques. In addition, deep pile foundations shall be driven through the poor foundation soils and into more competent materials.</p>	<p>Less than Significant with Mitigation.</p>	<p>No. The proposed VIP Amendments would not cause any new significant impacts due to changes in the project, as these amendments will be mitigated utilizing the same mitigation measures identified in the Certified EIR.</p>	<p>No. Implementation of the previously identified mitigation measures will prevent any substantial increase in already identified impacts due to changes associated with the VIP Amendments.</p>

7. Geology and Seismicity

VIP EIR Impact	VIP EIR Pre-Mitigation Significance	Condition of Approval/ VIP EIR Mitigation Measure	VIP EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
		Mitigation Measure 4.6-1c: Structural fill placed during the construction of VIP shall be designed to reduce fill settlement with keyways and subsurface drainage, and adequately compacted (i.e., Minimum 90 percent compaction as defined by American Society for Testing and Materials (ASTM D1557)).	Less than Significant with Mitigation.	No. The proposed VIP Amendments would not cause any new significant impacts due to changes in the project, as these amendments will be mitigated utilizing the same mitigation measures identified in the Certified EIR.	No. Implementation of the previously identified mitigation measures will prevent any substantial increase in already identified impacts due to changes associated with VIP Amendments.
		Mitigation Measure 4.6-1d: All structural foundations, aboveground utilities, and underground utilities shall be designed to accommodate estimated settlement without failure, especially across transitions between fills and cuts.	Less than Significant with Mitigation.	No. The proposed VIP Amendments would not cause any new significant Impacts due to changes in the project, as these amendments will be mitigated utilizing the same mitigation measures identified in the Certified EIR.	No. Implementation of the previously identified mitigation measures will prevent any substantial increase in already identified impacts due to changes associated with VIP Amendments.
		Mitigation Measure 4.6-1e: Final design of the proposed improvements shall be made in conjunction with a design-level geotechnical investigation submitted to the City of Benicia for review prior to issuing any grading or construction permits.	Less than Significant with Mitigation.	No. The proposed VIP Amendments would not cause any new significant Impacts due to changes in the project, as these amendments will be mitigated utilizing the same mitigation measures identified in the Certified EIR.	No. This Mitigation Measure has already been implemented (Geotechnical and Geologic Assessment, URS May 2002). Application of the study results to the new construction will prevent any substantial increase in already identified impacts due to changes associated with VIP Amendments.
Impact 4.6-2: Proposed foundation construction could be subjected to the geologic hazards related to expansive soils and natural settlement.	Significant.	Implement 4.6-1a through 4.6-1e.	Less than Significant with Mitigation.	No. The proposed VIP Amendments would not cause any new significant impacts due to changes in the project, as these amendments will be mitigated utilizing the same mitigation measures identified in the Certified EIR.	No. Implementation of the previously identified mitigation measures will prevent any substantial increase in already identified impacts due to changes associated with VIP Amendments.

7. Geology and Seismicity

VIP EIR Impact	VIP EIR Pre-Mitigation Significance	Condition of Approval/ VIP EIR Mitigation Measure	VIP EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.6-3: Construction of additional tanks or treatment units in the crude storage tank area and/or WWTP area could potentially adversely affect the stability of slopes along the retention pond perimeter berms.	Significant.	Mitigation Measure 4.6-3: To reduce potential slope instability hazards related to static and dynamic forces in the retention pond areas, a slope stability analysis of the retention pond perimeter berms shall be conducted by a licensed professional engineer. All recommendations shall be used in the design and construction of the tanks and submitted to the City of Benicia for review.	Less than Significant with Mitigation.	No. The proposed VIP Amendments would not cause any new significant impacts due to changes in the project, as these amendments will be mitigated utilizing the same mitigation measures identified in the Certified EIR.	No. Implementation of the previously identified mitigation measures will prevent any substantial increase in already identified impacts due to changes associated with the VIP Amendments.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

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3.1.8 Public Health

a. *Would the project expose receptors to substantial pollutant concentrations?* **No**

As described in **Section 3.1.2.**, emissions of TACs from stationary sources associated with the proposed VIP Amendments include products of combustion from the H2U furnace and fugitive organic emissions from additional piping components in hydrocarbon service such as valves, flanges, and pumps associated with the new desalter and other process components. Also as described in **Section 3.1.2.**, emissions of TACs from the Main Stack (F-101, F-102, F-103, and F-105) are not expected to change from the Certified EIR because the changes being proposed do not represent an increase in fuel combustion. Indirect emissions of TACs from mobile sources include DPM from trucks transporting materials and wastes associated with the VIP Amendments.

The potential health impacts of the VIP Amendments were assessed in an HRA. Separate HRAs were conducted for the new stationary sources and the increase in emissions from mobile sources. For each analysis, the incremental impacts at the off-site point of maximum impact (PMI) from the VIP Amendments were added to the impacts at the PMI identified in the Certified EIR. The overall impact was then compared to significance levels established by the Office of Environmental Health Hazard Assessment (OEHHA).

Health Risks Associated with Construction

Construction-related emissions are generally short-term in duration but must be evaluated because they can have the potential to impact public health. DPM from diesel-fueled vehicles and off-road construction equipment is the pollutant of greatest concern with respect to construction activities. Construction-related emissions can cause increases in localized concentrations of DPM.

The construction activities are expected to be similar in nature and magnitude to the activities described in the Certified EIR, and the health impacts described will be the same as described in the Certified EIR. The VIP Amendments are not expected to create any additional construction emissions.

Health Risks Associated with Stationary Sources

The HRA for stationary sources was conducted in three steps. First, emissions of TACs from the proposed equipment were estimated. Second, exposure calculations were performed using the Industrial Source Complex – Short Term 3 (ISCST3) dispersion model (version 99155) integral to the CARB Hot Spots Analysis and Reporting Program (HARP) software (Version 1.3, Build No. 23.04.05). Third, results of the exposure calculations along with the cancer potency factor, and chronic non-carcinogenic and acute reference exposure levels (RELs) for each TAC were used to perform the risk characterization to quantify individual health risks. The second and third steps were performed using the HARP software (Version 1.3, Build No. 23.04.05), which includes an integrated ISCST3 dispersion model and risk analysis software for conducting health risk assessments.

The HRA included TAC emissions from the new H2U furnace and fugitive volatile TACs from piping components. TAC emission estimates from the H2U furnace assumed continuous operation at the furnace's maximum capacity. The HRA did not account for reductions in TAC emissions from the decommissioned H2U furnace (F-301 or F-351) in order to provide a conservative evaluation of health risks.

Emissions of TACs from the Main Stack (F-101, F-102, F-103, and F-105) are not expected to change from the Certified EIR because the changes being proposed do not represent an increase in fuel combustion. In addition the operation of the Main Stack Scrubber will not contribute any additional TAC emissions. Therefore, TAC Emissions from the Main Stack were not included in the stationary source HRA. Emissions from other combustion sources will decrease relative to VIP (100 MMBtu/hr decrease for SG-1032, and 70 MMBtu/hr increase for GT-702, or a net reduction of 30 MMBtu/hr), and were also not included in the HRA.

Emissions of TACs from the new H2U furnace, other than ammonia, were derived from source testing of a similar combustion source. Emissions of ammonia from the H2U furnace were based on the proposed BACT outlet concentration.

TAC emissions from fugitive sources were calculated by multiplying the maximum additional POC emissions of 3-tons/year by the greatest weight concentration of each compound in the Benicia Refinery's process streams.

The incremental TAC emission rates for the VIP Amendments stationary sources during normal operations are summarized in **Table 3.1.8-1**. TAC emission estimates and detailed calculations and explanations are provided in **Appendix B**.

Table 3.1.8-1 Incremental TAC Emissions from Stationary Sources During Normal Operations

CAS No	Pollutant	H2U Reformer Furnace		Fugitive Emissions (lb/yr)	Total TAC Emissions (lb/yr)
		Emission Factor (lb/MMBtu)	Emissions (lb/yr) 980 MMBtu/hr		
75-07-0	Acetaldehyde	2.3E-06	2.0E+01	---	2.0E+01
7664-41-7	Ammonia	4.5E-03	3.9E+04	---	3.9E+04
7440-38-2	Arsenic	2.5E-07	2.1E+00	---	2.1E+00
71-43-2	Benzene	2.0E-06	1.7E+01	1.2E+02	1.7E+01
56-55-3	Benzo(a)Anthracene	7.6E-10	6.5E-03	---	6.5E-03
50-32-8	Benzo(a)Pyrene	7.6E-10	6.5E-03	---	6.5E-03
205-99-2	Benzo(b)Fluoranthene	7.6E-10	6.5E-03	---	6.5E-03
205-82-3	Benzo(k)Fluoranthene	7.6E-10	6.5E-03	---	6.5E-03
7440-43-9	Cadmium	9.2E-08	7.9E-01	---	7.9E-01
7440-47-3	Chromium (Total)	9.2E-07	7.9E+00	---	7.9E+00
7440-50-8	Copper	1.1E-06	9.2E+00	---	9.2E+00
53-70-3	Dibenzo(a,h)Anthracene	7.6E-10	6.5E-03	---	6.5E-03
100-41-4	Ethylbenzene	---	---	1.2E+02	0.0E+00
50-00-0	Formaldehyde	1.0E-05	8.7E+01	---	8.7E+01
18540-29-9	Hexavalent Chromium	1.6E-07	1.4E+00	---	1.4E+00
7783-06-4	Hydrogen Sulfide	2.3E-04	1.9E+03	---	1.9E+03
193-39-5	Indeno(1,2,3-cd)Pyrene	7.6E-10	6.5E-03	---	6.5E-03
7439-92-1	Lead	2.7E-07	2.3E+00	---	2.3E+00
7439-96-5	Manganese	4.9E-07	4.2E+00	---	4.2E+00
7439-97-6	Mercury	3.0E-07	2.5E+00	---	2.5E+00
91-20-3	Naphthalene	9.4E-05	8.1E+02	---	8.1E+02
7440-02-0	Nickel	1.9E-06	1.7E+01	---	1.7E+01
108-95-2	Phenol	3.7E-06	3.2E+01	---	3.2E+01
108-88-3	Toluene	5.6E-06	4.8E+01	3.0E+02	4.8E+01
108-38-3	Xylene	2.8E-06	2.4E+01	3.6E+02	2.4E+01
7440-66-6	Zinc	2.8E-06	2.4E+01	---	2.4E+01

Emissions shown in scientific notation: 4.5E-03 = 4.5 x 10⁻³ = 0.0045

The methods used to assess potential human health risks are consistent with the *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* published by the OEHHA (OEHHA 2003).

Stack parameters used for the new H2U furnace represent 100 percent load conditions. Fugitive emissions are assumed to be an area source encompassing the Refinery Process Block, reflecting the fact that new piping components associated with the VIP Amendments may be located at various points throughout the process area. The coordinates are in UTM Zone 10, referenced in USGS NAD27. Building downwash was calculated internally by HARP, using building location and height information from VIP modeling.

The HARP Industrial Source Complex (ISC) module was run using one year (2005) of meteorological data from the Valero Administration Building monitoring station (Station # 8704) to assess the maximum TAC concentrations. This is the nearest monitoring station to the proposed sources. The development of the receptor grid is discussed below.

A comprehensive Cartesian receptor grid extending to approximately 20 km from the Main Stack at the Benicia Refinery was used for the ISCST3 modeling to resolve the maximum ground-level pollutant concentrations. Receptors were generated in UTM Zone 10, NAD27. This receptor grid will be more than sufficient to resolve the maximum impacts and any significant impact area(s).

The Cartesian receptor grid consists of the following receptor spacing:

- Fenceline to 9,842 feet (3,000 m) at 328-foot (100-m) increments;
- Beyond 9,842 feet (3,000 m) to 16,400 feet (5,000 m) at 656-foot (200-m) increments;
- Beyond 3.1 miles (5 km) to 6.2 miles (10 km) at 1,640-foot (500-m) increments; and
- Beyond 6.2 miles (10 km) to 12.4 miles (20 km) at 3,280-foot (1,000-m) increments.

Discrete receptors were placed approximately every 164 feet (50 m) along the plant fenceline for increased resolution of impacts along this boundary. The Cartesian and fenceline receptors used in the CO AERMOD modeling were imported to HARP.

Terrain elevations were acquired from DEM data obtained from USGS. AERMAP was used to develop the receptor terrain elevations and imported into HARP. All of the DEM files were in UTM Zone 10 and referenced to NAD27.

Carcinogenic risks and chronic non-carcinogenic and acute health effects were assessed using the dispersion modeling described above and numerical values of toxicity provided by OEHHA. Exposure pathways included inhalation, homegrown produce (using default Urban ingestion fractions), and dermal, soil, and mother's milk absorption.

The following HARP modeling options were used for the risk analysis to estimate potential health impacts.

- Residential Cancer Risk – Derived (Adjusted) Method
- Chronic Hazard Index – Derived (OEHHA) Method
- Acute Hazard Index – Simple (Concurrent Max)

For the cancer and chronic hazard index impacts at off-site worker receptors, the HARP modeling option "modeled GLC and default exposure assumptions" was used. The cancer potency factors and RELs used are consistent with the current values as determined by OEHHA and as provided in the HARP software.

Table 3.1.8-2 presents the risk assessment results for each group of receptors, as applicable. The predicted cancer risk does not exceed ten in one million, and the predicted chronic non-carcinogenic and acute hazard indices (HIs) do not exceed 1.0 at any off-site receptor. Therefore, the incremental stationary source emissions associated with the VIP Amendments will result in a less-than-significant impact with respect to exposure of any sensitive receptors to TAC pollutant concentrations.

Table 3.1.8-2 Maximum Predicted Risks Due to Stationary Sources

Receptor	Cancer Risk (Per Million)	Chronic Hazard Index	Acute Hazard Index
VIP Amendments – Maximum Residential	0.453	0.00122	0.0068
VIP Amendments – Maximum Off-Site	0.598	0.00161	0.0078
<i>CEQA Significance Threshold</i>	10.0	1.0	1.0
Significant? (Yes/No)	No	No	No

Health Risks Associated with Mobile Sources

The VIP Amendments will result in a potential increase of truck transport trips to and from the Benicia Refinery beyond that of which was analyzed in the Certified EIR. Additional truck traffic is associated with the transportation of additional wet solid waste from the scrubber, additional aqueous ammonia deliveries for the new H₂U emissions controls, and ammonia needed for F-105 NO_x emission control. These deliveries and waste shipments will result in two additional truck trips per week on average. The trucks will be diesel-fueled and will emit DPM, classified as a carcinogenic TAC by the State of California. Therefore, a health risk assessment of the potential incremental cancer risk to residential populations along the truck transport route from the increase in export truck traffic was performed.

The truck routes are assumed to include the leg of I-680 between Highway 4 in Martinez, California and the Benicia Refinery, crossing the Benicia Bridge. For the purpose of conducting a risk analysis, it was assumed that all additional trucks would be completing a round trip along this route (i.e. 4 total truck trips per week). Since other truck routes will have fewer than two additional trucks per week, the route on I-680 from Highway 4 to the Benicia Refinery is assumed to represent the “worst-case” exposure scenario. Therefore, only this region was included in the risk assessment.

The transport route was modeled using meteorological data from the Shell East monitoring station (Station #2742), which is considered representative of the modeled area because it is located near the highway along the transport route.

The truck route was simulated with the ISCST3 module in HARP (Version 1.3, Build No. 23.04.05) as a series of volume sources spaced 328 feet (100 m) apart, as recommended by the USEPA’s ISC Model guidance (USEPA, 1995). That source spacing was chosen because it is twice the assumed average 164-foot (50 m) width of the roadway along the truck route. Assuming a source spacing of 328 feet (100 m), a total of 100 volume sources were used to represent emissions along the truck route.

Truck DPM exhaust emission factors were developed using EMFAC 2007 for the BAAQMD airshed. Assuming an average truck speed of 55 miles per hour, DPM emissions from heavy-duty diesel trucks are estimated to be 0.341 grams/mile. Overall, the increase in truck traffic due to the VIP Amendments will incrementally increase DPM emissions within the BAAQMD region by approximately 7.8 lb/year.

Based on 24-hour operation of truck transport and assuming emissions are spread evenly throughout the day and throughout the year, the individual emission rate for a single volume source was 0.0097 lb/year-source, as computed below:

$$\begin{aligned}
 ER_{source} &= 0.341 \text{ g/mi-source} \times 2 \text{ trucks/week} \times 2 \text{ trips/truck} \times \text{week}/7 \text{ days} \times \text{day}/24 \text{ hr} \\
 &\quad \times \text{mi}/5280 \text{ ft} \times 3.28 \text{ ft/m} \times 100 \text{ m/source} \times 1 \text{ lb}/454 \text{ g} \times 8,760 \text{ hr/year} \\
 &= 0.0097 \text{ lb/year –source}
 \end{aligned}$$

Where ER_{source} = Emission rate of DPM per source

The height of the emissions from each volume source was assumed to be 13 feet (4.0 m), approximately the height of the exhaust of a truck. The initial horizontal and vertical plume standard deviations were computed following guidance from Table 3-1 of the ISCST3 User’s Guide (USEPA, 1995). For the horizontal standard deviation, the source-to-source spacing of 328 feet (100 m) was divided by 2.15 to yield 152 feet (46.5 m). For the vertical standard deviation, the truck cab top was assumed equal to exhaust height, and the standard deviation was estimated as the cab height of 13 feet (4 m) divided by 2.15 to yield 6.1 feet (1.86 m). The use of the truck cab top for estimating the vertical standard deviation is conservative (i.e., likely underestimates the true value) because it does not account for any increase in vertical dispersion produced by the mechanical wake of moving vehicles in multiple adjacent lanes of traffic or for the plume rise from the exhaust stacks.

Receptors with a spacing of 328 feet (100 m) were placed along the entire truck route. The grid was placed around the transport route beginning approximately 164 feet (50 m) from the centerline of the roadway out to 1,148 feet (350 m), i.e., three rows of receptors following the roadway beginning approximately 164 feet (50 m) from the centerline. No receptors were placed along the Benicia Bridge. A total of 333 receptors were modeled. Terrain elevations were obtained from DEM files.

Carcinogenic risks and chronic non-carcinogenic health effects were assessed at each receptor using the dispersion modeling described above and numerical values of toxicity provided by OEHHA. DPM has no risk factor values for acute toxicity. The only exposure pathway modeled was the inhalation pathway, as this is the only pathway for which DPM health risk values have been developed. Risks were calculated at receptor locations using the appropriate exposure assumptions incorporated into HARP, as described above for stationary sources.

Table 3.1.8-3 presents the risk assessment results for truck transport. The predicted cancer risk does not exceed ten in one million, and the predicted chronic non-carcinogenic HI does not exceed 1.0 at any receptor. Therefore, incremental effect of the VIP Amendments will result in a less-than-significant impact with respect to expose of sensitive receptors to substantial TAC pollutant concentrations.

Table 3.1.8-3 Maximum Predicted Risks Due to Mobile Sources

Receptor	Cancer Risk (Per Million)	Chronic Hazard Index
VIP Amendments – Maximum Impact	0.024	0.000016
CEQA Significance Threshold	10.0	1.0
Significant? (Yes/No)	No	No

8. Public Health					
VIP EIR Impact	VIP EIR Pre-Mitigation Significance	Condition of Approval/ VIP EIR Mitigation Measure	VIP EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.7-1: Public exposure to toxic air contaminant (TAC) emissions from VIP would result in an increase in health risks. The increases in health risks are the result of exposure to both carcinogenic and non-carcinogenic substances. However, the increases would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. Public exposure to TACs from the VIP Amendments would increase beyond that analyzed in VIP. The increases in health risks are the result of exposure to both carcinogenic and non-carcinogenic substances. However, the incremental increases and cumulative impacts would be less than significant.	No significant impacts previously identified.
Impact 4.7-2: The proposed project, along with other ongoing and approved projects would lead to a net reduction in emissions of TACs when compared to TAC emissions from the Refinery under existing conditions. These TACs are responsible for public health impacts. The reduction in TAC emissions would constitute a net improvement in health risks and the impact would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments would cause a slight incremental increase in emissions of TACs. However, this incremental increase would not result in significant effects by itself, and would not result in a cumulative significant impact.	No significant impacts previously identified.

References:

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Bay Area Air Quality Management District, BACT/TBACT Workbook, located at <http://www.baaqmd.gov/pmt/bactworkbook/default.htm>.

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California Air Resources Board, HARP User Guide, December 2003.

California Office of Environmental Health Hazard Assessment, Air Toxics Hot Spots Program Risk Assessment Guidelines, August 2003.

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Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

Interviews, Valero personnel, January 2007.

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3.1.9 Public Safety

a. *Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials? No*

As with the analysis presented in the Certified EIR (Section 4.8.4.1), construction of the components of the proposed VIP Amendments would employ hazardous materials normally associated with construction of such facilities, including fuels, oils, lubricants, and paint. All use of hazardous materials during construction would have to comply with applicable local, state, and federal regulations, as would any waste products associated with such use. The operation of the Main Stack Scrubber will use an amine-based reagent similar to that currently used at the refinery. It does not represent a new or significantly increased safety hazard. The Main Stack Scrubber will cause a relatively small increase in hazardous waste generation. This waste will be managed and disposed using the refinery's existing waste management systems, and will not result in a substantial increased risk to the public. The SCR units for the H2U furnace and new CO furnace will use aqueous ammonia. The refinery's existing aqueous ammonia storage and delivery systems are adequate for the increased ammonia usage, so ammonia storage capacity (the largest vessel containing ammonia) will not increase. Accordingly, the increase in ammonia usage will not substantially increase hazards to the public. Other equipment associated with the VIP Amendments would not use significant quantities of hazardous materials.

The new H2U, including the HPU, would contain combustible materials such as hydrogen and hydrocarbons that could potentially produce an explosion. Valero conducted a review of the explosion potential of the new H2U during the initial siting process for this process unit. This study determined that the impact from a worst-case explosion would extend no farther than 0.2 miles from the H2U site. This impact radius is within Valero's property and would not result in an off-site impact.

b. *Would the project 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? No*

The new equipment could pose a risk to public safety because of the potential fire hazards. However, refinery fires generally pose little risk to the public because they are confined to a limited area and refineries have extensive fire water systems. All equipment associated with the VIP Amendments is buffered from surrounding uses and has fire water systems to address the possibility of fire.

The VIP Amendments will increase the Benicia Refinery's use of aqueous ammonia. This material will be centrally stored in an existing aqueous ammonia tank. The VIP Amendments will not require additional storage vessels for aqueous ammonia and therefore will not increase the potential for tank failure. Ammonia will be received through the Benicia Refinery's existing aqueous ammonia delivery system.

c. *Would the project emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school? No*

The equipment associated with the VIP Amendments will be sources of hazardous emissions. These impacts were addressed for potential public health impacts (see **Section 3.1.8.**). No equipment in the VIP Amendments is located within one-quarter mile of an existing or proposed school.

d. *Would the project 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? No*

The project would not create a significant hazard to the public or the environment by being located on a site which is listed under Government Code section 65962.5 list (the Cortese List), because the project site is not included on the Section 65962.5 list. For the purpose of this analysis, the Cortese list, maintained by the DTSC, was searched on-line.

- e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area? No**

The equipment associated with the proposed VIP Amendments is not located within an airport land use plan or within two miles of a public airport or public use airport.

- f. For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area? No**

The new equipment for the proposed VIP Amendments is not located within the vicinity of a private airport.

- g. Would the project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan? No**

The existing Benicia Refinery has standard operating procedures for emergency response and emergency evacuation. The construction and operation of the proposed VIP Amendments would occur with those procedures in place and would not impair implementation of those procedures or physically interfere with adopted emergency response and evacuation plans.

- h. Would the project 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? No**

The new H2U area will be managed to remove vegetation that could fuel wildland fires. The refinery also has extensive fire water systems that can be used to suppress wildland fires from adjacent areas if they pose a threat. All other equipment associated with the VIP Amendments will be located in fully developed areas, away from substantial vegetation.

9. Public Safety

VIP EIR Impact	VIP EIR Pre-Mitigation Significance	Condition of Approval/ VIP EIR Mitigation Measure	VIP EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.8-1: Possible accidental releases of acutely hazardous substances that might result from VIP were evaluated, and none were found to cause an unhealthful offsite impact or would not occur within the expected 30-year life of the plant. The impacts would therefore be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments represent a negligible additional source of accidental releases of hazardous substances which would not cause a significant impact.	No significant impacts previously identified.
Impact 4.8-2: Other industrial projects in the region are located too far away from the refinery to cause potential cumulative public safety impacts. In most cases, impacts from fires, explosions, or toxic gas releases are limited to the property fenceline or near the fenceline. Also, the probability of an accidental release occurring from a cumulative project at the same time that an accident would occur at VIP would be extremely low. Therefore, cumulative impacts would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The VIP Amendments would not result in significant cumulative public safety impacts, for the reasons described in the Certified EIR.	No significant impacts previously identified.
Impact 4.8-3: As stated in the transportation impacts section above, the methyl tert butyl ether (MTBE) phase-out project will result in the elimination of two marine visits per month, thus resulting in a reduction of marine visits per month, thus resulting in a reduction of marine vessel trips to the refinery. Therefore cumulative public safety impacts related to marine transportation will be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The VIP Amendments will have no effect on refinery marine traffic.	No significant impacts previously identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

URS Corporation, *Health Risk Assessment, Valero Improvement Project, Benicia, California Refinery*, June 2002.

3.1.10 Hydrology and Water Quality

a. *Would the project violate any water quality standards or waste discharge requirements?* **No**

The VIP Amendments project components that generate wastewater will be located within and adjacent to the Refinery Process Block. As described in the Certified EIR, wastewater from the Refinery Process Block, adjacent land, and the area north of the Refinery Process Block is collected and combined along with other wastewater collected within drainage Parcel 1 and directed to the WWTP. Parcel 1 is depicted in Figure 4.9-1 of the Certified EIR. As described in the Certified EIR, wastewater directed to the WWTP from Parcel 1 will be treated to comply with the National Pollutant Discharge Elimination System (NPDES) permit prior to discharge to Suisun Bay. The Benicia Refinery currently operates under NPDES Permit Number CA0005550 issued in 2002 and expires on November 30, 2007. In May 2007, Valero submitted a NPDES permit renewal application.

Wastewater loadings to the Benicia Refinery WWTP are discussed in further detail in **Section 3.1.15**. Qualitative and quantitative descriptions of the estimated incremental wastewater load from the VIP Amendments are summarized in **Table 3.1.10-1**.

Table 3.1.10-1 VIP Amendments Wastewater Discharge Summary to Benicia Refinery WWTP

Operating Unit	Incremental Increase to WWTP (gallons/day)	Description of Water Quality
VIP Amendments		
Pre-Scrubber Evaporative Losses	None	No water to WWTP
Pre-Scrubber Purge	57,600	Stream expected to contain 138 lb/year of nickel and vanadium and aluminum.
Amine Purification Purge	8,600	This stream included in Certified EIR to be recycled. Will contain heat stable salts similar to other refinery amine streams.
Caustic Polisher	14,400	Stream expected to contain sulfates
Un-fired Waste Heat Boiler Blowdown	4,300	Blowdown from purified boiler feed water; negligible contaminant loading.
Steam Condensate Recovery Project	-21,500 ¹	Reduces load to WWTP
VIP Amendments Subtotal	63,400	
Cumulative Projects		
Naphtha Reformer Unit (NRU) Catalyst Regeneration Facility Project	-100,800	Reduced refinery process stream with significant organic loadings
TOTAL	-37,400	Reduced overall rate to WWTP; increase of nickel, vanadium, and aluminum; reduction in organics.

Notes:

1. The Steam Condensate Recovery Project will reduce water consumption by over 21,500 gallons/day, however, the minimum project objectives were assumed in this analysis.

The WWTP, through planned modifications addressed in the Certified EIR, would treat additional wastewater loading from the scrubber's unfired waste heat boiler blowdown and miscellaneous water usage. These streams will have typical characteristics of other refinery wastewater streams and thus will be effectively treated by the WWTP. The pre-scrubber purge and caustic polisher purge may alter the WWTP discharge characteristics due to the increases of nickel, vanadium, aluminum, and sulfates.

As required by its current NPDES permit and consistent with the Certified EIR in implementing VIP and the VIP Amendments, the Benicia Refinery will, in consultation with the San Francisco Bay Regional Water Quality Control Board (RWQCB), determine whether a technical study of potential loading impacts will be required to address the mass increase of pollutants proposed to be discharged and propose new treatment process units, if necessary, to maintain water quality in Suisun Bay. Therefore, no degradation of water quality will occur and the Benicia Refinery will not violate any water quality standards or waste discharge requirements due to implementation of the VIP Amendments.

b. Would the project 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)? No

As with the project components of VIP, the construction of the proposed VIP Amendments will not intercept or impact groundwater. The operation of the proposed VIP Amendments will not require the use of groundwater and their location will not interfere substantially with groundwater recharge.

c. Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site? No

The storm water from the proposed locations of the VIP Amendments in and adjacent to the Refinery Process Block and north of the Refinery Process Block will be designed to be collected and conveyed to the Benicia Refinery's WWTP. The storm water is treated at the WWTP to comply with the refinery's NPDES permit prior to discharge to Suisun Bay. Therefore, there will be no net increase of storm water from these areas to the WWTP and no alteration of the existing drainage pattern of the Refinery Process Block would occur.

Construction of the VIP Amendments will utilize Best Management Practices (BMPs) required by the state general permit for construction to minimize erosion and siltation on site or off site and to avoid impacts to biological resources.

Storm water from the new employee parking lot will be designed to be diverted to existing outfalls so that post-construction runoff rates equal pre-construction rates.

Storm water from the relocated firehouse area, to northeast of the Administration Building in the Fuels Terminal, will also be diverted to existing outfalls so that post-construction runoff rates equal pre-construction rates.

Based on these design features, the VIP Amendments will not alter the existing drainage pattern in a manner that could result in substantial erosion or siltation on or off site.

d. Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site? No

As described above, the storm water from the proposed locations of the VIP Amendments in and adjacent to the Refinery Process Block and north of the Refinery Process Block will be collected and will continue to be conveyed to the Benicia Refinery's WWTP. Therefore, there will be no net increase of storm water from these areas to the WWTP and no alteration of the existing drainage pattern of the Refinery Process Block would occur.

Storm water from the new employee parking lot and relocated firehouse will be designed so that post-construction runoff rates equal pre-construction rates and storm water is routed to existing outfalls.

Based on these design features, the VIP Amendments will not alter the existing drainage pattern in a manner that could result in flooding on- or off-site.

e. Would the project create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff? No

As stated in the Certified EIR, storm water drainage from the Main Refinery Area, (which includes the Refinery Process Block, tank farms [other than the Crude Tank Farm], Administration Area, Fuels Terminal and undeveloped areas) is treated in the WWTP for the Benicia Refinery. Since the VIP Amendments do not alter the size or drainage patterns of the Main Refinery Area, the VIP Amendments do not increase the amount of storm water processed by the WWTP. The capacity of the WWTP is sufficient to accommodate the current storm water runoff; therefore, the WWTP will continue to have sufficient capacity to accept storm water from the improvements associated with the VIP Amendments.

Storm water from the VIP Amendments in and adjacent to the Refinery Process Block and north of the Refinery Process Block will be collected and conveyed to the Benicia Refinery WWTP. As described in the Certified EIR, the WWTP after VIP would treat and discharge an average rate of 1,775 gpm or 2.56 million gallons per day (MGD). With VIP Amendments, the load to the WWTP would increase by approximately 63,400 gpd (44 gpm). However, the NRU Catalyst Regeneration Facility Project, independently implemented in April 2007, reduced load to the WWTP by about 100,800 gpd (70 gpm). Cumulatively, the NRU Catalyst Regeneration Facility Project when taken with the VIP Amendments represents a reduction of 37,400 gpd (26 gpm) of flow to the WWTP. The WWTP has a hydraulic capacity of 2,500 gpm (3.6 MGD) and the VIP Amendments will not increase storm water flow to the WWTP. Therefore, since wastewater flows after the VIP Amendments will be less than the Certified EIR basis, and there is no increase in storm water flows, the Benicia Refinery WWTP has sufficient capacity to manage storm water and wastewater flows from the VIP Amendments.

Storm water collected from the new employee parking lot and the relocated firehouse site will be designed to flow to existing outfalls and will be designed so that post-construction runoff rates equal pre-construction rates. Runoff from these areas is not expected to contain additional pollutants.

f. Would the project otherwise substantially degrade water quality? No

As with the construction and operation of VIP project components, all of the runoff and other wastewater resulting from construction and operation of facilities associated with the VIP Amendments will be managed to comply with federal, state, and local regulations including the Refinery's NPDES permit and the construction and industrial storm water general permit. Furthermore, as required by its current NPDES permit and consistent with the Certified EIR in implementing VIP and the VIP Amendments, the Benicia Refinery will in consultation with the San Francisco Bay RWQCB determine whether a technical study of potential loading impacts will be required to address the mass increase of pollutants proposed to be discharged and propose new treatment process units, if necessary, to maintain water quality in Suisun Bay. Therefore, no degradation of water quality will occur.

g. Would the project 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? No

As with VIP project components, no housing will be constructed as part of the proposed VIP Amendments.

h. Would the project place within a 100-year flood hazard area structures which would impede or redirect flood flows? No

As described in the Certified EIR, the Benicia Refinery WWTP is located within a 100-year flood zone. Modifications to the Benicia Refinery WWTP were evaluated in the Certified EIR and these modifications will not change as a result of the VIP Amendments. As stated under Impact 4.9-6 of the Certified EIR, additions to the facilities at the WWTP are subject to the City of Benicia Floodplain Management Policy. Therefore, floodplain mitigation measures in accordance with the policy will be required to be included in VIP design basis. Adherence to these same mitigation measures for the VIP Amendments will also ensure that any potential impacts remain less than significant for any structures located within the 100-year flood hazard area.

i. Would the project 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? No

As discussed above, the WWTP is located within a 100-year flood zone. The mitigation measures referenced in Section 4.9 of the Certified EIR, for VIP modifications within the WWTP, will be adhered to for modifications in the area of the WWTP. These measures indicate that if additions to the facilities at the WWTP are determined to be necessary, flood hazard mitigation measures in accordance with the City of Benicia Floodplain Management Policy are required to be included in the design criteria. The design criteria will comply with construction standards established by the California Building Code. The remainder of the proposed project components associated with the VIP Amendments are located outside of the 100-year flood zone. Therefore, the project is not expected to expose people or structures to a significant risk of loss, injury, or death involving flooding.

j. Would the project inundation by seiche, tsunami, or mudflow? No

As described in the Certified EIR, the area within the vicinity of the Benicia Refinery boundary is not subject to inundation by seiche, tsunami, or mudflow. Therefore, the proposed VIP Amendments will not be located in any areas that are subject to seiche, tsunami, or mudflow hazards.

10. Hydrology and Water Quality

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
<p>Impact 4.9-1: In combination, additional processed wastewater and storm water runoff resulting from components of the project could potentially exceed the maximum hydraulic capacity of the system and exceed the capacity of the wastewater treatment retention area. This impact would be less than significant.</p>	<p>Less than Significant.</p>	<p>No Mitigation Required.</p>	<p>No Mitigation Required. Less than Significant.</p>	<p>No. The proposed VIP Amendments when taken with the NRU Catalyst Regeneration Facility Project represent a reduction in flow of process water to the WWTP and does not change storm water flows and thus would not cause a significant impact.</p>	<p>No significant impacts were previously identified.</p>
<p>Impact 4.9-2: The proposed additional throughput and the additional wastewater associated with new and modified process units would increase the mass loading in the wastewater stream. The WWTP is required to adequately treat the increase in the mass loading so as not to exceed the limits required in the NPDES permit for the refinery's discharge. This impact is less than significant.</p>	<p>Less than Significant.</p>	<p>No Mitigation Required.</p>	<p>No Mitigation Required. Less than Significant.</p>	<p>No. As required by its current NPDES permit and consistent with the Certified EIR in implementing VIP and the VIP Amendments, the Benicia Refinery will in consultation with the San Francisco Bay Regional Water Quality Control Board determine whether a technical study of potential loading impacts will be required to address the mass increase of pollutants proposed to be discharged and propose new treatment process units, if necessary, to maintain water quality in Suisun Bay. The Benicia Refinery will continue to be required not to exceed the limits set forth in the NPDES permit. Therefore, this impact will be made less than significant.</p>	<p>No significant impacts were previously identified.</p>

10. Hydrology and Water Quality

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
<p>Impact 4.9-3: The increase of crude throughput and the potential processing of a lower grade of crude would result in increased solids loading to the wastewater system. A portion of these solids are treated on site within the CKR and a portion is accumulated as a processed sludge that is disposed offsite. This impact is less than significant.</p>	<p>Less than Significant.</p>	<p>No Mitigation Required.</p>	<p>No Mitigation Required. Less than Significant.</p>	<p>No. As required by its current NPDES permit and consistent with the Certified EIR in implementing VIP components and the VIP Amendments, the Benicia Refinery will in consultation with the San Francisco Bay Regional Water Quality Control Board determine whether a technical study of potential loading impacts will be required to address the mass increase of pollutants proposed to be discharged and propose new treatment process units, if necessary, to maintain water quality in Suisun Bay. The Benicia Refinery will continue to be required not to exceed the limits set forth in the NPDES permit. Therefore, this impact will be made less than significant.</p>	<p>No significant impacts were previously identified.</p>

10. Hydrology and Water Quality

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.9-4: Depletion of groundwater supplies due to the increased impervious surface area could potentially decrease groundwater resources. This impact is less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments project elements represent a negligible additional source of storm water runoff and potential use of groundwater in the area is restricted due to existing groundwater contamination at the site. There fore, this impact is less than significant.	No significant impacts were previously identified.
Impact 4.9-5: Depending on the particular component of the proposed project, varying amounts of wastewater would be generated by construction activities. This wastewater could contain entrained sediment, petroleum constituents, or other contaminants generated during the construction operations. Provided the applicant adheres to the grading and construction plan and city policies and programs this impact is less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. Compliance with the grading and construction plan and city policies and programs will ensure that wastewater associated with construction of the proposed VIP Amendments elements would not cause a significant impact.	No significant impacts were previously identified.

10. Hydrology and Water Quality

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.9-6: Wastewater treatment facilities are located in the 100-year floodplain and new facilities would be subject to flooding. This impact is less than significant.	Less than Significant.	No Mitigation Required. Use Permit Condition 16: Valero shall submit Storm Water Pollution Prevention Plans to the City of Benicia when required under the City's Grading Ordinance for any component or group of components of the Valero Improvement Project. If wastewater plant improvements are to be constructed in a 100-year flood zone, Valero shall comply with the City of Benicia Floodplain Management Policy in designing the improvements and shall document such compliance when it applies for associated building and grading permits.	No Mitigation Required. Less than Significant.	No. Compliance with the City of Benicia Floodplain Management Policy will ensure that wastewater associated with construction of the proposed VIP Amendments elements would not cause a significant impact.	No significant impacts were previously identified.
Impact 4.9-7: The accumulative wastewater and storm water flows from the project and other refinery and non-refinery projects would increase pollutant discharges to the Bay. This would be a less than significant impact.	Less than Significant.	No Mitigation Required. Use Permit Condition 15: Valero shall provide the City with copies of its Anti-Degradation Report and, when requested, monthly self-monitoring reports when those reports are submitted to the Regional Water Quality Control Board (RWQCB). The documents shall be provided at no cost to the City. Also See Use Permit Condition 16-discussed above.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments when taken with the NRU Catalyst Regeneration Facility Project represent a reduction in flow to the WWTP and subsequently a decrease in wastewater discharge to Suisun Bay. Therefore, wastewater flow would not cause a significant cumulative impact.	No significant impacts were previously identified.
Impact 4.9-8: Cumulatively, the storm water generated from VIP, together with other refinery projects and the storm water generated from other non-refinery projects may potentially have a downstream flooding effect. This would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments project elements represent a negligible additional source of storm water flow. Therefore, storm water flow would not cause the cumulative impact to be significant.	No significant impacts were previously identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

Interview, Valero personnel, January 2007.

Technical memorandum entitled Amendment to the Water Supply Evaluation for the Valero Improvement Project, October 2002, prepared by Sierra Processing Systems, Inc., Daniel E. Glaze, Vice President for Environmental Affairs, dated January 22, 2007.

City of Benicia Water Study prepared by Environmental Science Associates (ESA), dated October 2002.

Federal Emergency Management Agency Flood Insurance Rate Map, Community Panel Number 0603680004C, dated 8/3/1989.

3.1.11 Land Use, Plans and Policies

Since certification of the Certified EIR in April 2003, Valero is not aware of changes in surrounding land uses or General Plan and zoning designations, or any other changes in plans, policies, or ordinances in Benicia that would be relevant to the proposed VIP Amendments project elements. One change of note is the City's adjustment of the Land Use Diagram, which was updated in November 2003, to reflect Measure K amendments; however, this adjustment has no impact on the land use designations at or surrounding the Benicia Refinery.

a. *Would the project physically divide an established community? No*

The proposed VIP Amendments will occur within the bounds of the existing Benicia Refinery. Areas designated for proposed VIP Amendments are located within the existing industrial area (EIR Figure 2-1). No development related to the VIP Amendments project elements would occur within existing open space buffers and there are no public roads that pass through the facility. Therefore, the new and modified equipment for the proposed VIP Amendments would not physically divide an established community.

b. *Would the project 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? No*

The project does not conflict with any applicable plans, policies, or ordinances. The Benicia Refinery exists within the geographic area named in the City of Benicia General Plan as the Benicia Industrial Park. The land use designation for the area to be utilized for the VIP Amendments is designated General Industrial (IG) by the Benicia Zoning Ordinance and the City of Benicia General Plan, as shown in the Certified EIR Figure 4.10-1. The project elements of the VIP Amendments are allowed uses in the IG zone.

c. *Would the project conflict with any applicable habitat conservation plan or natural community conservation plan? No*

As discussed in the Certified EIR (EIR Section 4.10.4.4), VIP would not conflict with any habitat conservation plan or natural community plan. Locations of project elements of the VIP Amendments outside of the area discussed in the Certified EIR are within the boundary of the Benicia Refinery. All of the project elements are located within disturbed areas within the Benicia Refinery boundaries, with the exception of the new employee parking lot. Proposed VIP Amendments in the areas described, as with the areas identified in the Certified EIR, are located in a developed and industrial area and will not conflict with any habitat conservation plans or natural community conservation plan.

As stated under impact 4.10-4 of the Certified EIR, the VIP project area is located outside the Marsh Protection Area identified in the Suisun Marsh Local Protection Program (SMLP Program); therefore, the Program is not directly applicable to VIP. Areas identified for the VIP Amendments are also located outside of the Marsh Protection Area. The SMLP Program does, however, contain policies that focus on the construction of new utilities within the marsh protection zone. One of the Benicia Refinery's effluent outfalls, which will not be physically altered or otherwise modified, discharges at a point approximately 1,100 feet into Suisun Bay, within the marsh protected zone. The SMLP Program requires that disposal of wastewater from the existing outfall follow requirements of the RWQCB and Solano County Health Department. As required by its current NPDES permit and consistent with the Certified EIR in implementing VIP and the VIP Amendments, the Benicia Refinery will, in consultation with the San Francisco Bay Regional Water Quality Control Board (RWQCB), determine whether a technical study of potential loading impacts will be required to address the mass increase of pollutants proposed to be discharged and propose new treatment process units, if necessary, to maintain water quality in Suisun Bay. Adherence to these requirements will ensure that potential impacts to the Suisun Marsh remain less than significant. Therefore, the VIP Amendments would continue to have no impact on a habitat conservation plan or a natural community plan.

11. Land Use, Plans and Policies					
Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.10-1: Construction of new refinery components and on-site improvements may result in intermittent impacts to adjacent industrial uses and nearby residences due to traffic congestion, air emissions, noise increases, view disruptions, and public safety. This impact is less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. No Impact.	No. Construction associated with the proposed VIP Amendments represents a short-term and negligible source of impacts to adjacent uses, which are not significantly different than what was evaluated for construction impacts in the Certified EIR. The underlying circumstances regarding adjacent industrial uses and nearby residences have not materially changed since the Certified EIR.	No previously significant impacts identified.
Impact 4.10-2: The project would not conflict with established plans, policies, and ordinances in Benicia. No impact would occur.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments will not conflict with any established plans, policies, or ordinances in the City of Benicia, and there have been no relevant changes in such plans, policies, or ordinances since the Certified EIR.	No previously significant impacts identified.
Impact 4.10-3: The project would not potentially divide an established community. No impact would occur.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments would not divide an established community.	No previously significant impacts identified.
Impact 4.10-4: The project would not affect a habitat conservation plan or natural community plan. No impact would occur.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments would have no effect on a habitat conservation plan or a natural community plan.	No previously significant impacts identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

City of Benicia General Plan and Land Use website viewed at
<http://www.ci.benicia.ca.us/benicia-generalplan.php>

3.1.12 Noise

- a. ***Would the project result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies? No***

It is expected that the construction of the proposed VIP Amendments (i.e., the H2U and site grading for parking needed to replace the parking area to be used for the new H2U and site grading and construction of the relocated firehouse) will be performed without the need for pile drivers. For all other construction equipment, the analysis of Impact 4.11-1 of the Certified EIR found that noise levels would not exceed performance standards in the City's General Plan or applicable noise regulations in the City Municipal Code. However, if pile driving proves necessary, implementation of Mitigation Measure 4.11-1 will ensure that noise impacts remain less than significant as discussed below. The equipment changes associated with the VIP Amendments will not result in a significant incremental increase in sound levels within the Benicia Refinery property compared to the noise generated by VIP previously evaluated for the Certified EIR. In addition, the incremental increase associated with the VIP Amendments sound levels will not exceed the standards at the property line for off-site receptors established in the local general plan or noise ordinance. The VIP Amendments would add the following potential noise-generating equipment:

1. The modified scrubber arrangement utilizes similar equipment as was previously analyzed in the Certified EIR (EIR Section 4.11). The potentially noise-generating equipment added by the VIP Amendments is listed in **Table 3.1.12-1**.

Table 3.1.12-1 Additional Noise Generating Equipment

Equipment Type	Quantity	Power Rating (HP)
Forced Draft Fan on F-105	1	1,000

2. The Certified EIR planned modifications to the H2U will not be done. Instead, one of the two existing trains will be shut down and a new H2U will be built. This new equipment is expected to have the noise generating equipment listed in **Table 3.1.12-2**.

Table 3.1.12-2 New Hydrogen Unit Equipment

Equipment Type/Configuration	Quantity	Power Rating (HP)
Centrifugal Forced Draft Fan	2	1,000
Centrifugal Induced Draft Fan	2	2,000
Horizontal Forced Draft Process Gas Air Cooler	2	40
Gas Compressors	2	700

The equipment specified in the VIP Amendments will be situated generally in the same area of the Benicia Refinery as the existing and/or the previously proposed VIP equipment. Based on the same conservative approach to the analysis as was used in the original analysis of the Certified EIR (Valero Improvement Project Noise Assessment, Benicia, California, May 30, 2002, prepared by Illingworth & Rodkin, Inc.), the average noise level produced by the VIP Amendments at the Administration Building will be 50 dBA.

If the noise produced by this equipment alone were the only noise source on the Valero site, this increase of less than 3 dBA, would be considered less than significant. However, noise from the VIP amendments must be considered with regards to other noise on the site, which was measured at 64 to 66 dBA day and night at the administration building. Thus, the average noise level produced by the VIP equipment and the VIP Amendments is 14 to 16 dBA less than those levels at the Administration Building without the new equipment operating. Since these sound levels are significantly lower than the existing noise levels at the Administration Building, the predicted average sound levels, using standard equations, after the VIP Amendments will be 64 to 66 dBA day and night. This is the same noise level as without the equipment from the VIP Amendments. Therefore, the operation of the VIP Amendments will have no effect on sound levels at the Administration Building.

Based on these on-site operational noise levels and the use of the same conservative approach to the analysis used in the Certified EIR, the average noise levels produced with all of the equipment operating simultaneously would be between 42 and 44 dBA at the residential receptors included in the Certified EIR. These would be the same level whether the equipment from the VIP Amendments is installed. These levels will continue to be below Benicia's General Plan performance standards of 55 dBA daytime and 50 dBA nighttime for stationary noise sources. Therefore, the VIP Amendments will not expose persons to noise levels in excess of standards established in the local general plan or noise ordinance.

b. Would the project result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels? No

The construction and operation of the new equipment not previously analyzed in the Certified EIR (listed above) will not expose people to excessive groundborne vibration or groundborne noise levels. The vibratory and acoustical energy imparted by these activities to the ground plane would be significantly attenuated through the substantial concrete foundations upon which the equipment will be placed. Furthermore, the locations of the new equipment from the VIP Amendments are within the Refinery Process Block and are one-half mile from the nearest residential receptors. The visual and acoustical path to these residential receptors is obscured by topographical features. Therefore, the effect of groundborne vibration or groundborne noise levels at sensitive land uses due to the attenuation produced by ground surface geometric spreading and material damping over the large distances to these uses, will be less than significant.

c. Would the project result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project? No

The operation of the new equipment proposed by the VIP Amendments, in addition to the equipment previously analyzed in the Certified EIR, will not introduce new noise sources that would result in the permanent significant increase in ambient noise levels. The new H2U replaces one of the two existing H2U trains within the Benicia Refinery and the equipment within the existing H2U will be shutdown. The operation of the new equipment proposed by the VIP Amendments will not result in a permanent significant increase in ambient noise levels above the levels analyzed in the Certified EIR. The noise generated by the additional equipment associated with the Main Stack Scrubber will also not significantly increase ambient noise levels above those analyzed in the Certified EIR. Other process modifications will not result in significant noise generating equipment. Based on the analysis above, the operation of the new equipment proposed by the VIP Amendments, in addition to the equipment previously analyzed in the Certified EIR, will not introduce new noise sources that would result in the permanent significant increase in ambient noise levels.

d. Would the project result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project? No

Construction of the proposed VIP Amendments will last approximately three to five years. Sensitive land uses are located more than 3,000 feet away. Based on typical construction noise levels for industrial projects with all pertinent equipment on site (Source: USEPA, Legal Compilation on Noise, Vol. 1, p. 2-104, 1973) and the effect of spherical sound propagation, non-pile driving related construction noise from the construction of the facilities proposed in the VIP Amendments (including the new H2U) at these receptors would not exceed 55 dBA at these noise sensitive uses. Therefore, if pile driving is not required, construction will not create a

significant noise impact at residential locations and other sensitive land uses in the project vicinity, compared to the local standard of 55 dBA daytime and 50 dBA nighttime for stationary noise sources. However, if pile driving proves necessary, implementation of Mitigation Measure 4.11-1 from the Certified EIR which limits the times of day piles may be driven will ensure that noise impacts remain less than significant.

- e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels? No***

The new equipment proposed for the VIP Amendments, are not located within an area covered by an airport land use plan or within two miles of a public airport or public use airport.

- f. For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels? No***

The new equipment proposed for the VIP Amendments, are not within the vicinity of a private airstrip.

12. Noise					
Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
4.11-1: Construction activities would intermittently and temporarily generate noise levels above existing ambient levels in the project vicinity over the duration of the construction period.	Significant.	4.11-1: Over the duration of pile driving activities, Valero shall require the construction contractor to implement the following mitigation measures: To reduce the potential for noise impacts from pile driving, alternate methods of driving shall be used, if feasible. Alternate measures may include pre-drilling of piles, the use of more than one pile driver to lessen the total time required for driving piles, and other measures. Pile driving activities shall be limited to daytime hours between 7 a.m. and 7 p.m., on weekdays. Pile driving shall be prohibited during weekends, state and federal holidays. Valero shall also designate a construction complaint manager for the project for the duration of the construction activities.	Less than Significant with Mitigation.	Construction associated with the VIP Amendments is not expected to require pile driving. If pile driving is necessary, Mitigation Measure 4.11-1 will ensure noise impacts will be less than significant.	No. Implementation of previously identified mitigation measures will ensure that impacts will be less than significant.
Impact 4.11-2: Operational noise associated with VIP could increase noise at nearby noise receptors. This impact would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. Operation of the VIP equipment and the new VIP Amendments equipment are not expected to result in increased ambient noise.	No significant impacts identified.
Impact 4.11-3: The proposed VIP Amendments together with proposed and planned future development at the Valero refinery could result in cumulative increase in noise levels. This impact is less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. Operation of the VIP equipment and the new VIP Amendments equipment are not expected to result in increased ambient noise.	No significant impacts identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

3.1.13 Public Services

a. ***Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:***

- ***Fire protection? No***
- ***Police protection? No***
- ***Schools? No***
- ***Parks? No***
- ***Other public facilities? No***

The VIP Amendments will not result in the need for additional public services related to fire protection, police protection, schools, parks and recreation, or other public facilities

As with VIP, the VIP Amendments will be served by an on-site fire brigade at the Benicia Refinery, which provides first-response fire, medical, hazardous materials and rescue services for the Benicia Refinery. As backup, the Valero Fire Department is a full-service industrial fire department licensed by the State Fire Marshall, (Certified EIR, Section 4.12.2.1). The Certified EIR (Section 4.12) found that VIP would not adversely affect the ability of the Benicia Fire Department to provide fire suppression and emergency response services to the Benicia Refinery or other parts of the City. The proposed VIP Amendments will occur within the bounds of the existing Benicia Refinery with the on-site private fire brigade providing first response without additional demands on the City of Benicia. In order to construct the new H2U, the firehouse will be demolished and the equipment and staff will be relocated to an existing building within the Benicia Refinery. This demolition and relocation of staff and equipment will occur such that no disruption or interruption to service will occur. Therefore, fire suppression and emergency response times will not be incrementally greater than VIP.

As with VIP (Certified EIR, Section 4.12.2.2), the VIP Amendments will not adversely affect the Benicia Police Department's ability to provide police protection services to the Project site and City as a whole. Police protection for the Project area is provided by the Benicia Police Department, which shares the responsibility for policing the Benicia Industrial Park, where the Project site is located, with private security officers employed by the individual industries in the park. City response time to the area is 3.5 minutes and security at the Benicia Refinery is provided 24 hours per day by a private security contractor. The proposed VIP Amendments will occur within the bounds of the existing Benicia Refinery and will be served by a private security force. Therefore, demands for City police services will not increase as a result of the VIP Amendments.

Section 4.12.4.3 of the Certified EIR found that implementation of VIP would not affect the ability of the Benicia Unified School District to adequately provide educational services to residents of Benicia. Incrementally, the VIP Amendments will contribute School Impact Fees as required by SB 50 and, as with VIP, there will be no substantial population migration into the area which would increase the student population. The VIP Amendments will add only 30 additional workers who will likely come from the surrounding region. Incrementally, the VIP Amendments will have no impact on schools.

The VIP Amendments will not add additional construction workers compared to VIP. The Certified EIR (Section 4.12.4.4) found that the construction workforce, which would likely come from the region, would likely use parks and other recreational facilities within their own communities. Since there is no increase in construction workforce from the VIP Amendments, there will be no impact on City of Benicia public parks and facilities.

13. Public Services

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.12-1: Implementation of the proposed VIP Amendments would not affect the Benicia Fire Department's ability to provide adequate fire suppression and emergency medical services to the project site and City as a whole. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments represent a negligible incremental increase in demand for fire and emergency medical services which would not cause a significant impact.	No significant impacts previously identified.
Impact 4.12-2: Implementation of the proposed VIP Amendments would not affect the ability of the Benicia Police Department to provide police protection services to the project site and City as a whole. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments represent a negligible incremental increase in demand for police services which would not cause a significant impact.	No significant impacts previously identified.
Impact 4.12-3: Implementation of the proposed VIP Amendments would not affect the ability of the BUSD to adequately provide educational services to residents of Benicia. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments represent a negligible incremental increase in demand for educational services.	No significant impacts previously identified.
Impact 4.12-4: The proposed VIP Amendments would not degrade the quality of existing park and recreation facilities or require the provision of new or expanded facilities. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments represent a negligible incremental increase in demand for recreational services.	No significant impacts previously identified.
Impact 4.12-5: The project would not affect other public facilities. No impact would occur.	No Impact.	No Mitigation Required.	No Mitigation Required. Less Than Significant.	No. The proposed VIP Amendments represent a negligible incremental increase in demand for or otherwise affect other public facilities.	No significant impacts previously identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

3.1.14 Transportation/Traffic

- a. *Would the project cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?*** No

The proposed VIP Amendments will have a minimal incremental effect on traffic when compared to the volumes and types of traffic previously analyzed in the Certified EIR (EIR Section 4.13). VIP Project Components that have already been completed or have been either reduced in scope or removed from VIP scope mostly offset the VIP Amendments, including the new H2U.

Compared to the Certified EIR Project Description (EIR Section 4.13), the VIP Amendments incrementally adds 30 permanent operations staff to the existing workforce. This new staff will generate 30 new trips arriving at and 30 new trips departing from the Benicia Refinery each day. However, this new commute activity will be distributed over three work shifts minimizing the potential for peak hour impacts above that identified in the Certified EIR. The three work shifts per day are 8 AM to 4 PM, 4 PM to Midnight, and Midnight to 8 AM. On average, only 10 new workers will arrive around 8 AM while 10 new workers will depart around 8 AM; similarly, only 10 new workers will arrive around 4 PM while 10 new workers will depart around 4 PM. Therefore, the VIP Amendments will generate approximately 10 new trips arriving and 10 new trips departing the Refinery during AM peak and 10 new trips arriving and 10 new trips departing the refinery during PM peak. These effects would not be significantly different from those estimated in the Certified EIR.

Also, under the VIP Amendments, approximately one new delivery truck per week is anticipated to arrive at the Benicia Refinery, which will represent one truck trip in and one truck trip out per week. One additional truck per week may be required to carry hazardous waste (wet scrubber solids) generated for disposal at Buttonwillow Landfill. Therefore, the maximum impact will be an additional two truck trips in and two truck trips out of the refinery during the day. These are not anticipated to occur during peak hours. These truck trips represent only a nominal incremental increase in operational phase truck trips which would not cause a significant impact. The proposed VIP Amendments would add no peak hour truck trips, and the effects would not be significantly different from those projected in the Certified EIR.

For construction trips, the “worst case” scenario remains the same as that which was previously analyzed (EIR Section 4.13). There will be no incremental changes in traffic occurring during the construction phase as a result of the VIP Amendments. As many as 2,000 construction workers may be on site during an approximate 45-day period when construction coincides with a major turnaround. During this 6-week duration, the up to 2,000 construction workers will be split into two shifts (one day shift, one night shift), reporting in accordance with the staggered arrival and departure times as per the Certified EIR (EIR Section 4.13). This is the same “worst case” scenario as analyzed in the Certified EIR, where half the workers arrive in staggered fashion between 7 AM and 9 AM and depart similarly in staggered fashion between 4 PM and 6 PM, and the other half arrive (also in staggered fashion) between 7 PM and 9 PM, then depart between 4 AM and 6 AM. This impact would be temporary and only occur for up to 45 days, and the same Mitigation Measure 4.13-1 provided in the Certified EIR will be applied for the VIP Amendments, to ensure that the impact would remain less than significant.

- b. *Would the project exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?*** No

The Solano Transportation Authority (STA) is the designated Congestion Management Agency for Solano County. The STA develops the countywide Congestion Management Program (CMP) and updates it every two years. The latest revision was completed in 2005. The CMP identifies a system of state highways and regionally significant principal arterials (known as the CMP system) and specifies the PM peak hour level of service (LOS) standards for those roadways. The minimum standard throughout the Solano County system is LOS ‘E’.

There are four CMP facilities within the City, including I-680, I-780, Military West Street and Military East Street. The PM peak hour LOS standard for each is 'E'; however, the 2005 measured levels of service on these facilities in the City are in the LOS 'A' to LOS 'C' range.¹ Cumulative plus project conditions for another very recent project¹ indicate that only one segment of CMP highway would experience a LOS worse than 'E', and that is westbound I-780 west of East 2nd Street. However, the mitigation – widening of I-780 – ascribed from Solano County's Capital Improvement Program to this other project¹ will substantially improve the LOS on this portion of I-780 from 'F' to 'B'. Whether or not that mitigation is constructed, the VIP Amendments with their relatively few 20 AM and 20 PM peak trips during operational phase will not significantly affect the LOS on the regional roadway system serving the site.

These 20 new AM and 20 new PM trips approaching and departing the refinery site will be distributed throughout the region. The Certified EIR (Section 4.13.3.2) based the trip distribution analysis on the following percentages: 60 percent to/from South on I-680; 17 percent to/from North on I-680; 20 percent to/from West on I-780; and three percent of the new trips were assumed to/from within the City of Benicia. Applying this methodology to the VIP Amendments, 24 new peak hour trips (12 in the AM and 12 in the PM) would arrive from/depart South on I-680; 7 new peak hour trips (3 to 4 in the AM and 3 to 4 in the PM) would arrive from/depart North on I-680; eight new peak hour trips (4 in the AM and 4 in the PM) would arrive from/depart West on I-780; and 1 new peak hour trip (1 or less trip in the AM and 1 or less trip in the PM) would arrive from/depart within the City of Benicia. These incremental trips traveling through the affected intersections during peak hours would be insignificant and would not be expected to result in a change in LOS. The incremental operational traffic generated by the proposed VIP Amendments would therefore not be significantly different from that projected in the Certified EIR.

c. *Would the project result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks? No*

As with the Certified EIR (EIR Section 4.13), there will be no change in air traffic patterns from construction of the VIP Amendments.

d. *Would the project substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)? No*

Vehicles entering and leaving the Benicia Refinery during construction of the VIP Amendments will be similar to the existing vehicle mix found in the area as previously analyzed in the Certified EIR (EIR Section 4.13). Based on the discussion in the Certified EIR, given the existing vertical and horizontal alignment of area roads, even the peak of construction vehicles occurring during the peak construction plus major turnaround phase will not substantially increase traffic hazards and will not introduce an incompatible use.

e. *Would the project result in inadequate emergency access? No*

The VIP Amendments will not increase vehicle trips entering and departing the Benicia Refinery during construction from levels previously analyzed in the Certified EIR (EIR Section 4.13). The facility's on-site security force manages the flow of traffic entering and departing the Benicia Refinery currently and this will not change as a result of the implementation of the VIP Amendments. The impact at I-680 northbound off-ramps/Bayshore Road will be mitigated by implementation of Mitigation Measure 4.13-1 which includes the provision of traffic control personnel at the impacted intersection during the a.m. peak hour. These personnel can manage emergency traffic and access. Therefore, the VIP Amendments will not have an impact on emergency access to the project site or the surrounding area.

f. *Would the project result in inadequate parking capacity? No*

The VIP Amendments are not expected to result in any changes to parking capacity compared to what was analyzed in the Certified EIR (EIR Section 4.13). The VIP Amendments, therefore, would maintain adequate parking capacity. Approximately 850 parking spaces are available for construction workers at the Benicia Refinery. These spaces are split between two contractor parking areas within the Benicia Refinery.

1. Benicia Business Park EIR, LSA Associates, Inc., January 2006.

The parking lot at Gate 9 (north of the Park Road/Bayshore Road intersection) currently accommodates 350 vehicles, while the parking lot at Gate 7 (along Park Road across from the Crude Tank Farm) can accommodate 500 vehicles. In the event parking becomes filled to near capacity during the short-duration peak construction plus major turnaround phase, the Benicia Refinery will rent off-site parking and shuttle the workers to and from the project site.

To accommodate the location of the proposed H2U, an existing parking lot will be replaced by a parking area situated on the Valero property to the west of the Refinery Process Block. The number of spaces located within the Benicia Refinery boundary will be increased to accommodate both existing and the proposed additional 30 permanent operating personnel associated with the VIP Amendments. Therefore, the project will maintain adequate parking capacity for Valero operations employees.

g. Would the project conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)? No

Similar to VIP, construction of the VIP Amendments even during the peak construction plus major turnaround phase is not expected to conflict with programs supporting alternative transportation modes. As described in Section 4.13.2 of the Certified EIR, there is a designated Class II bikeway on East Second Street south of Rose Drive. Between Rose Drive and Industrial Way, a shoulder is striped but no bikeway signs are provided. North of Industrial Way, the shoulder width is variable and continuous bike lanes are not provided. There are no other bike lanes along roadways in the vicinity of the Benicia Refinery. No pedestrian facilities, such as sidewalks or off-street paths, are provided in the vicinity. Local public transit in Benicia is provided by the City which operates two bus routes; neither of these serve the project vicinity.

14. Transportation/Traffic

VIP EIR Impact	VIP EIR Pre-Mitigation Significance	Condition of Approval/ VIP EIR Mitigation Measure	VIP EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
<p>4.13-1: The proposed construction phase of VIP would result in a potentially significant impact to the a.m. peak hour operations of I-680 northbound off-ramp/Bayshore Road in the 2004 plus project scenario.</p>	<p>Significant.</p>	<p>Mitigation Measure 4.13-1: Since this significant impact would be temporary and only occur for a period of approximately 45 days, there are several measures that can be applied to improve intersection levels of service at the I-680 northbound off-ramp/ Bayshore Boulevard intersection without the installation or construction of additional transportation facilities (e.g., lane widening, traffic signal installation, etc.).</p> <p>These measures include, at a minimum, provision of traffic control personnel at impacted intersection during the peak hours. For this intersection, the refinery and the City of Benicia will be required to apply for a Caltrans Encroachment Permit, since “manual” traffic control was conducted assuming the intersection as a “fixed time” signalized intersection. The signal would simulate a traffic control officer controlling vehicle flow at the intersection during the a.m. peak hour. If the traffic control officer were to allow the off-ramp traffic to enter the intersection unimpeded for 60 seconds, the LOS at the intersection would be LOS ‘B’ (11.0 seconds of delay). The estimated queue length would almost be reduced in half from 625 feet to 340 feet (or about 14 vehicles).</p> <p>Although not required, the following additional measures would provide further improvements (reductions) to the study area intersection delays:</p>	<p>Less than Significant with Mitigation.</p>	<p>Significant impact previously identified. Less than significant incremental impacts as a result of the amendments.</p>	<p>No. Implementation of the previously identified mitigation measures to construction of the proposed VIP Amendments will prevent any substantial increase in already identified impacts due to changes in the project.</p>

14. Transportation/Traffic

VIP EIR Impact	VIP EIR Pre-Mitigation Significance	Condition of Approval/ VIP EIR Mitigation Measure	VIP EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
		<ul style="list-style-type: none"> • Stagger work hours and shifts of construction personnel during the AM and PM peak commute periods. • Use alternative and additional gate access locations to disperse traffic from the I-680 northbound off-ramp/ Bayshore Road intersection. • Attendance at monthly traffic meetings between Valero Refinery staff and City of Benicia staff (Police, Traffic Engineering, and Public Works Departments) to review and implement the traffic controls listed above. <p>Use Permit Condition 17: Valero shall notify the Public Works Department and shall meet with designated representatives of the Police and Public Works Departments in advance of construction and monthly during construction to coordinate issues related to construction traffic and determine what traffic control measures need to be implemented by Valero.</p>			

14. Transportation/Traffic

VIP EIR Impact	VIP EIR Pre-Mitigation Significance	Condition of Approval/ VIP EIR Mitigation Measure	VIP EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
<p>4.13-2: The proposed construction phase of VIP would result in a contribution of construction traffic volumes to one of the I-680 ramp junctions which are already forecast to operate at LOS 'F' in the baseline (i.e., without project) condition. However, when the 2004 baseline and 2004 plus project ramp volumes are compared at the impacted ramps, the project's contribution would be nominal.</p>	<p>Less than Significant.</p>	<p>Implement 4.13-1.</p>	<p>Less than Significant with Mitigation.</p>	<p>Less than significant incremental impacts as a result of the VIP amendments.</p>	<p>No significant impacts previously identified.</p>

14. Transportation/Traffic

VIP EIR Impact	VIP EIR Pre-Mitigation Significance	Condition of Approval/ VIP EIR Mitigation Measure	VIP EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
<p>Impact 4.13-3: According to the Project Description, the minimal build-out operation phase of the Benicia Refinery is anticipated to generate 40 new daily trips from 20 new permanent workers, comprising 20 new AM peak hour trips and 20 new PM peak hour trips.</p>	<p>Less than Significant.</p>	<p>No Mitigation Required.</p>	<p>No Mitigation Required. Less than Significant.</p>	<p>No. The proposed VIP Amendments provide for 30 more permanent workers than VIP (30 more commute trips in plus 30 more commute trips out than under VIP). This commute activity will however be spread evenly over three work shifts per day, namely 8 AM to 4 PM, 4 PM to Midnight, and Midnight to 8 AM.</p> <p>The VIP Amendments will represent 2 new truck trips in and 2 truck trips out each week. These trucks are not expected to enter or leave the site during peak hours.</p> <p>These trips represent only a nominal increase in operational phase daily trips which would not cause a significant impact.</p>	<p>No significant impacts previously identified.</p>

References

Benicia Business Park EIR, LSA Associates, Inc., January 2006.

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

Interviews, Valero personnel, January 2007.

3.1.15 Utilities and Service Systems

a. *Would the project exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board? No*

As described in the **Hydrology and Water Quality Section 3.1.10**, wastewater from three separate parcels within the Benicia Refinery is collected and combined within the individual parcels and routed to the on-site Benicia Refinery WWTP. The separate drainage parcels within the Benicia Refinery boundaries are depicted in Figure 4.9-1 of the Certified EIR. The VIP Amendments proposed are in and adjacent to the Refinery Process Block and the area north of the Refinery Process Block and are thus within Parcel 1. As described in **Section 3.1.4** and **Section 3.1.10**, wastewater from the VIP Amendments project components within Parcel 1 will be directed to the Benicia Refinery WWTP and will be treated, along with other wastewater from the Benicia Refinery, to comply with the NPDES permit regulating the Refinery's discharge to Suisun Bay. **Table 3.1.10-1** provides a qualitative and quantitative description of the estimated incremental wastewater load from the VIP Amendments. Of the approximate 63,400 gpd added to the WWTP flow from the VIP amendments, 57,600 gpd will be a stream expected to contain nickel, vanadium, and aluminum and 14,400 gpd will be from the caustic polisher which will contain sulfates.

The additional nickel to be discharged is estimated to be 138 pounds per year (0.37 lbs/day), which will still allow the WWTP discharge to remain within both current and future NPDES discharge limits. However, as required by its current NPDES permit and consistent with the Certified EIR in implementing VIP and the VIP Amendments, the Benicia Refinery will in consultation with the San Francisco Bay RWQCB determine whether a technical study of potential loading impacts will be required to address the mass increase of nickel, vanadium, and aluminum. Vanadium and aluminum are of less concern because the RWQCB has not imposed numerical limits for these constituents. However, any technical study required would evaluate if new treatment process units are necessary to maintain water quality in Suisun Bay. Sulfates are ubiquitous in the Suisun Bay environment and based on testing by Valero, the sulfate stream will not adversely increase toxicity of the WWTP effluent. Therefore, compliance with permit requirements and potential consultation with the RWQCB will ensure that wastewater generated as a result of implementation of the VIP Amendments in Parcel 1 will not exceed the wastewater discharge limits of the RWQCB.

The relocated employee parking lot and the relocated firehouse will not generate wastewater. Construction and demolition associated with the VIP Amendments will be managed in accordance with the Benicia Refinery's construction storm water NPDES permit.

Because wastewater generated by the VIP Amendments will be managed in the ways identified above, the VIP Amendments will not impact wastewater treatment at the Benicia Refinery such that RWQCB requirements for wastewater are exceeded.

b. *Would the project require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects? No*

Potential modifications to the Benicia Refinery WWTP were evaluated in the Certified EIR. As stated in the Certified EIR Section 3.4.3.13 and below, Valero anticipates that it may be necessary to make some modifications to existing wastewater treatment processing, although the extent of the modifications depends on the NPDES permit conditions to be imposed by the RWQCB or the results of any technical studies performed, if required. No modifications to the Benicia Refinery WWTP above and beyond those described in the Certified EIR are expected as a result of the VIP Amendments; therefore, no significant environmental effects associated with the construction of new water or wastewater treatment facilities or expansion of existing facilities are expected as a result of the VIP Amendments. However, the design and installation of the Main Stack Scrubber may include wastewater pretreatment equipment that will reduce metals or metals and sulfates in the waste stream discharged to the Benicia Refinery WWTP as needed to meet Regional Water Board discharge requirements. No other WWTP modifications are necessary since the potential increase in wastewater flow of 63,400 gpd will be offset by the reduction of 100,800 gpd from the NRU Catalyst Regeneration Facility Project implemented in April 2007.

c. Would the project require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects? No

As described in the **Hydrology and Water Quality Section 3.1.10**, storm water from Parcel 1 (Refinery Process Block and area to the north of the Refinery Process Block) is collected, combined, and routed to the on-site WWTP. Storm water from the area within the Refinery Process Block and the area to the north of the Refinery Process Block will continue to be collected, combined, and routed to the Benicia Refinery WWTP after the implementation of the VIP Amendments. As discussed in **Section 3.1.10**, no increase in storm water to the refinery WWTP is expected due to the implementation of the VIP Amendments.

d. Would the project have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed? Yes

At the time the VIP EIR was certified, current and future water demands for the City could be met with existing supplies in normal years, but the water supplies would not be sufficient to meet future demands, with or without VIP, in dry years. As described later in this section, the City has since secured additional firm, long-term water supply contracts so that the water demand proposed in the Certified EIR would not exceed available water supply during normal or dry years.

According to Section 4.14.4.1 of the Certified EIR, the original VIP created an increase in raw water demand from the Benicia Refinery in the amount of 242 acre-feet per year (AF/Yr), or 216,000 gpd. The VIP Amendments are projected to require additional water use of 100,800 gpd (113 AF/yr) above that identified in the Certified EIR. **Table 3.1.15-1** below provides the projected water usage of project components presented in the Certified EIR, and the revised projected water usage requirements for the project after the proposed VIP Amendments. A water study was prepared for the VIP Amendments and is included as **Appendix E** of this application.

Table 3.1.15-1 VIP Amendments Water Demand Projections

Operating Unit	Gallons Per Day ¹		
	Certified EIR	Incremental Increase	New Total Water Usage
VIP Amendments			
Main Stack Scrubber	172,800	175,600	348,400
Hydrogen Production	21,600	-38,900	-17,300
New Desalter (will use recycle water)	---	0	0
Sulfur Recovery Cooling Water	14,400	-14,400	0
Coker Modifications	7,200	0	7,200
Steam Condensate Recovery Project		-21,500 ²	-21,500 ²
VIP Amendments Subtotal	216,000	100,800	316,800
Cumulative Projects			
NRU Catalyst Regeneration Facility Project	---	-100,800	-100,800
TOTAL	216,000	0	216,000

1. Acre feet/year = 893 gallons/day = 0.62 gallons/minute
2. The Steam Condensate Recovery Project will reduce water consumption by over 21,500 gallons/day, however, the minimum project objectives were assumed in this analysis.

The NRU Catalyst Regeneration Facility Project, which commenced operation in April 2007, decreased total refinery raw water demand by an estimated 100,800 gpd. As described in **Section 1.3**, the NRU Catalyst Regeneration Facility Project is not related to VIP, but is a separate project and is part of the cumulative projects at the Benicia Refinery. When considering the VIP Amendments, together with the NRU Catalyst Regeneration Facility Project there is no net change in water demand. That is, under current circumstances, the VIP Amendments are not expected to incrementally increase raw water demand over that in Certified EIR for the original VIP.

It should be noted that following the certification of the EIR for VIP by the Benicia City Council, on June 4, 2003, Valero and various organizations entered into a Settlement Agreement regarding water supplies to the Benicia Refinery. The Settlement Agreement provided that “Valero shall continue to participate in the planning and development of the City’s wastewater reuse project, consistent with its commitment to that project dated October 11, 2002”

Pursuant to the Settlement Agreement, Valero’s commitment in this planning and development process continues “as long as the reuse project continues to be economically, regulatorily, and technically feasible.” “Economically feasible” is defined in the Settlement Agreement to mean “approximately \$15 million of financial support for the water reuse project so long as Valero is anticipated to receive, as agreed by Valero and the City, at least one million gallons of useable water per day from the water reuse project.”

To evaluate whether the wastewater reuse would be economically, regulatorily, and technically feasible, the People Using Resources Efficiently (PURE) Committee was formed. Valero has participated with PURE for the last four years to evaluate the wastewater reuse project. However, the Benicia City Council agreed on June 5, 2007 to terminate further work on the wastewater reuse project (the PURE Project) once the Preliminary Design Review and administrative draft CEQA report documents were prepared.

Also following the certification of the VIP EIR, the City of Benicia entered into a Settlement Agreement with the Department of Water Resources to provide an additional 10,500 acre-feet of firm contracted water supply per year. This in essence implemented Certified EIR Mitigation Measure 4.14-1a.

This increased supply was subsequently included in the City’s Urban Water Management Plan (UWMP) completed and approved by the Benicia City Council in December 2005. As detailed in the City’s 2005 UWMP, this increased supply provides an adequate water supply for both the City of Benicia (through its projected build out) and the Benicia Refinery (assuming a projected increased demand rate) through the year 2030.

Table 3.1.15-2 includes data from Table 3-2 (water demand) and Table 7-4 (water supply in multiple dry years) of the 2005 UWMP, modified to include projected increases post-VIP Amendments (a total of 242 AF/Yr) and subtracting contributions from recycled water projected to be added to the City of Benicia supply beginning in 2010 (a total of 2,240 AF/Yr). In the table, the “City of Benicia Demand” includes demands by residential, commercial, industrial, etc. components of the City. “Other Projected Demands” refers to unaccounted-for water and operations, and emergency water components of demand.

Table 3.1.15-2 Multiple Dry Years Comparison and Demand Projections ¹

	2005	2010	2015	2020	2025	2030
City of Benicia Available Supply	17,354	19,550	19,550	19,550	19,550	19,550
City of Benicia Demand	5,642	5,758	5,874	5,990	5,990	5,990
Refinery Demand (pre-VIP and VIP Amendments)	4,675	5,050	5,425	5,800	5,800	5,800
Refinery Demand (Post-VIP and VIP Amendments including cumulative projects)	4,675	5,292	5,667	6,042	6,042	6,042
Other Projected Demands	1,580	1,612	1,644	1,737	1,737	1,737
Total Demand	11,897	12,662	13,185	13,769	13,769	13,769
Surplus of Supply	5,457	4,648	4,125	3,541	3,541	3,541

1. From Tables 7-2 and 7-4 of 2005 UWMP in AF/Yr.

This table indicates that a minimum of 3,541 AF/Yr surplus should be available through the year 2030 with no additional supply from recycled water including the additional estimated 282 AF/Yr demand projected for the VIP Amendments. However, when considered cumulatively with the April 2007 startup of the NRU Catalyst Regeneration Facility Project, the VIP Amendments do not increase the annual water demand above that in the Certified EIR. The surplus of water supply in multiple dry years as discussed in the UWMP represents the “worst case” scenario. Based on the supporting background information related to the firm water use contracts for the City of Benicia and planned water usage needs of the VIP Amendments, the water supply, defined in the UWMP, provided by the 2003 Settlement Agreement, would satisfy the projected water use demands related to the VIP Amendments even during a multiple dry years scenario. Accordingly, the proposed VIP Amendments would have sufficient water supplies available and no new or expanded entitlements would be needed as a result of the VIP Amendments. This conclusion remains valid without considering any supplies from recycled water.

Importantly, consistent with CEQA Guidelines, the Certified EIR established “significance criteria” with regard to water supply/demand considerations for VIP. Specifically the project’s impact would be considered significant if it would:

“Result in City water use in excess of water supplies available in normal, dry, and multiple dry years with water from all existing entitlements and sources, or if the project would require new or expanded -water entitlements or resources.”

The new long-term, firm water supply provided by the 2003 Water Rights Settlement Agreement, which has been incorporated into the 2005 UWMP, is in essence is an implementation of Mitigation Measure 4-14-1.a, impacts due to increased water demand from VIP would not now be considered significant. Moreover, as indicated below, this finding is also true regarding the currently proposed VIP Amendments.

Accordingly, as concluded by the UWMP, the City of Benicia has sufficient water to supply Valero’s requirements even during multiple dry year scenarios.

e. Would the project result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project’s projected demand in addition to the provider’s existing commitments? Yes

As described in the Certified EIR, the City of Benicia WWTP treats only wastewater flow from domestic uses at the Benicia Refinery associated with non-industrial uses, and the on-site Benicia Refinery WWTP treats process wastewater and certain storm water flows from the Benicia Refinery. This distinction in wastewater flows will not change as a result of this project.

The preliminary design criterion for the VIP Amendments indicates an increase in wastewater flow of 63,400 gpd (44 gpm) to the Benicia Refinery WWTP. This increase in flow is incrementally minor compared to the overall Benicia Refinery wastewater stream of 2.56 MGD described in the Certified EIR after VIP. The hydraulic capacity of the WWTP is approximately 3.6 MGD. This minor increase therefore results in an average flow of 2.63 MGD. This increase remains well within the hydraulic capacity of the WWTP.

Also, as described in **Section 4.2.15**, a cumulative project at the Benicia Refinery, the NRU Catalyst Regeneration Facility Project, has decreased wastewater flow to the Benicia Refinery WWTP by 70 gpm or 0.10 MGD, resulting in a net reduction in wastewater flow of 26 gpm (37,400 gpd) for a total post VIP Amendments water flow to the WWTP of 2.53 MGD. As described in **Sections 3.1.4, 3.1.10, and subsection a** of this section, as required by its current NPDES permit and consistent with the Certified EIR in implementing VIP and the VIP Amendments, the Benicia Refinery will in consultation with the San Francisco Bay RWQCB determine whether a technical study of potential loading impacts will be required to address the mass increase of pollutants proposed to be discharged and propose new treatment process units, if necessary, to maintain water quality in Suisun Bay.

Similar to what is described in the Certified EIR (EIR Section 4.14.4.2), further increases in wastewater flow to the City of Benicia municipal WWTP associated with non-industrial uses as a result of the VIP Amendments will be a function of the use of the sanitary sewer system and increases in new permanent full-time employees and temporary construction workers. The Certified EIR indicated that the Benicia Refinery generates approximately 0.0075 MGD of domestic wastewater, which is sent to the City of Benicia municipal WWTP. The VIP Amendments will include an additional 30 new permanent full-time employees.

This increase in employees on site would constitute only a minor increase in Benicia Refinery wastewater processing requirements at the City of Benicia municipal WWTP. As described in the Certified EIR, the total capacity of the city's WWTP is 4.5 MGD and during dry weather the plant operates at approximately 64 percent capacity. Since the increase in flow associated with the increase in a limited number of personnel will be nominal, the construction workforce will be temporary, and the City of Benicia municipal WWTP has adequate capacity to except the increase in flow (as described in the Certified EIR Section 4.14.2.2). The City of Benicia municipal WWTP has the capacity to serve the VIP Amendments demand in addition to existing commitments.

f. Would the project be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs? Yes

Solid waste generated at the Benicia Refinery is currently sent to the Keller Canyon Landfill, located in Pittsburg, California, a Class II facility that accepts municipal solid waste, non-liquid industrial waste, contaminated soils, ash, grit, and sludge. According to the Allied Waste website, Keller Canyon Landfill covers 2,600 acres of land, 244 acres of which are permitted for disposal. The site currently handles 2,500 tons of waste per day although the permit allows up to 3,500 tons of waste per day to be managed at the facility. As mentioned in the Certified EIR, the Keller Canyon Landfill has approximately 35 million cubic yards of remaining capacity and has a life of approximately 32 years. The spent catalyst represents the majority of solid waste the Benicia Refinery sends to the Keller Canyon Landfill. The amount of spent catalyst disposed of by Valero historically (1999-2002) at the Benicia Refinery is 609 tons per year.

The construction of the proposed VIP Amendments is anticipated to generate solid construction related waste slightly above the level analyzed in the Certified EIR. The majority of the construction debris has the potential to be recycled. The limited amount of non-recyclable solid waste generated will likely be disposed of at Keller Canyon Landfill. The Keller Canyon Landfill has sufficient permitted capacity to accommodate the proposed VIP Amendments' increase in solid waste disposal needs and would not require the expansion of any disposal facilities to accommodate the waste.

Hazardous waste generated at the Benicia Refinery is currently transported to various recyclers or to the Clean Harbors Buttonwillow, LLC Landfill west of Buttonwillow, California. (At the time that the VIP EIR was certified, the Benicia Refinery was sending hazardous wastes for landfill to the Kettleman Hills facility). The Buttonwillow Landfill is a permitted hazardous waste facility that can accept most types of hazardous waste for treatment, storage, and/or disposal. The Benicia Refinery currently ships one truck of waste sludge from the Benicia Refinery WWTP to the Clean Harbors Buttonwillow Landfill about every three days.

Currently, up to 800 tons per year of dry catalyst solids are generated by the Benicia Refinery, most of which are recycled with about 10% going for disposal to the Clean Harbors Buttonwillow, LLC Landfill. There will be an increase of 800 tons/year in the amount of waste delivered to the Buttonwillow Landfill associated with the new wet waste stream generated by the pre-scrubber. The incremental weight increase is due solely to weight of water associated with the wet rather than dry waste stream. The increase in weight does not represent an increase in the amount of hazardous waste solid generated within the waste stream. The Buttonwillow active hazardous waste management unit has a total design capacity of 10.7 million cubic yards or about 9.1 million tons. In addition, there are land use and air permits that further limit Clean Harbors to accept 352,105 tons per year with up to 4,050 tons in any one day.

The 800 incremental tons per year estimated to be generated by the VIP Amendments reflects only 0.2 percent of the annual operating limit for the landfill hazardous waste unit. Furthermore, over the last three years (2004 – 2006) the Buttonwillow landfill has averaged annual waste receipts of 322,684 tons per year. The additional 800 tons per year from the proposed VIP Amendments represents 2.7 percent of the allowable increase from the three-year average waste receipts to the permit limit. Also in each of the last three years, the Buttonwillow landfill could have accepted an additional 800 tons of hazardous waste and remained within permitted daily and annual capacity limits. Therefore, the VIP Amendments would have an insignificant effect on hazardous waste generation and disposal at the Buttonwillow Landfill and would not require the expansion of the Buttonwillow Landfill.

The VIP Amendments would be served by non-hazardous waste and hazardous waste landfills with sufficiently permitted capacities to accommodate the project's solid waste disposal needs and neither would require expansion. Therefore, the effects of the VIP Amendments would be less than significant.

g. Would the project comply with federal, state, and local statutes and regulations related to solid waste? Yes

Valero complies with and will continue to comply with all existing solid waste regulations during the construction and operation of the proposed VIP Amendments. There is nothing anticipated in association with the construction and operation of the proposed VIP Amendments that will result in conditions that would violate any local, state, or federal requirements related to solid waste management. Therefore, the proposed VIP Amendments' impacts would be incrementally insignificant.

15. Utilities and Service Systems					
Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.14-1: The Valero Improvement Project would increase demand for raw, untreated water from the City of Benicia in excess of the baseline refinery demand anticipated in the UWMP. In the future, the City's overall water demand may exceed available supplies from current sources in dry years. This impact would be significant. This impact could be altered to be less than significant if the City were to obtain additional water supplies or if the City were able to implement planned future water supply programs and projects. Some of these measures are beyond City control and some are within the control of the City and Valero.	Significant.	Mitigation Measure 4.14-1a: The City will continue to move forward with obtaining the future water supplies as identified in the Water Study, the UWMP, and the 1996 Water System Master Plan.	Less than Significant with Mitigation.	No. The proposed VIP Amendments are expected to increase the demand for raw water slightly from the City of Benicia; however, in 2003 the City of Benicia entered a Settlement Agreement with the California Department of Water Resources also involving the cities of Fairfield and Vacaville. This agreement provides an additional 10,500 acre-feet per year for the City of Benicia. This additional water supply is projected to result in a surplus of water supply, even in the "worst case" multiple dry years scenario, of 3,541 AF/Yr. Also, with implementation of the cumulative NRU Catalyst Regeneration Facility Project water demand from the City will be the same as the demand previously analyzed in the Certified EIR.	No. Previous significant impacts have been made less than significant due to obtaining additional long-term firm water supplies through the Settlement Agreement in 2003.

15. Utilities and Service Systems

<p>Impact 4.14-1: see above</p>	<p>Significant.</p>	<p>Mitigation Measure 4.14-1b: The City of Benicia and Valero will continue to implement General Plan Program 2.36A to pursue reuse of reclaimed wastewater where feasible, and the Benicia Refinery will accept and use reclaimed water from a City reclamation project.</p>	<p>Less than Significant with Mitigation.</p>	<p>No. The proposed VIP Amendments are expected to increase the demand for raw water from the City of Benicia; however, with implementation of the cumulative NRU Catalyst Regeneration Facility Project water demand from the City will be the same as the demand previously analyzed in the Certified EIR. The 2005 UWMP includes a premise of 2,240 acre-feet per year to be available for Valero use from recycled water. To date though, the City of Benicia's plans to pursue reuse of reclaimed water anticipated by mitigation measure 14.14-1b have not been shown to be feasible. However, removing this 2,240 acre-feet from the total water supply will continue to result in a greater than 3,500 acre-feet per year surplus even under multiple dry year scenario calculations. Also, the City of Benicia has provided additional water supply through firm contracts since the EIR was Certified.</p>	<p>No. Previous significant impacts have been made less than significant due to obtaining additional long-term firm water supplies through the Settlement Agreement in 2003.</p>
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15. Utilities and Service Systems

<p>Impact 4.14-1: see above</p>	<p>Significant</p>	<p>Mitigation Measure 4.14-1c: Drought Contingency. If a “water shortage” (as defined below) occurs, then Valero shall take the steps necessary to reduce water consumption at the refinery by an amount equal to or greater than the amount of raw water that is being consumed due to implementation of VIP during the period the water shortage. This reduction shall be in addition to any amount of reduction required by Condition WATER RES-2, approved by the California Energy Commission on October 31, 2001, for the Valero Cogeneration Project. Upon notification that a water shortage exists for any given year, Valero shall provide prompt documentation to the City of: the amount of water expected to be consumed by VIP during the year of the shortage; a description of the steps planned to reduce consumption; the amounts to be saved by the steps; and the timing of implementation. Valero shall notify the City as the steps are implemented and will provide an annual report at the end of the year, verifying the amounts of water saved by the steps taken.</p> <p>For purposes of this mitigation, “water shortage” means that all of the following conditions have occurred:</p> <p>a. The City is unable to secure, pursuant to Supplemental Water Rights Application 30681, rights to the amount of water projected to accommodate City demand for the year of the water shortage, as shown in Table 4.14-3 of the Certified EIR, plus the amount of water needed for VIP;</p>	<p>Less than Significant with Mitigation.</p>	<p>No. As described above, in 2003, the City of Benicia entered a Settlement Agreement with the California Department of Water Resources to provide an additional 10,500 acre-feet per year for the City of Benicia. This additional water supply is projected be sufficient to supply the VIP Amendments and provide for continued surplus, even in a multiple dry years scenario.</p> <p>However, despite this, as part of the VIP Amendments, the Benicia Refinery will implement Mitigation Measure 4.14.1c.</p>	<p>No. Previous significant effects have been made less than significant due to obtaining additional long-term firm water supplies through the Settlement Agreement in 2003.</p>
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15. Utilities and Service Systems

		<p>b. The City is unable to secure other water entitlements to the amount of water projected to accommodate City demand for the year of the water shortage, as shown in Table 4.14-3 of the Certified EIR, plus the amount of water needed for VIP;</p> <p>c. Valero has not secured a separate water entitlement, valid for the year of the water shortage, adequate for the amount of water needed for VIP;</p> <p>d. The City has not implemented the wastewater reuse project; and</p> <p>e. The City has announced a water alert, as defined by Benicia Municipal Code Title 13, Chapter 13.35, section 13.35.060(B), and has ordered implementation of conservation stage two pursuant to the City Code.</p>			
<p>Impact 4.14-2: The Valero Improvement Project would increase the amount of wastewater and the pollutant loading of the wastewater processed at the refinery's WWTP. This would be reduced to a less than significant impact by the wastewater treatment processes that meet the discharge limitations of the NPDES permit.</p>	<p>Less than Significant.</p>	<p>No Mitigation Required.</p> <p>Use Permit Condition 15: Valero shall provide the City with copies of its Anti-Degradation Report and, when requested, monthly self-monitoring reports when those reports are submitted to the RWQCB. The documents shall be provided at no cost to the City.</p>	<p>No Mitigation Required. Less than Significant.</p>	<p>No. The proposed VIP Amendments represent an increase in wastewater to the Benicia Refinery WWTP. However, the Benicia Refinery will comply with the refinery's NPDES permit and if necessary consult with the RWQCB to ensure the water quality of Suisun Bay is not impacted by the VIUP Amendments. Therefore, this would not cause a significant impact.</p>	<p>No significant impact previously identified.</p>
<p>Impact 4.14-3: The Valero Improvement Project could increase the amount of wastewater treated at the City of Benicia's WWTP. This impact would be less than significant.</p>	<p>Less than Significant.</p>	<p>No Mitigation Required</p>	<p>Less than Significant with Mitigation.</p>	<p>No. The proposed VIP Amendments represent a negligible increase in wastewater volume to the Benicia WWTP and would not cause a significant impact.</p>	<p>No significant Impact previously identified.</p>

15. Utilities and Service Systems					
Impact 4.14-4: The Valero Improvement Project would increase routine disposal of spent catalyst and of sludge from the refinery WWTP. This impact would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments are not expected to increase throughput, and thus not expected to increase disposal of spent catalyst and sludge from the refinery WWTP.	No significant impact previously identified.
Impact 4.14-5a: The Valero Improvement Project, together with the Cogeneration Project and other refinery projects would increase demand for raw, untreated water from the City of Benicia in excess of the baseline refinery demand anticipated in the UWMP. Together with other future, non-refinery projects, VIP would make a significant contribution to the cumulative shortfall in City water supply in dry years.	Significant.	Implement 4.14-1a through e.	Less than Significant With Mitigation.	No. As described above, in 2003, the City of Benicia entered a Settlement Agreement with the California Department of Water Resources to provide an additional 10,500 acre-feet per year for the City of Benicia. This additional water supply is projected be sufficient to supply the VIP Amendments and provide for continued surplus, even in a multiple dry years scenario. However, despite this, as part of the VIP Amendments, the Benicia Refinery will implement Mitigation Measure 4.14.1c.	No. Previous significant impacts have been made less than significant due to development of a Settlement Agreement in 2003, as described.
Impact 4.14-5b: VIP, together with other refinery projects, would increase the quantity of pollutants and the amount of wastewater processed at the refinery WWTP. This would be a less than significant impact due to NPDES discharge limitations.	Less than Significant.	No Mitigation Required.	Less than Significant With Mitigation.	No. The proposed VIP Amendments represent a negligible incremental increase in wastewater pollutant loading, and compliance with the refinery's NPDES permit and consultation with the RWQCB will ensure that this would not cause the cumulative impact to become significant. Cumulative impacts are further discussed in Section 4.	No significant impact previously identified.

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<p>Impact 4.14-5c: VIP, together with other refinery and non-refinery projects within Benicia, could increase the amount of wastewater treated at the City WWTP. This would be a less than significant impact due to NPDES discharge limitations on the refinery contribution and similar regulation of contributions from other projects.</p>	<p>Less than Significant.</p>	<p>No Mitigation Required.</p>	<p>Less than Significant. No Mitigation Required.</p>	<p>No. The proposed VIP Amendments represent a negligible incremental increase in wastewater pollutant loading, and compliance with the refinery's NPDES permit and consultation with the RWQCB will ensure that this would not cause the cumulative impact to become significant. Cumulative impacts are further discussed in Section 4.</p>	<p>No significant impact previously identified.</p>
<p>Impact 4.14-5d: VIP would increase the refinery's routine disposal of spent catalyst and sludge from the refinery WWTP at the Keller Canyon landfill. VIP contribution to the cumulative waste disposed at the landfill would be less than significant.</p>	<p>Less than Significant.</p>	<p>No Mitigation Required.</p>	<p>Less than Significant. No Mitigation Required.</p>	<p>No. The proposed VIP Amendments represent a negligible incremental increase in waste disposed at the landfill. Cumulative impacts are further discussed in Section 4.</p>	<p>No. The proposed VIP Amendments represent a negligible incremental increase in waste disposed at the landfill.</p>

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

Interview, Valero personnel, January 2007.

3.1.16 Agricultural Resources

- a. ***Would the project convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use? No***

The construction and operation of the proposed VIP Amendments, as with VIP, will be constructed within the existing footprint of the Benicia Refinery boundaries. None of these areas are designated Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland) under the Farmland Mapping and Monitoring Program of the California Resources Agency. Therefore, the proposed VIP Amendments will not convert any Farmland, to non-agricultural use.

- b. ***Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract? No***

No Farmland exists within the boundary of the Benicia Refinery. Therefore, the construction and operation of the planned improvements under the proposed VIP Amendments will not conflict with existing zoning for agricultural use, or a Williamson Act contract.

- c. ***Would the project involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use? No***

No Farmland exists within or in the vicinity of the boundary of the Benicia Refinery. Therefore, the construction and operation of the planned improvements under the proposed VIP Amendments could not result in conversion of Farmland to non-agricultural use.

16. Agricultural Resources					
Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.15-1: VIP would not Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland) to non-agricultural use. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments would not Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland) to non-agricultural use.	No significant impact previously identified.
Impact 4.15-2: VIP would not conflict with existing zoning for agricultural use, or a Williamson Act contract. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments would not conflict with existing zoning for agricultural use, or a Williamson Act contract.	No significant impact previously identified.
Impact 4.15-3: VIP would not involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments would not involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use.	No significant impact previously identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

Map of Farmland, Farmland Mapping & Monitoring Program, viewed on-line at http://www.consrv.ca.gov/DLRP/fmmp/images/fmmp2004_11_17.pdf, January 2007.

Map of agricultural zoning information City of Benicia Zoning Map, viewed on-line at <http://www.ci.benicia.ca.us/pdf/BeniciaZoningMap-c-July06.pdf>, January 2007.

Williamson Act information, viewed on-line at <http://www.ceres.ca.gov/wetlands/introduction/williamson.html>, January 2007.

3.1.17 Mineral Resources

- a. *Would the project 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? No***

The construction and operation of the VIP Amendments will be situated within the existing footprint of the Benicia Refinery boundaries. No known mineral resources of value to the region or residents of the state were identified in the Certified EIR within the vicinity of the Benicia Refinery; therefore, the construction and operation of the VIP Amendments is not expected to result in the loss of availability of a known mineral resource. While there are no known mineral resources at the project locations that are of value to the region and the residents of the state, placing the equipment and structures in either location will not preclude mineral retrieval in the future.

- b. *Would the project 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? No***

As with VIP, the site of the proposed VIP Amendments is within the existing Benicia Refinery boundaries. The area within the existing Benicia Refinery boundaries is zoned for General Industrial uses. As described in the Certified EIR (EIR Section 5.2.3), no locally important mineral resources, such as sand and gravel, were identified on any local plans as occurring within the vicinity of the Benicia Refinery. Therefore, the proposed VIP Amendments will not result in the loss of availability of any locally important mineral resource recovery site.

17. Mineral Resources					
Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.16-1: While there are no known mineral resources at the project site that are of value to the region and the residents of the state, VIP would not preclude mineral retrieval in the future. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments will not affect any mineral resources, as no such resources are present at the existing site.	No significant impact previously identified.
Impact 4.16-2: The site of VIP is zoned for General Industrial uses. No locally important mineral resources, such as sand and gravel, are identified on any local plans as occurring at the project site.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments will not affect any mineral resources, as no such resources are present at the existing site.	No significant impact previously identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

Interview, Valero personnel, January 2007.

3.1.18 Population and Housing

- 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)? No***

With the exception of the new employee parking lot, the construction and operation of the VIP Amendments, as with VIP project components described in the Certified EIR, will be situated within the existing footprint of the developed and disturbed areas within the Benicia Refinery boundaries. Construction activities related to the proposed VIP Amendments will take approximately three to five years and will use the existing workforce in the area. The operation of the proposed VIP Amendments will not directly or indirectly induce population growth because the construction workforce will only temporarily utilize a construction workforce and will use the existing workforce in the area. Valero anticipates that the VIP Amendments may require up to 30 additional permanent personnel, beyond the 20 permanent personnel envisioned in the Certified EIR, to operate the new and modified facilities. The proposed VIP Amendments will not result in an increase in process capacity at the Benicia Refinery that would translate into fuel production above the levels evaluated in the Certified EIR (EIR Section 3.1.1), and thereby indirectly increase vehicle use that would require new roads. Therefore, the proposed VIP Amendments will not directly or indirectly induce substantial population growth in the area.

- b. ***Would the project displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere? No***

The proposed project components of the VIP Amendments, as with VIP project components described in the Certified EIR, will be located within the existing footprint of the Benicia Refinery. There is no existing housing within the Benicia Refinery boundaries; therefore, the proposed VIP Amendments will not result in the displacement of any housing.

- c. ***Would the project displace substantial numbers of people, necessitating the construction of replacement housing elsewhere? No***

The proposed project components of the VIP Amendments, as with VIP project components described in the Certified EIR, will be located within the existing footprint of the Benicia Refinery. There is no existing housing within the Benicia Refinery boundaries. Adequate measures are taken to ensure health and safety to the population living in the housing areas surrounding the Benicia Refinery. Therefore, the proposed VIP Amendments will not result in the displacement of any people and will not result in the construction of replacement housing elsewhere.

18. Population and Housing					
Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.17-1: VIP would not induce substantial population growth in the area, either directly or indirectly. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments will not induce substantial population growth in the area, either directly or indirectly.	No significant impact previously identified.
Impact 4.17-2: VIP would not result in the displacement of any housing. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments would not result in the displacement of any housing.	No significant impact previously identified.
Impact 4.17.3: The construction and operation of VIP would not result in the displacement of any people and would not result in the construction of replacement housing elsewhere.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments would not result in the displacement of any people and would not result in the construction of replacement housing elsewhere.	No significant impact previously identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

4.0 Other CEQA Considerations

4.1 Cumulative Projects

4.1.1 Overview

The CEQA Guidelines define a cumulative impact as one resulting from the combined effect of the proposed project plus other past, present and reasonably foreseeable future projects. CEQA requires that:

- cumulative impacts be discussed when they may be significant;
- the discussion may be more general than that for the individual project impacts, but should reflect the potential extent, severity, and probability of the impact;
- the cumulative impact analysis be based either on a list of past, present and probable future projects producing related or cumulative impacts, or on projections from a General Plan or regional planning agency; and
- reasonable options for mitigating or avoiding the project's contribution to significant cumulative impacts be proposed, noting that for some cumulative impacts the only feasible mitigation may involve the adoption of ordinances or regulations rather than the imposition of conditions on a project-by-project basis.

This section has been developed to provide the City a cumulative impact analysis for use in reviewing the overall impacts of the VIP Amendments. The analysis considers the range of potential impacts addressed in **Section 3.1.1** through **3.1.18**, evaluated in the context of other projects which, taken together with the VIP Amendments, could contribute to cumulative impacts.

The key characteristics of a cumulative impact analysis are:

- A project impact (significant or not), plus
- Impacts from other projects of the same type as that of the project. This is especially important where the cumulative projects include other ongoing refinery projects, as well as projects with similar impacts.
- The interaction of these impacts to create a cumulative impact affecting the same geographic area as that of the proposed project.

4.1.2 Cumulative Projects Considered

A cumulative impact analysis was conducted for VIP and is included in Section 5.0 of the Certified EIR. Certain projects that were considered in Section 5.0 of the Certified EIR have either been completed or are no longer under consideration for implementation. Therefore, the list of projects considered for the cumulative impact assessment of the VIP Amendments is incrementally different than that considered for the original VIP. Also a number of other projects are currently undergoing permit review by the City of Benicia and merit inclusion in the VIP Amendments analysis presented below.

The following is an updated list of the activities and projects considered in evaluating cumulative impacts of the VIP Amendments, followed by a list of the projects no longer relevant or applicable to the analysis.

Benicia Refinery Projects Independent of VIP and VIP Amendments

Benicia Refinery-associated projects under consideration for the VIP Amendments cumulative impact analysis include the following:

- Operation (construction is completed) of the first unit of the Cogeneration Plant and construction and operation of the second 51 MW unit;
- Treatment of wastewater from the Valero Benicia Asphalt Plant (formerly referred to as the Huntway Asphalt Refinery);
- Operation of the NRU Catalyst Regeneration Facility Project;
- Construction and operation of the proposed Air Liquide Hydrogen Pipeline or the competing Air Products Hydrogen Pipeline; and
- On-going Benicia Refinery maintenance, including future refinery-wide turnarounds.

Cogeneration Project

Details of the Cogeneration Project are provided in Section 3.6.1.2 of the Certified EIR. The first unit, with a maximum rated electrical power output of 51 MW was constructed and is now in operation. Similar to the first unit, the second 51 MW unit will have a gas turbine generator, which will burn refinery fuel gas, a refinery by-product, with natural gas as an alternative or back-up fuel. This second unit is currently scheduled for a construction start in 2016 and as described in the Certified EIR, the construction period would be approximately 12 months. Both units are expected to operate continuously to provide electricity to the refinery or export electricity to the state power grid. This project is an independent project and is not related to VIP or the VIP Amendments.

Treatment of Wastewater from the Valero Benicia Asphalt Plant

Details of the Treatment of Wastewater from the Valero Benicia Asphalt Plant (formerly the Huntway Asphalt Plant) are also provided in Section 3.6.1.2 of the Certified EIR. As previously described in the Certified EIR, it has not yet been determined if changes would be required at the Valero wastewater treatment plant to handle the additional (40,000 gallons per day) wastewater flows from this project. The operational details have not changed and the analyses provided in the Certified EIR are still valid. This project is an independent project and is not related to VIP or the VIP Amendments.

New Projects Not Previously Included in the Certified EIR

The NRU Catalyst Regeneration Facility Project, the Air Liquide Hydrogen Pipeline, and the competing Air Products Hydrogen Pipeline projects are additional projects included in the cumulative impact analysis.

The NRU Catalyst Regeneration Facility Project involved the installation of a new caustic recirculation and air cooling system to eliminate the once-through water cooling. As a result, the project has eliminated an average of 70 gpm (100,800 gpd) of raw water consumption as well as the same amount of hydraulic loading at the Benicia Refinery WWTP. This project is an independent project and is not related to VIP or the VIP Amendments. This project has been constructed and has been operational since April 2007.

The Air Liquide Hydrogen Pipeline project is a potential hydrogen production project proposed by Air Liquide as a third-party supplier to the Shell Martinez Refinery (in Contra Costa County) and the Valero Benicia Refinery (in Solano County). The project includes the proposed installation of an approximately two-mile-long, 12- to 20-inch diameter pipeline extending from the Shell Martinez Refinery to the Valero Benicia Refinery (in Solano County). Air Liquide is proposing to build the pipeline without commitments from either refinery. The proposed project would enable Air Liquide to deliver hydrogen gas to refineries during periods of peak hydrogen needs, or during hydrogen producing outages.

The Air Products Hydrogen Pipeline project is a competing hydrogen production project proposed by Air Products and Chemicals, Inc. at the Tesoro and Shell, Martinez refineries, and the Valero Benicia Refinery. The project includes the proposed installation of two approximately 6.7-mile-long, 8-inch diameter pipelines running side by side containing hydrogen and holding fuel gas. The pipeline would begin at Tesoro Refinery, run linearly to Shell Martinez Refinery, run approximately one mile back along the same path, and terminate at the Valero Benicia Refinery. The pipeline would connect the Air Products hydrogen plant at the Tesoro Refinery, the Air Products hydrogen plant at the Shell Martinez Refinery, and the Valero Benicia Refinery. The application by Air Products was submitted to Contra Costa County on May 1, 2007. Air Products is proposing to build the pipeline without commitments from the Valero Benicia Refinery.

Planned to serve generally the same facilities, it is anticipated that as competing pipelines only one of the Air Liquide or Air Products project would be constructed, but not both. The Benicia Refinery is implementing components of VIP and the VIP Amendments relating to increased hydrogen production for the purpose of meeting the internal hydrogen needs of the Benicia Refinery independent of Air Liquide's or Air Products' plans. Valero's engineering design basis for installation of the new hydrogen production unit is based on supplying the on-site needs of the Benicia Refinery without increasing capacity. Moreover, the Benicia Refinery may utilize hydrogen deliveries via the Air Liquide or Air Products pipeline during hydrogen production outages, whether or not the VIP Amendments are approved. Accordingly, the VIP Amendments and the Air Liquide and/or Air Products projects are separate and functionally independent projects.

Ongoing Benicia Refinery Maintenance and Turnaround

As discussed in Section 3.6 of the Certified EIR, operation of the Benicia Refinery requires substantive ongoing maintenance activities. In addition to the ongoing activities, scheduled maintenance actions, called turnarounds, are also necessary. Major maintenance activities are conducted during turnarounds. Additionally, turnarounds provide an opportunity to modify refinery processes and tie-in new and modified equipment during a scheduled downtime. Thus, the turnaround schedule becomes the controlling factor when planning and scheduling upgrades or other major changes to the process equipment. These activities are part of the normal, ongoing maintenance program and do not require City permits or environmental review.

Valero plans to implement pre-construction measures and most of the major equipment construction prior to commencement of turnaround so that remaining connections and final construction elements can be completed during turnaround.

Benicia Refinery Projects No Longer Applicable to Cumulative Impact Assessment

Several other Benicia Refinery projects evaluated in the cumulative impacts analysis in the Certified EIR are no longer applicable to the cumulative impacts assessment. The projects listed below, described in Section 3.6 of the Certified EIR, are either completed or are no longer planned for implementation. Projects which have already been completed are included in the analysis as current operations at the site. The Selective Hydrogenation Facilities project, as listed below, will no longer to be implemented and is not included in this cumulative analysis.

- MBTE Phase Out Project (EIR Section 3.6.1.2) is complete.
- Alkylation Unit Modifications (EIR Section 3.6.1.3) are complete.
- Selective Hydrogenation Facilities (EIR Section 3.6.1.3) will no longer be implemented.
- Light Ends Rail Rack Arm Drains project (EIR Section 3.6.1.3) is completed.
- BAAQMD Reg. 9 Rule 10 NO_x Alternate Compliance Plan (EIR Section 3.6.1.3) is completed.

Outside (Non-Refinery) Projects

Other large projects by other project proponents also could be underway in the vicinity of the Benicia Refinery and their construction could overlap that of the proposed VIP Amendments. The following projects were included in the cumulative impact analysis included in the Certified EIR. As updated, these include:

- Caltrans Benicia-Martinez Bridge – Construction of this project is nearing completion with the new eastbound span open to traffic. However, other minor project elements are yet to be complete, but have been estimated to be completed by late 2007
- Seeno Benicia Business Park – The draft EIR has undergone public review. A Response to Comments document was released in July 2007.
- Southampton Tourtelot Residential Development – This project is partially constructed, with the remaining units to be constructed in the next two years.

Within the City of Benicia, the Benicia-Martinez Bridge construction includes reconstruction of the I-680 interchanges at I-780 in Benicia and restoration of a 22.8-acre parcel of tidal marsh in the City of Benicia. The Seeno Benicia Business Park was proposed to occupy 527.5 acres of undeveloped land in the eastern part of the city, to the northeast of the Benicia Refinery. The project would include four million square feet of industrial buildings on 285 acres of land and 490,000 square feet of commercial development on 45.0 acres of land, near the intersection of Lake Herman Road and East Second Street. Construction of residential dwellings associated with the Southampton Tourtelot development began in 2003, and the Water's End neighborhood, part of the Southampton Tourtelot Residential Development, is expected to have 417 homes upon completion. The Water's End project is currently under construction and scheduled for completion in 2009.

The above projects were considered relevant to this analysis as they fall within the geographic scope of the area affected by the VIP Amendments from a cumulative impact perspective.

Certain other projects (listed below) have been identified by the City of Benicia as possible projects underway in the vicinity of the Benicia Refinery. These projects are:

- The Lower Arsenal Mixed Use Specific Plan
- Downtown Mixed Use Master Plan
- The Marina Area Storm Drain Project

The Lower Arsenal Mixed Use Specific Plan covers the Lower Arsenal/Arsenal Historic District, a 50-acre parcel located to the south of the Benicia Refinery. The goal of this Specific Plan coincides with the City of Benicia's General Plan and proposes mixed use development in the Lower Arsenal/Arsenal Historic District. At present, an EIR is being prepared.

In concert with the Lower Arsenal Mixed Use Specific Plan, the Downtown Mixed Use Master Plan is under preparation and a Mitigated Negative Declaration is being prepared by the City.

The goal of the Marina Area Storm Drain Project is to remediate an existing flooding problem and provide adequate storm drainage in the East 2nd Street drainage basin. The project is located in the vicinity of the Benicia Marina, near East E Street and East 2nd Street, to the west of the Benicia Refinery. The EIR prepared for this project was certified by the Benicia City Council on November 20, 2003, and construction is nearly complete.

4.2 Cumulative Projects Analysis

4.2.1 Aesthetics

The construction of the projects listed above at the Benicia Refinery would expand the industrial appearance of the overall complex. However, as explained below, none of the changes associated with individual projects together with those of the VIP Amendments are expected to substantially impact visual resources. As such, the VIP Amendments and the other refinery projects are expected to produce a less than significant cumulative overall visual quality impact. **Section 3.1.1, Aesthetics** presents a detailed analysis of VIP Amendments related visual impacts.

Other planned projects at the Benicia Refinery include new construction, modifications of processing activities, and routine maintenance activities. 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. Some staging and laydown areas used temporarily for the construction of other refinery projects would be visible, and would incrementally add to the overall extent of disturbed and graded areas surrounding the project locations. However, this impact is temporary and minimal. Thus, the visual impact of other refinery projects together with the VIP Amendments on views from Lake Herman Road, Gallagher Drive, Rose Drive, and Addison Court would be less than significant.

The development closest to Lake Herman Road would be the Benicia Business Park. As described in the Certified EIR, although the Business Park would be visible from some of the same points on Lake Herman Road as the Benicia Refinery, the contribution of the other refinery projects to the cumulative impact would be less than significant. The incremental contribution of the VIP Amendments does not change this conclusion.

As described in the Certified EIR, construction and operation of the Caltrans Benicia-Martinez Bridge, the Benicia Business Park and/or other large-scale industrial developments within the City, and the City of Benicia Water Reuse Project each would alter the visual character of their sites and the visual character of the entire area. While noticeable, these visual changes have a limited total effect in changing the existing visual context of the region; therefore, the total visual impact of the cumulative projects combined with the VIP Amendments are less than cumulatively significant.

4.2.2 Air Quality

According to the BAAQMD CEQA Guidelines, any proposed project that would individually have a significant air quality impact would also be considered to have a significant cumulative air quality impact. For any project that does not individually have significant operational air quality impacts, the determination of significant cumulative impact is based on an evaluation of the consistency of the project with the local general plan and of the general plan with the regional air quality plan. As discussed in **Section 3.1.2**, the proposed VIP Amendments would have a less-than-significant impact on air quality. Furthermore, as discussed in the same section, the VIP Amendments are consistent with the City of Benicia General Plan, which in turn is consistent with the BAAQMD's current air quality plan (2005 Ozone Strategy). As a result, the VIP Amendments satisfy the BAAQMD CEQA Guidelines conditions and therefore would not contribute to significant cumulative effects to air quality.

4.2.3 Greenhouse Gases

As demonstrated in **Section 3.1.3**, the VIP Amendments will result in a net reduction in GHG emissions from project operations. This includes the indirect GHG emissions resulting from the small increase of electrical power demands of the project. Since there will be no impact on global climate change from the proposed project, the VIP Amendments will not have a cumulative impact on this resource.

4.2.4 Biological Resources

Construction and operation of the VIP Amendments will avoid direct impacts to Sulphur Springs Creek and potential habitats for special-status plants and wildlife. In addition, the VIP Amendments avoid important terrestrial habitat and wetland resources. Impacts associated with ground disturbance activities such as those planned for the construction and operation of cumulative projects, especially industrial and highway development, may result in indirect, cumulative impacts to biological resources from incremental changes in storm water streams discharging to the same bodies of receiving water as the VIP Amendments. While the incremental loss of biological resources over time has and does occur from both natural and human-caused activities, the combined effects of the implementation of City, County, State and Federal level laws and regulations (including the Clean Water Act, the Endangered Species Act, and the Fish & Wildlife Coordination Act as well as comparable California laws) that require identification and evaluation of biological resources as part of environmental review and requires avoidance or reduction of impacts to biological resources effectively reduces the cumulative impacts that could occur due to cumulative projects. However, the VIP Amendments are designed to avoid impacts on biological resources

As described in **Section 3.1.15**, the increased 63,400 gpd wastewater flow from VIP Amendments project components will be treated, along with other wastewater from the Benicia Refinery, to comply with the NPDES permit governing the refinery's discharge to Suisun Bay. In addition, when considered cumulatively with other projects at the Benicia Refinery, most notably the NRU Catalyst Regeneration Facility Project, there will be a reduction of about 37,400 gpd to the WWTP. If the Benicia Asphalt Plant project is implemented, the net will be a slight increase in flow to the WWTP of about 2,600 gpd (1.5 gpm). This is insignificant compared to the post VIP WWTP flows of 2.56 MGD and a hydraulic capacity of 3.6 MGD. Compliance with permit requirements will ensure that wastewater generated as a result of implementation of the VIP Amendments will not exceed the wastewater discharge limits of the RWQCB.

Therefore, to the extent that any other projects would have cumulative impacts to biological resources, the VIP Amendments would not contribute to these impacts because the VIP Amendments avoid such impacts entirely.

Potential increases in pollutant discharge and impacts to special status fisheries could occur due to accumulative wastewater and/or storm water discharges from other non-refinery industrial projects. As explained in **Sections 3.1.10** and **3.1.15**, no net increases in wastewater or storm water volumes will be generated as a result of the VIP Amendments. As previously described, the Main Stack Scrubber may contribute about 138 pounds per year (without assumed removal) to the final wastewater effluent. None of the other identified cumulative projects are expected to contribute nickel to receiving waters. As demonstrated in **Section 3.1.15 (a)** compliance with permit requirements and potential consultation with the RWQCB will ensure that wastewater generated as a result of implementation of the VIP Amendments will not exceed the wastewater discharge limits of the RWQCB. The less than significant impact from the VIP Amendments would similarly be expected to have a less than significant cumulative impact when considered in conjunction with other projects each with an insignificant volume contribution and no specific compounds where mass loadings would overlap with the VIP Amendments projects. Therefore, both the wastewater volume or water quality potential increases in pollutants from cumulative projects would essentially be the same whether or not VIP is implemented. Refinery projects other than the NRU Catalyst Regeneration Facility Project and the Benicia Asphalt Plant are not expected to decrease or increase wastewater or storm water flows above or below that which was described for the VIP in the Certified EIR. The NRU Catalyst Regeneration Facility Project, which is now operating, is estimated to have decreased the wastewater sent to the Benicia Refinery WWTP by 100,800 gpd. The Benicia Asphalt Plant is projected to increase the amount of wastewater sent to the refinery WWTP by about 40,000 gpd. These additional refinery projects, when combined with the small increase of wastewater of approximately 63,400 gpd from the Main Stack Scrubber elements and other projects in the VIP Amendments, will result in a slight increase in flow to the WWTP of about 2,600 gpd (1.5 gpm). This is insignificant compared to the post VIP WWTP flows of 2.56 MGD and a hydraulic capacity of 3.6 MGD.

Potential increases in pollutant discharge and impacts to special status fisheries could occur due to accumulative wastewater and/or storm water discharges from other non-refinery industrial projects. However, no net increases in wastewater or storm water will be generated as a result of the VIP

Amendments. Therefore, potential increases in pollutants from other cumulative projects would essentially be the same whether or not VIP is implemented because the VIP Amendments do not contribute to such impacts.

4.2.5 Cultural Resources

Because construction and operation of the VIP Amendments would not affect known significant cultural resources, the VIP Amendments would not be expected to contribute to significant cumulative impacts.

However, it remains possible that ground-disturbing activities such as those planned for construction of the VIP Amendments and other cumulative projects, especially industrial and highway development, may uncover unknown resources with cultural significance. While the incremental loss of cultural resources over time has and does occur from both natural and human-caused activities, the combined effects of the implementation of both County and State level regulations that require identification and evaluation of cultural resources as part of environmental review effectively reduces the cumulative impacts that occur to cultural resources. These requirements are designed to reduce direct impacts on cultural resources to a less-than-significant level on a site-specific basis. Mitigation measures for discovery of unknown resources required by other projects, as well as for the VIP Amendments as described in **Section 3.1.5**, will result in less than cumulative significant impacts to cultural resources.

4.2.6 Energy

The construction and operation of the VIP Amendments, in addition to other cumulative refinery and non-refinery cumulative development in the project area would not result in any known cumulative impacts to energy resources. The VIP Amendments are projected to increase the Benicia Refinery's electrical demand by approximately 5 MW over the electrical use projected in the Certified EIR. However, the cumulative refinery projects that have been identified include the operation of the first cogeneration unit at the Benicia Refinery, which has already been constructed, and construction and operation of the second cogeneration unit. These two projects will reduce the Benicia Refinery's electrical demand by 102 MW, which exceeds the combined 35 MW net increase for VIP and the VIP Amendments. Therefore, there will be a net reduction in electrical demand, resulting cumulatively from other refinery projects, which would not contribute to cumulative impacts.

The VIP Amendments will result in a net decrease in the Benicia Refinery's consumption of natural gas as described in **Section 3.1.6**. Therefore, the VIP Amendments will not contribute to cumulative impacts to gas consumption.

The cumulative electrical and natural gas demands of the other, non-refinery cumulative projects would be served by PG&E. Those projects represent planned development under the Benicia General Plan, and it is PG&E's responsibility to plan for and construct the energy distribution structure and to deliver natural gas and electricity to those developments. Within this context, the net reduction of the Benicia Refinery's cumulative electricity and gas use would not contribute to any cumulative impact to the energy demand within Benicia from non-refinery projects.

4.2.7 Geology and Seismicity

As discussed in **Section 3.1.7**, the construction and operation of the VIP Amendments would be designed and carried out in conformance to codes and standards to ensure a less than significant impact related to geology and seismicity. Soil disturbance will occur during construction but will be minimized through implementation of Best Management Practices. Appropriate grading and design and structural considerations and specifications will comply with California Building Code requirements or a more stringent standard as described in Mitigation Measures 4.6-1a through 4.6-1e and 4.6-3 in the Certified EIR. New construction associated with the other refinery and non-refinery projects will be subject to the same stringent standards which will cumulatively ensure less than significant impacts and will provide an overall benefit in resistance to potential expansive soil and adverse effects from ground shaking.

Therefore, the VIP Amendments would not contribute to significant cumulative effects relative to geology and seismicity resulting from the cumulative projects, including the industrial and highway developments considered in this analysis.

4.2.8 Public Health

Cumulative effects to public health could occur if TAC emissions from the VIP Amendments were to combine with TAC emissions from one or more cumulative projects in the region to cause a significant cumulative health impact. Cumulative projects that may occur in the future include those at the Benicia Refinery, the reconstruction of the Benicia Bridge, and residential and commercial projects expected to occur nearby.

Future projects at the Benicia Refinery that involve construction concurrent with the VIP Amendments, including the Benicia Asphalt Wastewater Project, would not emit TACs above BAAQMD thresholds that trigger the need for an HRA. The trigger levels were established to represent an emission rate that, when modeled using very conservative assumptions, would result in a health risk no greater than one in one million for cancer risk, or an HI of 0.2 for non-cancer risk. This represents the upper bound for risk impact for each of the two projects. Therefore, the combined health risk from the cumulative refinery projects would not be expected to exceed two in one million for cancer or a HI of 0.4 for non-cancer risk. As presented in **Section 3.1.8**, the estimated health risk from refinery sources associated with the VIP Amendments is less than 0.6 in one million for cancer risk and a HI less than 0.01 for both chronic and acute non-cancer risk. Conservatively, assuming that the point of greatest impact is the same location for all three projects, the combined risk would be substantially below the significant impact level. Thus, these two cumulative projects, when added to the risk associated with the VIP Amendments, would result in a health impact below the significant impact level and would not pose a cumulative public health concern.

Cumulatively, the residential and commercial projects will not be routine sources of TACs during their operation and, therefore, would not cumulatively contribute to TAC emissions from the VIP Amendments. TACs would be emitted during the construction of these projects. However, the construction will be short-term in duration, and therefore will not represent a cumulative health concern for carcinogenic and non-cancer chronic exposure. Impacts from TACS representing acute health risks would be from such sources as construction machinery, which tend to have localized impacts. Acute health risks associated with the VIP Amendments are also limited to the area near the Benicia Refinery and would not combine with health risks from the construction projects to create a significant impact. In addition, the construction schedules for these cumulative projects may not overlap with the construction of the VIP Amendments. Therefore, there would be no cumulative public health concern associated with the residential and commercial projects.

Construction activities associated with the reconstructed Benicia Bridge would also not result in a cumulative health risk for the same reasons. Post-construction, the bridge project is not expected to result in an increase in TAC emissions over current conditions. Therefore, this project would not result in a chronic cumulative health impact.

Based upon this analysis, exposure levels of TACs from cumulative projects would be less than significant.

4.2.9 Public Safety

Other refinery projects are not expected to result in significant cumulative impacts to public safety. Refinery accidents with off-site consequences are low-probability events and it is not expected that multiple events would occur simultaneously to cause a cumulative impact. In addition, the replacement of an existing H2U train with a new H2U featuring modern safety technology would result in an overall reduction in safety risks.

The VIP Amendments are unlikely to cause a chain reaction accident due to interaction with other cumulative refinery projects. Fires would likely be confined to a limited area by the refinery's fire suppression system, and would not affect other Refinery projects such as the NRU Catalyst Regeneration Facility Project and the Benicia Asphalt Wastewater Project. Since the VIP Amendments will not require additional ammonia storage, the probability of a catastrophic release of aqueous ammonia is not increased. Therefore, the probability of such an event interacting with other accidents is unchanged. The VIP Amendments slightly increase the risk

of a smaller ammonia release due to the increase in deliveries. However, such a release, such as from a ruptured delivery hose, is not expected to be of sufficient magnitude to trigger additional releases from other projects. Similarly, refinery explosions are low-probability events, and an on-site explosion would not be expected to combine with impacts from any other on-site cumulative projects.

Other planned projects in the region are located too far away from the Benicia Refinery to cause potential cumulative impacts to public safety. As noted above, all of the potentially injurious effects of fires, explosions, or from toxic gas releases from new equipment associated with the VIP Amendments would be limited to the interior of the property. Also, the probability of an independent accidental release occurring from another cumulative project at the same time that an accident would occur at the Benicia Refinery would be extremely low. However, in the event of a release due to earthquake-induced simultaneous accidents at industries in Benicia and throughout the Bay Area, the limited geographic extent of the accident effects from the proposed VIP Amendments elements would make that contribution inconsequential. Therefore, the VIP Amendments do not contribute to a significant cumulative public safety impact together with non-Refinery projects.

4.2.10 Hydrology and Water Quality

As described in the **Hydrology and Water Quality Section 3.1.10**, wastewater from three separate parcels within the Benicia Refinery is collected and combined within the individual parcels and routed to the on-site Benicia Refinery WWTP. The separate drainage parcels within the Benicia Refinery boundaries are depicted in Figure 4.9-1 of the Certified EIR. The VIP Amendments proposed in and adjacent to the Refinery Process Block and the area north of the Refinery Process Block are located within Parcel 1. As described in **Section 3.1.4** and **3.1.10**, wastewater from VIP Amendments project components within Parcel 1 will be directed to the Benicia Refinery WWTP and will be treated, along with other wastewater from the Benicia Refinery, to comply with the NPDES permit governing the refinery's discharge to Suisun Bay. Of the approximate 63,400 gpd added to the WWTP flow from the VIP amendments, 57,600 gpd will be a stream expected to contain nickel, vanadium, and aluminum and 14,400 gpd will be from the caustic polisher which will contain sulfates. These additional wastewater streams, when combined with the decrease in wastewater to the Benicia Refinery WWTP due to the NRU Catalyst Regeneration Facility Project of 100,800 gpd and the increase in wastewater to the Benicia Refinery WWTP from the Benicia Asphalt Plant of approximately 40,000 gpd, will result in a slight increase in the rate of wastewater flow to the Benicia Refinery WWTP by about 2,600 gpd (1.5 gpm). These combined additional wastewater streams estimated to be generated are insignificant compared to the post VIP WWTP flow of 2.56 MGD and 3.6 MGD hydraulic capacity of the WWTP. As demonstrated in **Section 3.1.15 (a)** compliance with permit requirements and potential consultation with the RWQCB will ensure that additional wastewater and wastewater load generated as a result of implementation of the VIP Amendments will not exceed the wastewater discharge limits of the RWQCB.

As discussed in Section 3.1.10, the VIP Amendments will not alter the size or drainage pattern of the Main Refinery Area; therefore, the VIP Amendments do not increase the amount of storm water processed by the WWTP. Storm water from the area of the new employee parking lot and the relocated firehouse will be diverted to existing outfalls and will be designed so that post-construction runoff rates equal pre-construction rates. Runoff from these areas is not expected to contain additional pollutants. Therefore, taken together the VIP Amendments will not increase the flow rates of discharge from the WWTP or flow rates of runoff.

The VIP Amendments taken cumulatively with other refinery projects and the non-refinery projects may contribute controlled amounts of pollutants to Suisun and San Pablo Bay due to wastewater or storm water discharges during construction and/or operation. Cumulatively, these discharges and emissions are assimilated into the surface waters. Discharges to the waters of the United States are regulated under the RWQCB's implementation of the NPDES that establishes waste discharge requirements and provisions to dischargers to manage effluent concentrations of contaminants. Within this regulatory context, the Benicia Refinery's contribution and the contribution of other non-refinery projects are controlled by the discharge limits in the Benicia Refinery NPDES permit and the general NPDES permit. As discussed above, there will be a net decrease in the refinery's cumulative wastewater discharge and no net increase in the Benicia Refinery's storm water discharge due to the VIP Amendments. Therefore, the VIP Amendments would provide a less than significant increase in the amount of pollutants discharged to Suisun or San Pablo Bay and would not change the discharges from other projects.

As described in the Certified EIR, the Seeno Benicia Business Park and Southampton Tourtelot Development projects located northeast and northwest of the Benicia Refinery, respectively, could considerably change runoff conditions and cause downstream flooding effects to the Lower Sulphur Springs Creek drainage area. The incremental impacts of the VIP Amendments are not cumulatively considerable because storm water from the VIP Amendments will not run off to the Lower Sulphur Springs Creek. Therefore, the VIP Amendments would not contribute to any increase in pollutants discharged to Lower Sulphur Springs Creek by other projects.

4.2.11 Land Use, Plans and Policies

The VIP Amendments will occur within the area designated the Benicia Industrial Park in the City's General Plan. The land use designation for the area to be utilized for the VIP Amendments is designated General Industrial (IG) by the Benicia Zoning Ordinance and the City of Benicia General Plan, as shown in the Certified EIR Figure 4.10-1. The project elements of the VIP Amendments are allowed uses in the IG zone.

The construction and operation of the VIP Amendments, in addition to other cumulative refinery and non-refinery cumulative developments, would not result in any known cumulative impacts to land use plans and policies. The impact of each project, if any, would be specific to its site and land use changes and overall effects were considered in the development of the Benicia General Plan.

4.2.12 Noise

The methodology for noise analysis as presented in the Certified EIR and further evaluated in **Section 3.1.12** takes cumulative noise into account. As discussed in Section 3.1.12, the cumulative impact of the VIP Amendments and other refinery projects operating simultaneously at the Benicia Refinery would at most cause a 3 dBA increase in background equivalent noise level (L_{eq}) at the nearest residential receptors (i.e. 136 Carlisle Way and 37 La Cruz) which are situated approximately 3,300 feet from the Process Block. No measurable change is predicted in day/night noise level (DNL) at the residential receptors. Since operation of the VIP Amendments would not contribute additional noise above that identified in the Certified EIR, the total increase in ambient noise level due to the cumulative projects in conjunction with the noise generated by the VIP Amendments would be less than the significance thresholds identified for this project, would constitute an imperceptible increase over existing levels and will comply with noise standards of the City of Benicia. Accordingly, the VIP Amendments would not contribute to a significant cumulative impact.

As discussed in **Section 3.1.12**, construction noise from construction of the VIP Amendments would not exceed 55 dBA during the day or 50 dBA nighttime at sensitive receptors. Therefore, construction of the VIP Amendments will not create a significant noise impact at residential locations and/or other sensitive land uses in the project vicinity. Noise levels during construction of the VIP Amendments will not exceed performance standards in the City of Benicia's General Plan or applicable noise regulations in the City of Benicia Municipal Code. Construction of the second unit of the Cogeneration Project is expected to begin after the completion of the VIP Amendments and therefore, will not contribute to construction noise during construction of the VIP Amendments. Construction activities associated with the Benicia Refinery maintenance turnarounds, treatment of wastewater from the Benicia Asphalt Plant, and the VIP Amendments would not be expected to occur at the same time. Based on the expected construction schedules, the VIP Amendments would not contribute to a significant cumulative impact.

Noise from either the Air Liquide or Air Products pipelines will be short term and arise from construction activities. Although no information on estimated noise levels was provided, the short-term, noise-related impacts resulting from construction of the Air Liquide or Air Products pipeline projects may occur adjacent to sensitive receptors (e.g., residences near the refinery). These sensitive receptors are approximately one mile from the Refinery Process Block. This is sufficiently far away such that acoustical energy resulting from construction within the Benicia Refinery would be significantly attenuated at sensitive land use areas and would not contribute to the construction noise from either the Air Liquide or Air Products pipeline projects. (The noise from the Benicia Refinery would be more than 10 dBA less than pipeline construction equipment).

Construction associated with either the Air Liquide or Air Products pipeline projects near the refinery would not be expected to occur at the same time as construction of the VIP Amendments and would be unlikely to involve pile driving. Based on the distance of the construction of the VIP Amendments from the majority of the noise generating construction of the Air Liquide or Air Products pipelines and the expected staggering of construction, the VIP Amendments are not expected to contribute a significant cumulative impact.

In addition to the other refinery projects, the Seeno Benicia Business Park project, the Benicia-Martinez Bridge project, the Southampton Tourtelot Development and the City of Benicia Wastewater Reuse project would add to cumulative noise levels in the area. Construction of these projects may contribute to construction noise levels during the construction of the VIP Amendments. However, these developments are sufficiently far away from the refinery that acoustical energy imparted by these activities would be significantly attenuated at sensitive land uses near the refinery. Similarly, the VIP Amendments would not contribute to any cumulative impacts of other projects on sensitive receptors near those projects, due to the attenuation of noise originating from the VIP Amendments.

The construction and operation of the new equipment not previously analyzed in the Certified EIR (listed in **Section 3.1.12**) will not expose people to excessive groundborne vibration or groundborne noise levels. The vibratory and acoustical energy imparted by these activities to the ground plane would be significantly attenuated at sensitive land uses due to ground surface geometric spreading and material damping over the large distances to these uses. As described above, construction of other refinery projects will either not be constructed at the same time as the VIP Amendments or the construction of the projects will be sufficiently far away from the VIP Amendments that acoustical energy imparted by these activities would be significantly attenuated before reaching the VIP Amendments' construction locations or sensitive land uses. Therefore, the other refinery projects will not contribute to significant vibration at sensitive land uses or expose people to excessive vibration.

Other non-refinery projects may contribute to vibration at sensitive land uses. However, these projects will be constructed sufficiently far from the refinery that any vibratory and acoustical energy imparted by these activities to the ground plane would be significantly attenuated prior to reaching the refinery. Therefore, vibration produced by construction of these activities would not be amplified by Refinery construction.

4.2.13 Public Services

As described in **Section 3.1.13**, the VIP Amendments will not result in the need for additional public services related to fire protection, police protection, schools, parks and recreation, or other public facilities. Therefore, the construction and operation of the VIP Amendments would not result in any impacts to public services in the vicinity of the Benicia Refinery.

Other refinery projects would utilize the services described in **Section 3.1.13**. The VIP Amendments would not result in a significant expansion of long-term employment at the Benicia Refinery. Therefore, the other refinery projects combined with the VIP Amendments would not require additional public services related to fire protection, police protection, schools, parks and recreation, or other public facilities. Other non-refinery cumulative development, including the Seeno Benicia Business Park or other industrial development within the City, could adversely affect the provision of certain of these City services if these projects increase the number of Benicia residents or increase the demand on City fire and police protection services. However, the VIP Amendments would not contribute to these cumulative impacts.

4.2.14 Transportation/Traffic

The methodology for traffic analysis as described in the Certified EIR and applied in **Section 3.1.14** takes cumulative traffic into account. As described in **Section 3.1.14**, the incremental impacts associated with operation of the VIP Amendments represent only a nominal incremental increase in traffic and would not cause a significant impact. Construction traffic generated by the VIP Amendments would add relatively few marginal peak hour trips, and the effects would not be significantly different from those projected in the

Certified EIR. Cumulatively, the locations and sizes of the major development projects envisioned in the County and Cities' General Plans have been programmed into the Countywide Year 2025 Travel Demand Model, which was developed by the Solano Transportation Authority's County wide Congestion Management Program travel demand model, and the long-term traffic impacts associated with the build out of the Solano County and City of Benicia General Plans.

As described in **Section 3.1.14**, there are four CMP facilities within the City of Benicia, including I-680, I-780, Military West Street, and Military East Street. Cumulative plus project conditions for another recent project indicate that only one segment of a CMP highway (westbound I-780 west of East 2nd Street) would experience a LOS worse than 'E'. However, the mitigation – widening of I-780 – ascribed from Solano County's Capital Improvement Program to this other project (Benicia Business Park EIR, LSA Associates, Inc., January 2006) will substantially improve the LOS from 'F' to 'B'. The VIP Amendments with their relatively few marginal trips during the operational phase will not contribute to a significant cumulative effect at the mitigated I-780 segment. At other locations, the VIP Amendments will not contribute to a significant impact because LOS will remain at acceptable levels without need for mitigation.

As stated in Section 2.6, operation of the facilities following implementation of the VIP Amendments construction would add 30 additional new permanent employees, generating about 60 new one-way commute trips (30 in and 30 out). With total employment at the Benicia Refinery estimated at 500, the incremental employment resulting from the VIP Amendments represents a six percent increase.

In addition, there would be about two new truck deliveries or pick-ups per week (i.e., about four new one-way truck trips) mainly to deliver additional process chemicals (such as aqueous ammonia or caustic) and carry solid waste out for disposal to Clean Harbors Buttonwillow Landfill. These truck trips would be spread throughout the day and are expected to occur primarily during off-peak traffic hours. The VIP Amendments would not significantly cumulatively affect the LOS.

4.2.15 Utilities and Service Systems

Water Supply

As described in the Certified EIR, VIP together with the Cogeneration Project and other refinery projects would increase demand for raw, untreated water from the City of Benicia in excess of the baseline Benicia Refinery demand anticipated in the UWMP. The VIP Amendments add additional water demand above that identified in the Certified EIR; however, the NRU Catalyst Regeneration Facility Project, now under operation, represents an equivalent reduction in water demand, as described in **Section 3.1.15** and depicted in **Table 3.1-15-1**. Other non-refinery projects may require an increased amount of raw water from the City of Benicia. Since the combination of the VIP Amendments and other refinery projects results in no net increase in raw water demand, the VIP Amendments would not contribute to an impact from the increase in raw water demand due to other non-refinery projects. Therefore, there are no cumulative impacts to the water supply due to the VIP Amendments.

As described in the Certified EIR, water conservation measures instituted under the City Ordinance would reduce water demand in times of water shortages. To the extent that new development within the City also would be governed by the use limitations of the ordinance, water demand would be reduced for new developments as well as for existing users and cumulative impacts would be less than significant.

Wastewater Treatment

As described in the Certified EIR, VIP together with other refinery projects would increase the quantity of pollutants and the amount of wastewater processed at the Benicia Refinery WWTP. This increase was evaluated in the Certified EIR and would be a less than significant impact due to NPDES discharge limitations.

As described in the **Hydrology and Water Quality Section 3.1.10**, wastewater from three separate parcels within the Benicia Refinery is collected and combined within the individual parcels and routed to the on-site Benicia Refinery WWTP. The separate drainage parcels within the Benicia Refinery boundaries are depicted in Figure 4.9-1 of the Certified EIR. The VIP Amendments proposed in and adjacent to the Refinery Process Block and the area north of the Refinery Process Block are located within Parcel 1. As described in **Section 3.1.4** and **3.1.10**, wastewater from the VIP Amendments project components within this Parcel 1 will be directed to the Benicia Refinery WWTP and will be treated, along with other wastewater from the Benicia Refinery, to comply with the NPDES permit governing the refinery's discharge to Suisun Bay. Of the approximate 63,400 gpd added to the WWTP flow from the VIP amendments, 57,600 gpd will be a stream expected to contain nickel, vanadium, and aluminum and 14,400 gpd will be from the caustic polisher which will contain sulfates. However, as described in **Sections 3.1.10** and **3.1.15**, the Benicia Refinery will be able to remain within its NPDES discharge limits. Therefore compliance with permit requirements will ensure that wastewater generated as a result of implementation of the VIP Amendments in Parcel 1 will not exceed the wastewater discharge limits of the RWQCB.

The VIP Amendments represent a 63,400 gpd increase in wastewater flow to the Benicia Refinery WWTP and limited increases in flow to the municipal WWTP associated with the nominal increase in full time employees at the refinery. The NRU Catalyst Regeneration Facility Project represents a decrease in wastewater flow to the Benicia Refinery WWTP of 100,800 gpd. The Benicia Asphalt Plant represents an increase in wastewater flow to the Benicia Refinery WWTP of about 40,000 gpd. Therefore, the VIP Amendments combined with the cumulative refinery projects result in a slight net increase of about 2,600 gpd (1.5 gpm) at the Benicia Refinery WWTP. As described in **Section 3.1.10** and **3.1.15**, the WWTP has a maximum capacity of 2,500 gpm (3.6 MGD) and the VIP Amendments and other cumulative projects will negligibly increase wastewater flow and will not change storm water flow to the WWTP. Therefore, the WWTP has sufficient capacity to manage storm water and wastewater flows at the refinery.

The VIP Amendments, together with other refinery and non-refinery projects within Benicia, could increase the amount of wastewater treated at the City WWTP. As described in **Section 3.1.15**, the amount of wastewater generated by the VIP Amendments, associated with the increase in a limited number of personnel, will be nominal and the construction workforce will be temporary. As described in the Certified EIR, the total capacity of the city's WWTP is 4.5 MGD and during dry weather the plant operates at approximately 64 percent capacity; therefore, the city of Benicia's municipal WWTP has adequate capacity to serve the VIP Amendments demand in addition to existing commitments. Also, as described in the Certified EIR, the rerouting of the Benicia Asphalt Plant wastewater flow from the city of Benicia's municipal WWTP to the Benicia Refinery WWTP would result in a decrease in flow of approximately 0.03 MGD to the City plant. Other non-refinery projects could potentially increase wastewater flow to the City of Benicia WWTP. However, the increased flow from the refinery would be negligible in relation to the WWTP's available capacity to accommodate existing uses and planned growth. Accordingly, the contributions to the sanitary sewer from the Benicia Refinery would not represent a cumulatively considerable increase in flow to the City of Benicia WWTP.

Solid and Hazardous Waste Disposal

The VIP Amendments would not increase the Benicia Refinery's disposal of non-hazardous materials from what was previously analyzed in the Certified EIR. Therefore, the VIP Amendments would not contribute any cumulative impacts from increases in non-hazardous waste generation and disposal at landfills in the region from any other sources.

As described in **Section 3.1.15**, the VIP Amendments will increase the amount of hazardous waste landfilled at the Clean Harbors Buttonwillow facility LLC landfill by up to 800 tons per year. The Buttonwillow active hazardous waste management unit has a total design capacity of 10.7 million cubic yards or about 9.1 million tons. In addition, there are land use and air permits that further limit Clean Harbors to accept 352,105 tons per year with up to 4,050 tons in any one day. Over the last three years (2004 – 2006) the Buttonwillow landfill

has averaged annual waste receipts of 322,684 tons per year. The additional 800 tons per year from the proposed VIP Amendments represents only 2.7 percent of the allowable increase from the three-year average waste receipts to the permit limit. Additional landfill capacity remains for increases from other projects, if needed. Therefore, the VIP Amendments would have a cumulatively inconsiderable effect on hazardous waste generation and disposal at the Buttonwillow facility along with that from other sources.

4.2.16 Agricultural Resources

The construction and operation of the VIP Amendments would not result in any impacts to agricultural resources or lands designated for such use. The other Benicia Refinery and non-refinery projects generally also will not result in impacts to agricultural resources since they are not located in areas requiring conversion of existing agricultural resources or lands designated for such use. Therefore, the VIP Amendments will not contribute to any cumulative impacts from other projects in the region affecting agricultural resources or lands designated for such use.

4.2.17 Mineral Resources

The construction and operation of the VIP Amendments would not result in the loss of availability or preclude the retrieval of mineral resources. Soils excavated for site construction will remain onsite for use as grading material. Although other cumulative projects, such as the highway and industrial developments, may require retrieval of mineral resources for their construction, the VIP Amendments will not contribute to these cumulative effects.

4.2.18 Population and Housing

The construction and operation of the VIP Amendments would not result in a substantial population growth or need for housing. Construction activities related to the proposed VIP Amendments will take approximately three years and will use the existing workforce in the area. Construction of the VIP Amendments will not directly or indirectly induce population growth because the construction workforce will be drawn from the existing workforce in the area. The proposed VIP Amendments will require approximately 30 new fulltime operations staff. This is a minor increase in the total operational workforce of about 500 at the Benicia Refinery. The other refinery and non-refinery projects are likely to result in regional population growth and a subsequent need for housing. Regional population growth was estimated by the Association of Bay Area Governments to grow from 7,096,100 in 2005 to 7,730,000 in 2015. This represents a planned growth increase of approximately 9 percent in the region during the construction of the VIP Amendments and the cumulative projects. The additional new workers associated with the VIP Amendments are negligible in comparison when taken within the context of this planned regional population growth. Therefore, the VIP Amendments do not represent a cumulatively significant impact on population and housing in the region.

4.3 Unavoidable Impacts

There are no significant unavoidable impacts from VIP (EIR Section 5.1) and, incrementally, there are no significant unavoidable impacts resulting from the VIP Amendments.

4.4 Project Alternatives

Since the VIP Amendments represent minor revisions to VIP, the CEQA required analysis of project alternatives reflected in Section 6.2 of the Certified EIR are still appropriate and additional analysis is not required.

Appendix A

Visible Plume Modeling

Prepared for:
Valero Refining Company – California
Benicia Refinery

Technical Report

Assessment of Visible Water Vapor Plume Formation – VIP Amendments

ENSR Corporation
Rev. 1 August 2007
Document No.: 06993-023-900

Prepared for:
Valero Refining Company – California
Benicia Refinery

Technical Report

Assessment of Visible Water Vapor Plume Formation – VIP Amendments



Prepared By: Brian Stormwind



Reviewed By: Michael Dudasko

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1.0 Introduction

This report prepared for the Valero Refining Company – California (Valero) serves as an addendum to the June 2002 report entitled “Assessment of Visible Steam Plume Formation” (URS, 2002), which documented the visible water vapor plume analysis conducted in support of the Valero Improvement Project (VIP).

Originally, VIP included the use of a Main Stack scrubber to control sulfur dioxide (SO₂) emissions from the Fluid Coking Unit (CKR). Based on recent detailed engineering and design work, Valero is currently proposing amendments to VIP (VIP Amendments) which include using a Main Stack scrubber to control SO₂ emissions from both the CKR and the Fluid Catalytic Cracking Unit (FCCU).

With the VIP Amendments, the Main Stack scrubber will be designed to process about three times more flue gas than analyzed in the VIP. As a consequence of the larger flue gas volumes processed by the scrubber, more water will be evaporated in the scrubbing process. This requires a reanalysis of the effect on the potential for the Main Stack to have a visible water vapor plume. This report summarizes that analysis to support the VIP Amendments.

2.0 Modeling Methodology and Input Data

Stack plume visibility modeling was conducted for the water vapor emissions from the main stack to determine the potential frequency of formation (hours/year), length and potential for ground-level impingement of visible plumes associated with the process changes proposed as part of the VIP Amendments.

The potential for water vapor emissions to form visible plumes depends on the amount of water vapor in the exhaust gas, the temperature and volume of the exhaust gas, and the temperature and moisture content of the ambient air. Any additional water vapor introduced to saturated air (i.e., relative humidity of 100 percent) will condense into small water droplets.

The exhaust plume exiting a stack mixes with ambient air and is diluted. For a given volume of stack exhaust mixed with ambient air, the following steps are used to determine whether or not the resultant vapor plume will be visible:

- The resultant temperature and water vapor density of the diluted plume are determined by use of temperature and mass balance equations.
- The saturation vapor pressure of water is calculated for the resultant temperature of the diluted plume.
- The saturation vapor density of the diluted plume is calculated from the saturation vapor pressure.
- If the vapor density of the diluted plume is greater than the saturation vapor density, then condensation is assumed to occur and the plume is considered to be visible.

The steps described above were performed on an hourly basis for an array of model receptors (i.e., 20-meter spacing from the stack out to 5-kilometers and 40-meter spacing beyond 5-kilometers out to 10-kilometers) to estimate frequency and length of visible plumes. This was accomplished utilizing dispersion modeling results from AERMOD in the form of hourly water vapor concentrations (at each receptor evaluated) and concurrent hourly values of ambient dry bulb and dew point temperature. AERMOD, also used for the air quality dispersion modeling, is a state-of-the-art dispersion model and is preferred by U.S. Environmental Protection Agency (USEPA) and Bay Area Air Quality Management District (BAAQMD) for dispersion modeling applications where representative or onsite meteorological data are available.

The modeled water vapor concentration data obtained from AERMOD were input to a Fortran program, VIZDET, developed by ENSR which performs the calculations described above. Specifically, VIZDET determines if the modeled water vapor concentrations result in visible plumes (i.e., condensation of water vapor occurs) based on the plume conditions coupled with the ambient conditions (e.g., temperature and relative humidity). The plume is defined to be visible at a given downwind distance if the liquid water content of the plume exceeds 10^{-5} kg water (condensed)/kg dry air. VIZDET has been used in regulatory applications to support power plant permitting in New York and California. Refer to Appendix A for details on the VIZDET program equations.

The analysis for the VIP Amendments was conducted with 1-year of onsite meteorological data (2005) collected at the Valero Refinery administration building. The data were provided by the BAAQMD for the air quality impact analysis. The on-site data measurements included the wind speed, wind direction, temperature and relative humidity (RH) required for the analysis. The analysis also utilized weather and fog observations recorded at nearby Buchanan Field Airport in Concord, California (obtained from the National Climatic Data Center). In addition to the AERMOD model output and meteorological data, source data including the water vapor emission rate, stack exhaust flow rate and exhaust temperature were also input to VIZDET. These data are summarized in **Table 2-1**.

Table 2-1 Stack Data Required for Vapor Plume Analysis

Parameter	Value
Stack Height (ft)	465
Stack Diameter (ft)	15.5
Water vapor emission rate (lb/hr)	230,102
Exhaust flow rate (ACFM)	690,971
Exhaust temperature (°F)	313

3.0 Model Results

The modeling analysis was conducted to determine the frequency and length of visible plumes based on two meteorological data sets: 1) the full year of meteorology and 2) for daytime hours only that were not associated with either precipitation, fog or 100 percent RH. The night time, precipitation, fog, and 100 percent RH hours were excluded because a plume would either not be visible or difficult to distinguish against the background conditions. **Table 3-1** summarizes the predicted frequency of occurrence of a visible water vapor plume based on model output data.

Table 3-1 Vapor Plume Modeling Results - Frequency

Case	Hours per Year with Visible Plume	Days per Year with Visible Plume
All Hours	493	93
Daytime Only, excluding hours of precipitation, fog and 100 percent RH	55	36

All hours with predicted visible plume formation were analyzed to identify the maximum predicted visible plume length as well as more representative comparison standards which include the 50th percentile (median visible plume) and 90th percentile visible plume lengths. The results of this analysis are shown in **Table 3-2**. The maximum predicted plume length during daytime hours without precipitation, fog or 100 percent RH is 328 feet (100 meters) which was predicted to occur for 1 hours. For this daytime condition, the predicted 90th percentile visible plume length is 197 feet (60 meters) and the median plume length is 131 feet (40 meters).

Table 3-2 Vapor Plume Modeling Results – Plume Dimensions

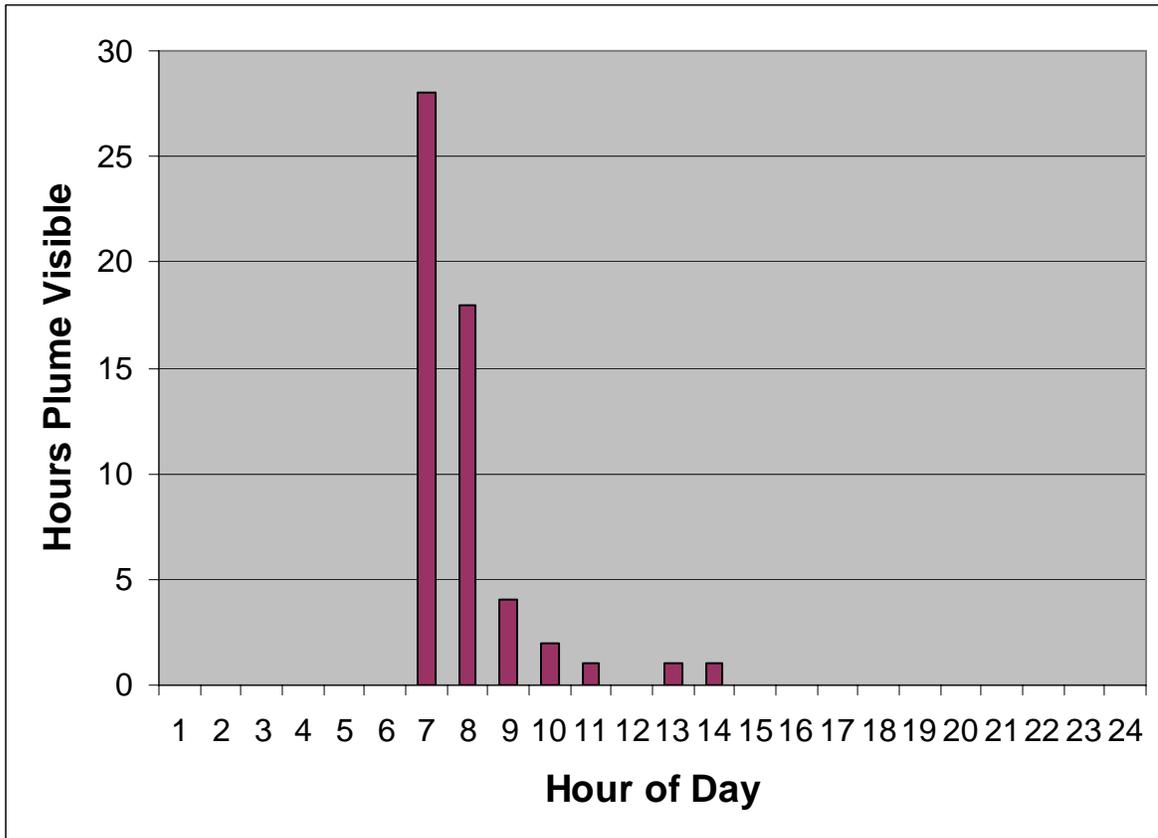
Case	Maximum Plume		90 th Percentile Plume		Median Plume	
	Length (feet)	Hours/Year	Length (feet)	Hours/Year ⁽¹⁾	Length (feet)	Hours/Year ⁽²⁾
Daytime Only, excluding hours of precipitation, fog and 100 percent RH	328	1	197	4	131	30

(1) Number of hours/year that the modeled visible plume length was equal to or greater than the 90th percentile.

(2) Number of hours/year that the modeled visible plume length was equal to or greater than the 50th percentile

The distribution of the hours with modeled visible plumes as a function of the time of day is illustrated in Figure 3-1 for daytime hours not associated with either precipitation, fog or 100 percent RH. Figure 3-1 shows that the daytime hours with modeled visible plumes are predominantly at sunrise and shortly thereafter.

**Figure 3-1 Distribution of Modeled Visible Plumes – Daytime Hours
(excluding precipitation, fog or 100 percent RH)**



A modeling analysis was also performed to determine if visible water vapor plumes would touch ground. Based on the full year of meteorological data, visible plumes were not predicted to touch ground at any time.

Appendix A

VIZDET Technical Appendix

Appendix A

VIZDET Technical Appendix

The following provides documentation of the methodology used to estimate the extent of vapor plumes.

The potential for water vapor emissions to form visible plumes depends on the amount of water vapor in the exhaust gas, the temperature and volume of the exhaust gas, and the temperature and moisture content of the ambient air. Any additional water vapor introduced to saturated air (i.e., relative humidity of 100 percent) will condense into small water droplets.

The exhaust plume exiting a stack mixes with ambient air and is diluted. For a given volume of stack exhaust mixed with ambient air, the following steps are used to determine whether or not the resultant vapor plume will be visible:

- The resultant temperature and water vapor density of the diluted plume are determined by use of temperature and mass balance equations.
- The saturation vapor pressure of water is calculated for the resultant temperature of the diluted plume.
- The saturation vapor density of the diluted plume is calculated from the saturation vapor pressure.
- If the vapor density of the diluted plume is greater than the saturation vapor density, then condensation is assumed to occur and the plume is considered to be visible.

The steps described are performed on an hourly basis for an array of model receptors to estimate frequency and length of visible plumes. This is accomplished utilizing dispersion modeling results from a Gaussian dispersion model (e.g., AERMOD) in the form of hourly water vapor concentrations (at each receptor evaluated) and concurrent hourly values of ambient dry bulb and dew point temperature. The modeled water vapor concentration data obtained from AERMOD are input to a Fortran program, VIZDET, developed by ENSR which performs the calculations described above. Specifically, VIZDET determines if the modeled water vapor concentrations result in visible plumes (i.e., condensation of water vapor occurs) based on the plume conditions coupled with the ambient conditions (e.g., temperature and relative humidity). The plume is defined to be visible at a given downwind distance if the liquid water content of the plume exceeds 10^{-5} kg H₂O (condensed)/kg dry air, consistent with fog and cloud visibility thresholds.

The following provides details on the VIZDET program and equations.

Consider a source that emits exhaust gases containing water vapor. The key parameters for this source are given below:

Q_{wv} = water vapor release rate (kg/s)

V_F = volume flux from source (m³/s)

T_s = source temperature (°K)

Assume that by application of an air quality dispersion model the normalized concentration (X/Q) has been calculated for a receptor location (either at ground level or on a "flagpole"). The heat balance requirement at this receptor is given by the following equation:

$$\rho_a c_a (T_p - T_a) = Q_s \left(\frac{X}{Q} \right) + H_v (C_{wv} - C_{wvsat}) \quad (1)$$

where

T_a = ambient temperature ($^{\circ}\text{K}$)

T_p = plume temperature ($^{\circ}\text{K}$)

ρ_a = density of air at T_a (kg/m^3)

c_a = specific heat of air ($0.238 \text{ kcal}/(\text{kg } ^{\circ}\text{K})$)

C_{wv} = water vapor concentration due to both the plume and ambient air (kg/m^3)

C_{wvsat} = saturated water vapor concentration at temperature T_p (kg/m^3)

X/Q = normalized concentration at the receptor (s/m^3)

Q_s = source heat release rate relative to ambient air (kcal/s)

H_v = heat of vaporization of water at T_a (kcal/kg)
 = $597.3 + (0.441 - 1.007)(T_a - 273.15)$

The density of air as a function of ambient temperature is given by:

$$\rho_a = \frac{P_{\text{atm}} MW_{\text{air}}}{R T_a} \quad (2)$$

where

P_{atm} = atmospheric pressure (pascals) (101325 pascals at sea level)

MW_{air} = molecular weight of air (28.966)

R = gas constant ($8314.39 \text{ N}\cdot\text{m}/(\text{kg}\cdot\text{mole } ^{\circ}\text{K})$)

The water vapor concentration, C_{wv} , at the receptor is given by:

$$C_{wv} = \left(1 - V_F \left(\frac{X}{Q}\right)\right) C_{wvamb} + Q_{wv} \left(\frac{X}{Q}\right) \quad (3)$$

The ambient water vapor concentration, C_{wvamb} , is given by:

$$C_{wvamb} = \frac{P_{sat}(T_{dp}) MW_{wv}}{R T_a} \quad (4)$$

where

T_{dp} = ambient dewpoint temperature ($^{\circ}K$)

MW_{wv} = molecular weight of water vapor (18.016)

The saturation vapor pressure function $P_{sat}(T)$ gives the saturation vapor pressure (pascals) as a function of absolute temperature $T(^{\circ}K)$:

$$P_{sat} = 611 \left(\frac{T}{273.15}\right)^{-5.13139} \exp\left(6816.8 \left(\frac{1}{273.15} - \frac{1}{T}\right)\right) \quad (5)$$

The following approximations have been made in Equations (1) and (2):

- Air density and specific heat are calculated for dry air.
- Dry air specific heat is assumed not to vary with temperature.
- Heat of vaporization is calculated for the ambient temperature rather than the plume temperature.

Sensitivity analyses have shown that these approximations do not significantly affect the determination of whether the plume is visible at a given receptor due to condensation of water vapor.

Assuming that the exhaust molecular weight and specific heat are close to those of air, Equation (1) may be simplified as follows:

$$T_p - T_a = V_F \left(\frac{T_a}{T_s}\right) (T_s - T_a) \left(\frac{X}{Q}\right) + \frac{H_v (C_{wv} - C_{wvsat})}{\rho_a c_a} \quad (6)$$

For convenience Equation (6) is non-dimensionalized as follows:

$$\frac{T_p - T_a - \Delta T_{nc}}{\Delta T_{nc}} = \frac{H_v (C_{wv} - C_{wvsat})}{\rho_a c_a \Delta T_{nc}} \quad (7)$$

where

$$\Delta T_{nc} = V_F (T_a/T_s)(T_s - T_a)(X/Q)$$

= temperature increase at receptor without condensation reheat (°K)

The plume temperature, T_p , is varied between T_1 and T_2 until the absolute value of the difference between the left and right hand sides of Equation (7) is less than some specified tolerance level (e.g. 10^{-5}). The lower bound, T_1 , for T_p is given by:

$$T_1 = T_a + \Delta T_{nc} \quad (8)$$

The upper bound, T_2 , is given by:

$$T_2 = T_1 + \frac{H_v (C_{wv} - C_{wvsat}(T_1))}{\rho_a c_a} \quad (9)$$

where

$$C_{wvsat}(T_1) = \text{saturation water vapor concentration (kg/m}^3\text{) at temperature } T_1$$

The concentration of condensed droplets, C_{drop} , at the receptor is given by:

$$C_{drop} = C_{wv} - C_{wvsat}(T_{pfinal}) \quad (10)$$

where

$$T_{pfinal} = \text{value of } T_p \text{ which minimizes the difference between the left and right hand sides of Equation (7)}$$

The calculations described above are performed by a DOUBLE PRECISION FORTRAN SUBROUTINE named VIZDET.

Appendix B

Air Emission Calculations

Prepared for:
Valero Refining Company – California
Benicia Refinery



VIP Amendments Air Emission Calculations Project Emissions Compared to VIP

ENSR Corporation
September 2007
Document No.: 06993-023-300

Prepared for:
**Valero Refining Company – California
Benicia Refinery**

VIP Amendments Air Emission Calculations Project Emissions Compared to VIP



Prepared By



Reviewed By

ENSR Corporation
September 2007
Document No.: 06993-023-300

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LIST OF ABBREVIATIONS AND ACRONYMS

% Cont	Percent Control
API	American Petroleum Institute
ATC	Authority to Construct
AVW	Average Vehicle Weight
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
Bbl	Barrel
Btu	British Thermal Unit
CARB	California Air Resources Board
CEQA	California Environmental Quality Act
CKR	Fluid Coker
CH ₄	Methane
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CO ₂ -e	GHG Emissions (CO ₂ Equivalent)
DPM	Diesel Particulate Matter
dscf	Dry standard cubic feet
dscfm	Dry standard cubic feet per minute
EF	Emission Factor
EIR	Environmental Impact Report
EMFAC	California Air Resources Board EMISSION FACTORS model for vehicle emissions
ERD	Entrained Road Dust
ESP	Electrostatic Precipitator
°F	Degrees Fahrenheit
FCCU	Fluid Catalytic Cracking Unit
gal	Gallon
GHG	Greenhouse Gases
GWP	Global Warming Potential
H ₂ U	Hydrogen Unit
HHV	Higher Heating Value
I	Interstate
lb	Pound
lb/MMBtu	Pound per million Btu
MMBtu	Million British Thermal Unit
MMBtu/hr	Million British Thermal Units per hour
MMscfd	Million standard cubic feet per day
MSEL	Main Stack Emission Limitation
MW	Molecular Weight or Megawatt
MV	Molecular Volume
N ₂ O	Nitrous Oxide
NH ₃	Ammonia

LIST OF ABBREVIATIONS AND ACRONYMS

NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
NSPS	New Source Performance Standards
O ₂	Oxygen
O ₂ Corr	Oxygen Correction
PM	Particulate Matter
PM10	Particulate Matter with an aerodynamic diameter less than 10 microns
PM2.5	Particulate Matter with an aerodynamic diameter less than 2.5 microns
POC	Precursor Organic Compounds
ppmv	Parts per million by volume
ppmvd	Parts per million by volume, dry
PS	Pipestill
RFG	Refinery Fuel Gas
scf	Standard cubic feet
scfm	Standard cubic feet per minute
SCR	Selective Catalytic Reduction
SNCR	Selective Non Catalytic Reduction
SL	Silt Loading
SO ₂	Sulfur Dioxide
TAC	Toxic Air Contaminant
Tonnes	Metric Tons
TPY	Ton per year
URS	URS Corporation
Valero	Valero Refining Company – California
VIP	Valero Improvement Project
VMT	Vehicle Miles Traveled

1.0 Introduction

1.1 Project Summary

The Valero Refining Company – California (Valero) has prepared this document to support the application to amend its current Use Permit application submitted to the City of Benicia (City) for amendments to Use Permit PLN 2002-00022 for the Valero Improvement Project (VIP) at the Valero Benicia Refinery (Benicia Refinery). Use Permit PLN 2002-00022 was previously issued in April 2003, and is being amended to reflect certain changes in VIP that result in environmental and technological enhancements. The VIP proposed to implement a series of modifications and additions to the Benicia Refinery to update refinery equipment and to better align it to current market demands.

These amendments include the following changes to the VIP project scope:

- (1) Further reductions to air emissions from the Main Stack;
- (2) Improved energy efficiency and reductions in emissions of greenhouse gases (GHGs);
- (3) Measures to minimize flaring; and
- (4) Minor clarifications to certain technical details of the VIP scope.

For the purposes of this emission calculation document, the collective amendments to the project, as outlined above, will be referred to as “VIP Amendments”. VIP Amendments allow Valero to implement project refinements that will better achieve operational efficiency, air emissions reductions, and minimizations of flaring. The VIP Amendments will not increase the permitted capacities of the Benicia Refinery’s process units beyond the levels permitted in the Certified EIR.

1.2 Project Overview

Valero is submitting an application for a modification to the Use Permit issued for the VIP to allow the construction of new or modified project elements as necessary to allow for operation of the VIP and VIP Amendments. The specific modifications covered by the application include:

- Use of the Main Stack scrubber to control sulfur dioxide (SO₂) emissions from the Fluid Catalytic Cracking Unit (FCCU) in addition to the Fluid Coking Unit (CKR) which was proposed under VIP;
- A new carbon monoxide (CO) furnace, F-105, to combust the CO gas from the FCCU and CKR, in place of the refinery fuel gas (RFG)-fired Pipestill (PS) Helper furnace proposed in the Certified EIR;
- Retrofit of existing CO furnaces, F-101 and F-102, with low-NO_x burners to fire only RFG;
- New Hydrogen Unit (H2U);
- Shutdown of one of the two trains of the existing H2U; and
- Additional fugitive components (e.g., valves, flanges, pumps, connectors) associated with a new H2U, desalter, and other process components.

2.0 Scope of this Document

The VIP Amendments will cause a change in the level of air emissions from the Benicia Refinery from those proposed in the Certified EIR. This document provides a summary of the emissions estimated for the VIP Amendments relative to the predicted VIP emissions.

Emissions are estimated for the sources affected by the VIP Amendments. Stationary sources and mobile sources are included in the incremental emission estimates. Because the VIP Amendments are clarifications and refinements to those projects proposed and approved in the Certified EIR, the emissions projected for the VIP Amendments are compared to the emission estimates presented in the Certified EIR.

The analysis indicates that the incremental emissions of NO_x, PM10/PM2.5, and SO₂ will decrease relative to the Certified EIR following implementation of the VIP Amendments. Emissions of POC may increase slightly (2.9 tons/year) relative to VIP, and emissions of CO may increase by about 63 tons/year from VIP levels. As demonstrated in **Section 3.1.2** of the Environmental Analysis for the VIP Amendments, the VIP Amendments will not cause a significant impact to air quality.

In addition, emissions of GHGs will decrease relative to the Certified EIR. Thus, as demonstrated in **Section 3.1.3** of the Environmental Analysis for the VIP Amendments, GHG emissions associated with the VIP Amendments will not cause a significant impact.

3.0 VIP Emissions

Estimated emissions from the Benicia Refinery after implementation of VIP were calculated by URS (URS 2002) and presented in the Certified EIR. References to VIP emissions in this analysis are taken from the Certified EIR. Emissions from VIP are summarized in **Table 2**.

4.0 VIP Amendments Emissions

The impact on emissions at the Benicia Refinery due to the VIP Amendments project elements is discussed in this section. Detailed emission calculations for new or modified sources are presented in **Attachment A**.

4.1 Main Stack Emissions

The Certified EIR anticipated the installation of a Scrubber to control SO₂ emissions from the CKR. The CO gas from the CKR would be combusted in F-102 and routed through the scrubber. The CO gas from the FCCU would have continued to furnace F-101 and would then have been commingled with the treated gas from the Main Stack Scrubber and exhaust gas from the new PS Helper Furnace prior to entering the Main Stack. Respirable particulate (PM10) emissions control would have continued to be provided by the existing electrostatic precipitators (ESPs).

The process design proposed under VIP Amendments will differ from what was anticipated in VIP. The design proposed for VIP Amendments will route the combined CKR and FCCU CO gas into a new PS furnace F-105 that replaces the PS Helper Furnace proposed in the Certified EIR (this PS Helper Furnace was designated F-102A in the Certified EIR). The exhaust gas from F-105 will first pass through a Selective Catalytic Reduction (SCR) system to remove NO_x. The F-105 exhaust gas then will pass through a waste heat boiler to cool the exhaust gas while recovering heat via steam generation. The F-105 exhaust gas then enters a pre-scrubber to remove particulates, and finally passes through the Main Stack amine scrubber to remove SO₂. Furnaces F-101 and F-102 will be retrofitted with new low-nitrogen oxide (NO_x) burners and will be reconfigured to fire only RFG. A small existing RFG-fired furnace, F-103, will not be modified and will continue to exhaust through the Main Stack. The cleaned F-105 exhaust gas will be combined with exhaust gas from F-101, F-102, and F-103 and other sources before entering the Main Stack. A simplified flow diagram of the existing and proposed Main Stack Scrubber configuration is shown in **Figure 2.4.2-1** in the Environmental Analysis for the VIP Amendments.

The emission changes are calculated as the post-VIP Amendments emissions minus the emissions calculated for VIP as shown in the Certified EIR. The VIP Amendments emissions from the Main Stack, including furnace F-105 firing RFG and CO gas from the CKR and FCCU, and F-101, F-102, and F-103 firing RFG, are compared to VIP emissions in **Table 3**. For the purpose of this air quality analysis, emissions of fine particulate matter (PM2.5) are assumed to be equivalent to PM10 emissions.

4.2 Non-Main Stack Combustion Emissions

The VIP Amendments include the installation of a new H2U and the decommissioning of one of the two process trains of the existing H2U. The new H2U has a higher overall efficiency which is realized primarily as increased steam production as a byproduct from the new H2U. Due to the production of steam in the new H2U, the incremental increase in firing of one steam generator projected in VIP will not be necessary to meet the steam requirements following the installation of the new H2U.

As noted, the new H2U will have a larger hydrogen production capacity and larger reformer furnace than the plant it replaces; however, the Benicia Refinery's hydrogen production capacity will not increase above the 190 million standard cubic feet per day (MMscfd) proposed for VIP, and the average fuel consumption for the production of hydrogen will be at the level proposed for VIP, approximately 1,010 Million British thermal units per hour (MMBtu/hr). For this air quality analysis, Valero has evaluated emissions from H2U furnaces based on a likely scenario for actual operation of the units. The following basis is used to develop this emission estimate:

1. One existing H2U furnace is shut down, a net reduction in load of 450 MMBtu/hr (historic average firing rate).

2. The remaining existing H₂U furnace operates at 50 percent of maximum load (equal to 302.5 MMBtu/hr), a net reduction of 147.5 MMBtu/hr when compared to historic usage of 450 MMBtu/hr.
3. New H₂U furnace operates to supply balance of 1,010 MMBtu/hr H₂U furnace load – it will operate at 707.5 MMBtu/hr (approximately 70 percent of maximum rated capacity).
4. 100 MMBtu/hr increase in firing demand from SG-1032 (or another boiler) identified in VIP not required.

The VIP projected an incremental increase in fuel use and associated combustion emissions from several process units at the refinery, including one gas turbine, one steam generator, and three furnaces, identified in the refinery as GT-1031, SG-1032, F-4460, F-104, and F-2901-4. Relative to VIP, the VIP Amendments will not cause an additional increase in fired duty for GT-1031, F-4460, F-104, and F-2901-4. Therefore, the incremental firing does not change compared to VIP. VIP Amendments will require an increase in firing in GT-702 of 70 MMBtu/hr to provide additional air to the FCCU that was not identified in the Certified EIR.

For the anticipated operating scenario, the 110 MMBtu/hr increase in firing of H₂U furnaces F-301 and F-351 that was projected for VIP is assumed not to occur (one will be shut down and the other will operate at reduced load under the VIP Amendments). **Table 4** presents the incremental firing of combustion equipment under the VIP Amendments as it differs from the fired duty analyzed for the Certified EIR. For illustration purposes, F-301 is shown as the unit to be shut down. However, Valero will decide which train of the existing H₂U to shut down in the future, based on Valero's process optimization needs. The two existing trains are identical, and decommissioning either furnace would result in the same emissions scenario.

4.3 Storage Tank Emissions

The VIP Amendments have no impact on storage tank throughput or emissions relative to VIP.

4.4 Fugitive Source Emissions

Valero has estimated that the VIP Amendments will result in up to an additional three (3) tons per year of fugitive POC emissions relative to VIP. The annual emission rate is divided by 365 days per year to determine daily project emissions, and the daily emission rate is divided by 24 hours per day to determine hourly emissions. Fugitive emissions are summarized in **Table 5**.

4.5 Transportation (Mobile Source) Emissions

The VIP Amendments project elements will result in up to two (2) additional truck trips per week on average beyond that which was analyzed by URS and presented in the Certified EIR due to the transportation of additional wet solid waste from the scrubber and small amounts of additional chemicals. The VIP Amendments will not require additional ship or rail trips in excess of what was proposed in VIP.

Solid waste is expected to be transported to the Clean Harbors Landfill in Buttonwillow, California. Emission estimates are based on the distance from the Benicia Refinery to the boundary of the BAAQMD along the route to Buttonwillow. For simplicity, all trucks associated with the VIP Amendments are assumed to follow this route to the BAAQMD boundary.

Truck exhaust emission factors are developed based on EMFAC 2007 for the BAAQMD airshed (CARB 2002). Entrained road dust emission factors are derived from California Air Resources Board (CARB) Methodology 7.9 (CARB 1997). Emissions are calculated based on these emission factors and the predicted travel distance. Transportation emissions are summarized in **Table 6**.

4.6 Greenhouse Gas Emissions

Direct and indirect emissions of GHGs from the Benicia Refinery will change as a result of the VIP Amendments. As described in **Section 4.2**, combustion of gaseous fuels will decrease due to the increased efficiency of the H2U furnace. Electrical demand will increase by approximately five (5) MW relative to VIP, which will cause an increase in indirect emissions of GHGs from off-site power plants. Finally, as described in **Section 4.5**, there will be an increase in truck traffic associated with the VIP Amendments compared to VIP. These trucks will emit GHGs in addition to criteria pollutants.

The changes to the Benicia Refinery's GHG emissions as a result of the VIP Amendments were estimated using two independent sources of emission factors. Both sources are currently being used to estimate GHG emissions from petroleum refineries, though neither has been widely accepted as the standard.

For one analysis, GHG emissions changes from fuel combustion and electrical demand were estimated using emission factors presented in the American Petroleum Institute's (API) Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industries (API 2004). Carbon dioxide (CO₂) emissions from mobile sources were estimated using the EMFAC2007 model (CARB 2002). Mobile source emissions of the GHGs nitrous oxide (N₂O) and methane (CH₄) were estimated using emission factors and methods presented in the Compendium.

The other estimate of GHG emission changes used emission factors and protocols developed by the California Climate Action Registry (CCAR), a non-profit, voluntary registry for GHG emissions. Under this analysis, emission changes due to fuel combustion were estimated using emission factors presented in the CCAR General Reporting Protocol Version 2.2 (CCAR 2007). Emission changes associated with electrical demand were estimated using CCAR protocols and emission factors specific to the Pacific Gas & Electric (PG&E) service area for 2005 as reported to Valero by PG&E. As in the Compendium-based analysis, CO₂ emissions from mobile sources were estimated using EMFAC2007. Mobile source N₂O and CH₄ emissions were estimated using CCAR emission factors and protocols.

GHG emissions are presented in **Table 7**. The VIP Amendments will result in a decrease in GHG emissions relative to the project described in the Certified EIR.

5.0 References

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Tables

**VIP Amendments
Air Emission Calculations**

**Table 2
Valero Benicia Refinery VIP Certified EIR Emissions Summary
Stationary Sources Only**

Source Type	Emissions (tpy)				
	NO _x	SO ₂	PM10/PM2.5	POC	CO
Main Stack	734.1	2,706.0	104.4	6.5 ^(a)	277.3
Combustion	1,272.8	76.8	132.4	55.8	686.3
Storage Tanks	---	---	---	192.5	---
Fugitives	---	---	---	76.2	---
Total	2,007	2,783	237	331	964

(a) Main Stack POC Emissions underestimated in Certified EIR due to limited source testing; new limit of 16.1 tpy proposed by Valero

Source: URS 2002 Table 9

**Table 3
Valero Benicia Refinery VIP Amendments Main Stack Emissions**

Scenario	Main Stack Emissions (Tons/Year)					Reference
	NO _x	SO ₂	PM10/ PM2.5	POC(a)	CO	
VIP Certified EIR	734.1	2,706	104.4	16.1	277.3	URS Table 9
VIP Amendments	686.1	374	106.5	16.1	288	Table A-2
Change from VIP EIR	-48.0	-2,331.6	2.1	0.0	10.7	Calculated

(a) Main Stack POC Emissions Limitation proposed by Valero in October 2006

**VIP Amendments
Air Emission Calculations**

**Table 4
Valero Benicia Refinery VIP Amendments Combustion Emissions**

Source	Firing (MMBtu/hr)	NO _x		SO ₂		PM10/PM2.5		POC		CO	
		ppm	tpy	ppm	tpy	lb/MMBtu	tpy	lb/MMBtu	tpy	ppm	tpy
GT-702 (a)	70	4.65	5.1	36	1.6	0.0112	3.4	0.0062	1.9	50	33.4
SG-1032	-100	3.1	-1.6	36	-2.3	0.0026	-1.1	0.0024	-1.1	6	-1.9
F-301(b)	-450	40.6	-98.9	36	-10.8	0.0026	-18.0	0.0024	-5.4	6	-41.2
F-351(b)	-257.5	40.6	-54.0	36	-6.0	0.0026	-2.9	0.0024	-2.7	6	-4.9
New H2U(c)	707.5	7	25.6	45	20.5	0.0025	7.7	0.0023	7.1	30	66.7
Total Project (d)	-30	---	-123.7	---	3.1	---	-10.9	---	-0.1	---	52.1

(a) NO_x emission factor taken from 1-year baseline, factors for remaining pollutants are assumed to be the same as GT-1031.

(b) Either F-301 or F-351 may be shut down. F-301 displayed as decommissioned unit for illustrative purposes; emission reduction is 1-year VIP Baseline

(c) Emission factors and calculation methods taken from Attachment A, however, emissions calculated based on a lower firing rate than assumed in Attachment A.

(d) Firing increase includes 5 MMBtu/hr to F-103. These emissions are captured in the main stack estimate and not included in this table.

**VIP Amendments
Air Emission Calculations**

**Table 5
Valero Benicia Refinery VIP Amendments Fugitive POC Emissions**

Component	POC Emissions (tpy)	Reference
VIP Amendments	3.0	<i>Project Description</i>
Total	3.0	<i>Calculated</i>

**Table 6
Valero Benicia Refinery VIP Amendments Mobile Source Emissions**

Category	Emissions (tpy)					Reference
	NOx	SO₂	PM10/PM2.5	POC	CO	
Additional Trucks	0.2	0.0	0.0	0.0	0.1	<i>Table A-6</i>
Additional Ships	0.0	0.0	0.0	0.0	0.0	<i>Project Description</i>
Additional Railcars	0.0	0.0	0.0	0.0	0.0	<i>Project Description</i>
Total Post-VIP Amendments	0.2	0.0	0.0	0.0	0.1	<i>Calculated</i>

**VIP Amendments
Air Emission Calculations**

**Table 7
Valero Benicia Refinery VIP Amendments Greenhouse Gas Emissions**

Source	API Compendium	CCAR
	Emissions Tonnes/year CO ₂ -e	Emissions Tonnes/year CO ₂ -e
Fuel Combustion (30 MMBtu/hr reduction)	-14,902	-16,357
Electrical Consumption (5 MW increase)	12,071	1,001
Mobile Sources (Heavy-Duty Trucks, 52,624 mi/yr)	101	101
Total change from VIP	-2,731	-15,255

Attachment A
VIP Amendments Emission Calculations

Attachment A

VIP Amendments Emission Calculations

Emissions of criteria pollutants, toxic air contaminants (TAC), and Green House Gases (GHG) are expected from the various project elements of the VIP Amendments. Emission estimation methodology and sample calculations are provided in this attachment. Emission calculation worksheets are included as tables at the end of this attachment.

Main Stack Emissions

The BAAQMD ATC for VIP included a Main Stack Emission Limitation (MSEL) for criteria pollutants from the Main Stack (BAAQMD Permit Condition #20820 Parts 8 and 21). Valero will continue to operate the sources exhausting through the Main Stack (F-101, F-102, F-103, and F-105) in compliance with the MSEL. The MSEL includes both short-term limits and annual maximum emissions, as presented in **Table A-1** and **Table A-2** at the end of the attachment. For the purpose of these emission calculations, PM_{2.5} emissions are assumed to be equal to PM₁₀ emissions.

The sections below present the expected emissions from the new CO furnace F-105 and the three gas-fired furnaces that will exhaust through the main Stack (F-101, F-102, and F-103).

Modified Furnaces F-101 and F-102 and Existing Furnace F-103

The existing furnaces F-101 and F-102 will be modified to combust only refinery fuel gas (RFG). The existing burners will be replaced with low-NO_x burners which will result in an overall NO_x emission reduction from these sources. The Main Stack also currently exhausts the exhaust gas from a small gas-fired furnace, F-103. This furnace will not be changed as a result of the VIP Amendments. The three furnaces will have a combined maximum heat duty of 681.5 MMBtu/hr. Emissions are calculated for the three furnaces in combination.

NO_x and CO Emission Calculations

Estimated emissions of NO_x and CO from the three furnaces are based on the projected stack gas concentration in the stack discharge. The volumetric stack flow rate is determined using an F-factor of 8,446 scf/MMBtu derived by Valero during a recent source test of a RFG-fueled device (URS 2002), with the appropriate correction for O₂ content. Emissions of these pollutants are calculated using **Equation 1**.

$$\text{Emissions (lbs/hr)} = (\text{ppmv}/10^6) \times (\text{flow}) \times (60 \text{ min/hr}) \times (\text{O}_2 \text{ Corr}) \times (\text{MW/MV}) \quad (\text{Eq. 1})$$

Where: ppmv = concentration of the pollutant in the stack, in units of parts per million by volume

flow = volumetric flow of exhaust gas, standard cubic feet per minute, dry basis (dscfm)

O₂ Corr = Correction for excess O₂ content: $(20.9/[20.9 - \%O_2])$

MW = molecular weight of the species; SO₂ = 64 lbs/mole; CO = 28 lbs/mole

MV = molar volume of gas (385 dscf/mole)

For this calculation, flow is calculated as the F-factor multiplied by the heat rate of the furnace.

Based upon best engineering judgment and Valero's past experience with similar sources, the estimated stack gas concentrations are 50 parts per million by volume, dry (ppmvd) corrected to three (3) percent excess oxygen (O₂) for NO_x, and 30 ppmvd corrected to 3 percent excess O₂ for CO. These concentrations are used for both short-term and annual average emissions.

Calculations for NO_x

$$\text{Emissions}_{\text{NO}_x} \text{ (lbs/hr)} = (50 \text{ ppmv}/10^6) \times (8,446 \text{ dscf/MMBtu}) \times (20.9/(20.9 - 3.0)) \times (46 \text{ lbs/mol} / 385 \text{ dscf}) \times (681.5 \text{ MMBtu/hr}) = \underline{40.1 \text{ lbs/hr}}$$

$$\text{Emissions}_{\text{NO}_x} \text{ (lbs/day)} = (40.1 \text{ lbs/hr}) \times (24 \text{ hrs/day}) = \underline{962.4 \text{ lbs/day}}$$

$$\text{Emissions}_{\text{NO}_x} \text{ (tons/yr)} = (40.1 \text{ lbs/hr}) \times (1 \text{ ton}/2,000 \text{ lb}) \times (8,760 \text{ hr/yr}) = \underline{175.6 \text{ tons/yr}}$$

Calculations for CO

$$\text{Emissions}_{\text{CO}} \text{ (lbs/hr)} = (30 \text{ ppmv}/10^6) \times (8,446 \text{ dscf/MMBtu}) \times (20.9/(20.9 - 3.0)) \times (28 \text{ lbs/mol} / 385 \text{ dscf}) \times (681.5 \text{ MMBtu/hr}) = \underline{14.7 \text{ lbs/hr}}$$

$$\text{Emissions}_{\text{CO}} \text{ (lbs/day)} = (14.7 \text{ lbs/hr}) \times (24 \text{ hrs/day}) = \underline{352.8 \text{ lbs/day}}$$

$$\text{Emissions}_{\text{CO}} \text{ (tons/yr)} = (14.7 \text{ lbs/hr}) \times (1 \text{ ton}/2,000 \text{ lb}) \times (8,760 \text{ hr/yr}) = \underline{64.2 \text{ tons/yr}}$$

POC and PM10/PM2.5 Emission Calculations

Estimated emissions for POC and PM10/PM2.5 are based on emission factors expressed in units of lb/MMBtu heat input at the higher heating value (HHV) of the fuel, which were determined from source tests at similar sources at the Benicia Refinery. Hourly emissions are calculated according to **Equation 2**.

$$\text{Emissions (lbs/hr)} = (\text{EF}) \times (\text{heat rate of furnace [MMBtu/hr]}) \quad (\text{Eq. 2})$$

Calculations for POC

Basis: EF = 0.0023 lb POC/MMBtu

$$\text{Emissions}_{\text{POC}} \text{ (lbs/hr)} = (0.0023 \text{ lb POC/MMBtu}) \times (681.5 \text{ MMBtu/hr}) = \underline{1.6 \text{ lbs/hr}}$$

$$\text{Emissions}_{\text{POC}} \text{ (lbs/day)} = (1.6 \text{ lbs/hr}) \times (24 \text{ hrs/day}) = \underline{40.8 \text{ lbs/day}}$$

$$\text{Emissions}_{\text{POC}} \text{ (tons/yr)} = (1.6 \text{ lbs/hr}) \times (1 \text{ ton}/2,000 \text{ lb}) \times (8,760 \text{ hr/yr}) = \underline{6.9 \text{ tons/yr}}$$

Calculations for PM10/PM2.5

Basis: EF = 0.0025 lb PM/MMBtu

$$\text{Emissions}_{\text{PM}} \text{ (lbs/hr)} = (0.0025 \text{ lb PM/MMBtu}) \times (681.5 \text{ MMBtu/hr}) = \underline{1.7 \text{ lbs/hr}}$$

$$\text{Emissions}_{\text{PM}} \text{ (lbs/day)} = (1.7 \text{ lbs/hr}) \times (24 \text{ hrs/day}) = \underline{37.7 \text{ lbs/day}}$$

$$\text{Emissions}_{\text{PM}} \text{ (tons/yr)} = (1.7 \text{ lbs/hr}) \times (1 \text{ ton}/2,000 \text{ lb}) \times (8,760 \text{ hr/yr}) = \underline{7.5 \text{ tons/yr}}$$

SO₂ Emission Calculations

Emissions of SO₂ are based on the sulfur content of the fuel gas, assuming all the sulfur in the fuel is converted to SO₂. The average heating value of the fuel gas, in Btu/scf, is used to calculate an emission factor (EF) in units of lb/MMBtu, according to **Equation 3**. Emissions are calculated using **Equation 2**.

$$\text{EF (lb/MMBtu)} = (\text{ppmv}/10^6) \times (\text{scf}) \times (\text{MW/MV}) \quad (\text{Eq. 3})$$

Where: EF = Emission factor

ppmv = concentration of sulfur in the fuel gas

scf = volume of fuel gas in units of scf/MMBtu

MW = molecular weight of the species; SO₂ = 64.1 lbs/mole

MV = molar volume of gas (385 dscf/mole)

Calculations for SO₂

Basis: 45 ppmv sulfur in the fuel gas, and 1,150 Btu/dscf average HHV of fuel

$$EF_{SO_2} \text{ (lbs/MMBtu)} = (45 \text{ ppmv}/10^6) \times (1 \text{ dscf}/1,150 \text{ Btu}) \times [((1 \text{ mol SO}_2/\text{mol S}) \times (64.1 \text{ lb SO}_2/\text{mol})) / 385 \text{ dscf}] = \underline{0.00656 \text{ lb SO}_2/\text{MMBtu}}$$

$$Emissions_{SO_2} \text{ (lbs/hr)} = (0.00656 \text{ lb SO}_2/\text{MMBtu}) \times (681.5 \text{ MMBtu/hr}) = 4.4 \text{ lbs/hr}$$

$$Emissions_{SO_2} \text{ (lbs/day)} = (4.44 \text{ lbs/hr}) \times (24 \text{ hrs/day}) = \underline{106.6 \text{ lbs/day}}$$

$$Emissions_{SO_2} \text{ (tons/yr)} = (4.44 \text{ lbs/hr}) \times (1 \text{ ton}/2,000 \text{ lb}) \times (8,760 \text{ hr/yr}) = \underline{19.4 \text{ tons/yr}}$$

New CO Furnace F-105

The Certified EIR for VIP anticipated the installation of a scrubber to control SO₂ emissions from the CKR unit. As part of the VIP Amendments, Valero will install a scrubber which will control SO₂ emissions from the FCCU in addition to the CKR. This will result in a significantly greater SO₂ emission reduction than predicted for VIP. In addition, the Certified EIR included a proposed new gas-fired PS Helper Furnace. As part of the VIP Amendments, Valero will install a new CO furnace, F-105, to combust the CO gas from the FCCU and CKR instead of the PS Helper Furnace. The design of this new furnace will allow the emissions from both process units to be controlled by a scrubber that is similar to the scrubber described in the Certified EIR.

SO₂ and CO Emission Calculations

Estimated emissions of SO₂ and CO from the new furnace are based on the projected stack gas concentration at the scrubber outlet. Emissions of these pollutants are calculated using **Equation 1**.

The Main Stack Scrubber will be designed to operate at a total exhaust flow rate of 325,000 dscfm. The scrubber will be designed and operated to achieve a maximum Main Stack SO₂ concentration of 50 ppmvd, corrected to zero percent excess O₂ over a seven-day rolling average, and 25 ppmvd corrected to zero percent O₂ on a 365-day average basis. The furnace will be designed and operated to achieve a CO concentration of 100 ppmv, corrected to three percent excess O₂ on a seven-day rolling average basis.

The calculation of emissions of these pollutants is presented below.

Calculations for SO₂ – Short Term

Short term emissions of SO₂ are based on a concentration of 50 ppmvd corrected to 0%O₂.

$$Emissions_{SO_2} \text{ (lbs/hr)} = (50 \text{ ppmv SO}_2/10^6) \times (325,000 \text{ dscf exhaust/min}) \times (60 \text{ min/hr}) \times (20.9/(20.9 - 0)) \times (1 \text{ mol}/385 \text{ dscf}) \times (64 \text{ lb SO}_2/\text{mol}) = \underline{162.1 \text{ lbs/hr}}$$

$$Emissions_{SO_2} \text{ (lbs/day)} = (162.1 \text{ lbs/hr}) \times (24 \text{ hrs/day}) = \underline{3,890 \text{ lbs/day}}$$

Calculations for SO₂ – Annual

Annual emissions of SO₂ are based on a concentration of 25 ppmvd corrected to 0%O₂.

$$\begin{aligned} \text{Emissions}_{\text{SO}_2} \text{ (tons/yr)} &= (25 \text{ ppmv SO}_2/10^6) \times (325,000 \text{ dscf exhaust/min}) \times (60 \text{ min/hr}) \times (20.9/(20.9 - 0)) \\ &\quad \times (1 \text{ mol}/385 \text{ dscf}) \times (64 \text{ lb SO}_2/\text{mol}) \times (8,760 \text{ hr/yr}) \times (1 \text{ ton}/2,000 \text{ lb}) \\ &= \underline{355.0 \text{ tons/year}} \end{aligned}$$

Calculations for CO – Short Term

Short-term emissions of CO are based on a concentration of 100 ppmvd corrected to 3%O₂.

$$\begin{aligned} \text{Emissions}_{\text{CO}} \text{ (lbs/hr)} &= (100 \text{ ppmv CO}/10^6) \times (325,000 \text{ dscf exhaust/min}) \times (20.9/(20.9 - 3)) \times (60 \text{ min/hr}) \\ &\quad \times (1 \text{ mol}/385 \text{ dscf}) \times (28 \text{ lb CO/mol}) = \underline{165.6 \text{ lbs/hr}} \end{aligned}$$

$$\text{Emissions}_{\text{CO}} \text{ (lbs/day)} = (165.6 \text{ lbs/hr}) \times (24 \text{ hrs/day}) = \underline{3,974 \text{ lbs/day}}$$

Annual emissions of CO from F-105 will be based on the MSEL. The emissions are presented as the MSEL, less the projected emissions from the three gas-fired furnaces F-101, F-102, and F-103

$$\text{Emissions}_{\text{CO}} \text{ (tons/yr)} = (288.0 \text{ tons/yr}) - (64.2 \text{ tons/yr}) = \underline{223.8 \text{ tons/yr}}$$

NO_x Emission Calculations

Estimated emissions of NO_x are based on the estimated stack gas concentration exiting F-105 and the BACT level of control efficiency of the NO_x control system. The exhaust gas from the SCR for F-105 is expected to have a NO_x concentration of up to 100 ppmvd corrected to zero percent O₂ on a seven-day average basis, and 50 ppmvd corrected to zero percent O₂ on an annual average basis. Emissions are estimated using **Equation 1**. For NO_x, the molecular weight of NO₂ is used for the molecular weight in **Equation 1**.

Calculations for NO_x – Short Term

Molecular weight of NO_x (as NO₂) = 46

$$\begin{aligned} \text{Emissions}_{\text{NO}_x} \text{ (lbs/hr)} &= (100 \text{ ppmv NO}_x/10^6) \times (325,000 \text{ dscf exhaust/min}) \times (60 \text{ min/hr}) \\ &\quad \times (1 \text{ mol}/385 \text{ dscf}) \times (46 \text{ lb NO}_x/\text{mol}) \times (20.9/(20.9 - 0)) = \underline{233.0 \text{ lbs/hr}} \end{aligned}$$

$$\text{Emissions}_{\text{NO}_x} \text{ (lbs/day)} = (233.0 \text{ lbs/hr}) \times (24 \text{ hrs/day}) = \underline{5,592 \text{ lbs/day}}$$

Calculations for NO_x – Annual

$$\begin{aligned} \text{Emissions}_{\text{NO}_x} \text{ (tons/yr)} &= (50 \text{ ppmv NO}_x/10^6) \times (325,000 \text{ dscf exhaust/min}) \times (60 \text{ min/hr}) \\ &\quad \times (1 \text{ mol}/385 \text{ dscf}) \times (46 \text{ lb NO}_x/\text{mol}) \times (8,760 \text{ hr/yr}) \times (1 \text{ ton}/2,000 \text{ lb}) \\ &\quad \times (20.9/(20.9 - 0)) \\ &= \underline{510.2 \text{ tons/yr}} \end{aligned}$$

POC and PM10/PM2.5 Emission Calculations

POC and PM10/PM2.5 emissions from the CO furnace are based on the MSEL. The emissions are presented as the MSEL, less the projected emissions from the three gas-fired furnaces F-101, F-102, and F-103. POC has no short-term MSEL, and short-term POC emissions specifically from F-105 have not been quantified.

Calculations for PM10/PM2.5

MSEL for PM10/PM2.5: 40 lbs/hr and 106.5 tons/yr

$$\text{Emissions}_{\text{PM}} \text{ (lbs/hr)} = (40 \text{ lbs/hr}) - (1.70 \text{ lbs/hr}) = \underline{38.3 \text{ lbs/hr}}$$

$$\text{Emissions}_{\text{PM}} \text{ (lbs/day)} = (38.3 \text{ lbs/hr}) \times (24 \text{ hrs/day}) = \underline{919.2 \text{ lbs/day}}$$

$$\text{Emissions}_{\text{PM}} \text{ (tons/yr)} = (106.5 \text{ tons/yr}) - (7.5 \text{ tons/yr}) = \underline{99.0 \text{ tons/yr}}$$

Calculations for POC

$$\text{Emissions}_{\text{POC}} \text{ (tons/yr)} = (16.1 \text{ tons/yr}) - (6.9 \text{ tons/yr}) = \underline{9.2 \text{ tons/yr}}$$

Table A-1 summarizes the short-term emissions from the new CO furnace F-105 and the existing furnaces F-101 F-102 and F-103. **Table A-2** summarizes the annual emissions from these sources.

New H2U Reformer Furnace Emissions

Criteria pollutant emissions from the combustion of fuel in the H2U Reformer furnace are based on the proposed Best Available Control Technology (BACT) limitations. The BACT limit for each pollutant is converted to an emission factor expressed as mass emission rate per MMBtu of heat input. The emission factors are shown in **Table A-3**.

For each pollutant, maximum hourly emissions are calculated by multiplying the emission factor by the maximum heat input capacity of the reformer furnace of 980 MMBtu/hr. Annual emissions are calculated assuming continuous operation at the maximum heat input rate for 8,760 hours per year. The calculations presented in this attachment represent maximum potential to emit, and not the emissions at the expected load on the furnace under actual operating conditions.

Sample calculations are provided below to illustrate the methods, formulas and assumptions used to derive the emission factors from the BACT basis and to calculate emissions. EFs and criteria pollutant emissions are summarized in **Table A-3**.

NO_x and CO Emission Calculations

Emissions of NO_x and CO are estimated based on pollutant concentration in the stack discharge. The volumetric stack flow rate is determined using an F-factor of 8,446 scf/MMBtu derived by Valero during a source test of a RFG-fueled device (URS 2002), with the appropriate correction for O₂ content. The volumetric flow is used to convert the proposed BACT limit from units of ppmv to an EF in units of lbs/MMBtu. The EF is calculated using **Equation 1**. Emissions are calculated using **Equation 2**. Daily emissions are based on 24 continuous hours of operation at full fire per day, and annual emissions are based on continuous operation at full fire 8,760 hours per year.

Calculations for NO_x

Basis: Stack concentration of NO_x = 7 ppmv corrected to 3% O₂

$$\text{EF}_{\text{NO}_x} = (7 \text{ ppmv}/10^6) \times (8,446 \text{ dscf/MMBtu}) \times (20.9/(20.9 - 3.0)) \times (46 \text{ lb/mol} / 385 \text{ dscf/mol}) \\ = \underline{0.0082 \text{ lbs NO}_x/\text{MMBtu}}$$

$$\text{Emissions}_{\text{NO}_x} \text{ (lbs/hr)} = (0.0082 \text{ lb NO}_x/\text{MMBtu}) \times (980 \text{ MMBtu/hr}) = \underline{8.1 \text{ lbs/hr}}$$

$$\text{Emissions}_{\text{NO}_x} \text{ (lbs/day)} = (8.1 \text{ lbs/hr}) \times (24 \text{ hrs/day}) = \underline{194.0 \text{ lbs/day}}$$

$$\text{Emissions}_{\text{NO}_x} \text{ (tons/yr)} = (8.1 \text{ lbs/hr}) \times (1 \text{ ton}/2,000 \text{ lb}) \times (8,760 \text{ hr/yr}) = \underline{35.4 \text{ tons/yr}}$$

Calculations for CO

Basis: stack concentration CO = 30 ppmv corrected to 3% O₂

$$\begin{aligned} \text{EF}_{\text{CO}} &= (30 \text{ ppmv}/10^6) \times (8,446 \text{ dscf/MMBtu}) \times (20.9/(20.9 - 3.0)) \times (28 \text{ lb/mol} / 385 \text{ dscf}) \\ &= \underline{0.0215 \text{ lb CO/MMBtu}} \end{aligned}$$

$$\text{Emissions}_{\text{CO}} \text{ (lbs/hr)} = (0.0215 \text{ lb CO/MMBtu}) \times (980 \text{ MMBtu/hr}) = \underline{21.1 \text{ lbs/hr}}$$

$$\text{Emissions}_{\text{CO}} \text{ (lbs/day)} = (21.1 \text{ lbs/hr}) \times (24 \text{ hrs/day}) = \underline{506.4 \text{ lbs/day}}$$

$$\text{Emissions}_{\text{CO}} \text{ (tons/yr)} = (21.1 \text{ lbs/hr}) \times (1 \text{ ton}/2,000 \text{ lb}) \times (8,760 \text{ hr/yr}) = \underline{92.4 \text{ tons/yr}}$$

POC and PM10/PM2.5 Emission Calculations

Proposed BACT for POC emissions is expressed in units of lb/MMBtu heat input at the HHV of the fuel. The emission rate for PM10/PM2.5 is based on the permitted emission limit for a similar source at the Benicia Refinery, and is also expressed in units of lb/MMBtu. Hourly emissions are calculated according to **Equation 2**. Daily and annual emissions are based on continuous operation.

Calculations for POC

Basis: EF = 0.0023 lb POC/MMBtu

$$\text{Emissions}_{\text{POC}} \text{ (lbs/hr)} = (0.0023 \text{ lb POC/MMBtu}) \times (980 \text{ MMBtu/hr}) = \underline{2.25 \text{ lbs/hr}}$$

$$\text{Emissions}_{\text{POC}} \text{ (lbs/day)} = (2.25 \text{ lbs/hr}) \times (24 \text{ hrs/day}) = \underline{54.0 \text{ lbs/day}}$$

$$\text{Emissions}_{\text{POC}} \text{ (tons/yr)} = (2.25 \text{ lbs/hr}) \times (1 \text{ ton}/2,000 \text{ lb}) \times (8,760 \text{ hr/yr}) = \underline{9.9 \text{ tons/yr}}$$

Calculations for PM10/PM2.5

Basis: EF = 0.0025 lb PM/MMBtu

$$\text{Emissions}_{\text{PM}} \text{ (lbs/hr)} = (0.0025 \text{ lb POC/MMBtu}) \times (980 \text{ MMBtu/hr}) = \underline{2.45 \text{ lbs/hr}}$$

$$\text{Emissions}_{\text{PM}} \text{ (lbs/day)} = (2.45 \text{ lbs/hr}) \times (24 \text{ hrs/day}) = \underline{58.8 \text{ lbs/day}}$$

$$\text{Emissions}_{\text{PM}} \text{ (tons/yr)} = (2.45 \text{ lbs/hr}) \times (1 \text{ ton}/2,000 \text{ lb}) \times (8,760 \text{ hr/yr}) = \underline{10.7 \text{ tons/yr}}$$

SO₂ Emission Calculations

Emissions of SO₂ are based on the sulfur content of the fuel gas, assuming all the sulfur in the fuel is converted to SO₂. The average heating value of the fuel gas, in Btu/scf, is used to calculate an EF in units of lb/MMBtu, according to **Equation 3**. Emissions are calculated using **Equation 2**.

Calculations for SO₂

Basis: 45 ppmv sulfur in the fuel gas, and 1,150 Btu/scf average HHV of fuel

$$\begin{aligned} \text{EF}_{\text{SO}_2} \text{ (lbs/MMBtu)} &= (45 \text{ scf S/MMscf}) \times (1 \text{ scf}/1,150 \text{ Btu}) \times [((1 \text{ mol SO}_2/\text{mol S}) \\ &\quad \times (64.1 \text{ lb SO}_2/\text{mol})) / 385 \text{ scf}] = \underline{0.00656 \text{ lb SO}_2/\text{MMBtu}} \end{aligned}$$

$$\text{Emissions}_{\text{SO}_2} \text{ (lbs/hr)} = (0.00656 \text{ lb SO}_2\text{/MMBtu}) \times (980 \text{ MMBtu/hr}) = \underline{6.4 \text{ lbs/hr}}$$

$$\text{Emissions}_{\text{SO}_2} \text{ (lbs/day)} = (6.4 \text{ lbs/hr}) \times (24 \text{ hrs/day}) = \underline{153.6 \text{ lbs/day}}$$

$$\text{Emissions}_{\text{SO}_2} \text{ (tons/yr)} = (6.4 \text{ lbs/hr}) \times (1 \text{ ton}/2,000 \text{ lb}) \times (8,760 \text{ hr/yr}) = \underline{28.0 \text{ tons/yr}}$$

Fugitive Emissions.

The Benicia Refinery emits POC from fugitive sources such as flanges, valves, and pump seals. Valero estimates that the VIP Amendments will result in up to an additional 3 tons per year of fugitive POC emissions from these sources. The annual emission rate is divided by 365 days per year to determine daily project emissions, and the daily emission rate by 24 hours per day to determine hourly emissions.

$$\text{Emissions}_{\text{POC}} \text{ (tons/yr)} = 3.0 \text{ tons/yr}$$

$$\text{Emissions}_{\text{POC}} \text{ (lbs/day)} = (3.0 \text{ tons/yr}) \times (2,000 \text{ lbs/ton}) \times (1 \text{ yr}/365 \text{ days}) = \underline{16.4 \text{ lbs/day}}$$

$$\text{Emissions}_{\text{POC}} \text{ (lbs/day)} = (16.4 \text{ lbs/day}) / (24 \text{ hrs/day}) = \underline{0.68 \text{ lbs/hr}}$$

Transportation Emissions

The VIP Amendments will require up to 2 truck trips per week on average more than what was analyzed in the Certified EIR. This section describes the methodology used to estimate emissions associated with this transportation.

For the purpose of this calculation, additional truck trips are assumed to transport additional hazardous waste generated by the scrubber project and small quantities of chemicals such as sodium hydroxide. Hazardous waste is expected to be transported to Clean Harbors landfill in Buttonwillow, California. The route taken by these trucks will be South on Interstate 680 (I-680) across the Benicia Bridge, to Interstate 580 (I-580) East to the BAAQMD regional border near Tracy, California. To simplify the analysis, trucks transporting other materials are assumed to follow the same route to exit the BAAQMD borders. The round trip travel distance to the BAAQMD border on I-580 is approximately 100 miles. The two trucks per week (104 trucks total) will thus travel a total of 10,400 miles/year. The estimated truck traffic is summarized in **Table A-4**.

Truck exhaust emission factors are developed based on EMFAC 2007 for the BAAQMD airshed (CARB 2002). Entrained road dust emission factors are derived from CARB Methodology 7.9 (CARB 1997). Emissions are calculated based on these emission factors and the travel distance.

The BURDEN component of EMFAC was run for heavy heavy-duty diesel trucks for calendar year 2010. This is the anticipated start-up year for the Main Stack Scrubber, which will be associated with most of the additional trucking.

BURDEN computes the total vehicle miles traveled (VMT) per day by the trucking fleet, and also computes the total mass emissions in tons per day for each subject pollutant. This information is used to create an EF for each pollutant in pounds per mile traveled, in accordance with **Equation 4**. An EF for entrained road dust PM10 emissions is calculated using the methods described in CARB Methodology 7.9 (CARB 1997), pursuant to **Equation 5**. The emission factors for exhaust and entrained road dust (ERD) are then used to calculate the emissions from trucks associated with the VIP Amendments, in accordance with **Equation 6**.

$$EF_i \text{ (lbs/mile)} = (\text{airshed emissions}) \div (\text{VMT}) \tag{Eq. 4}$$

Where: EF_i = Emission Factor for pollutant i

VMT = Vehicle miles traveled

$$EF_{ERD} \text{ (lbs/mi)} = 0.016 \times (SL / 2)^{0.65} \times (AVW / 3)^{1.5} \quad (\text{Eq. 5})$$

Where: EF_{ERD} = Emission factor for entrained road dust

SL = Silt Loading

AVW = Average vehicle weight, assumed to be 2.4 tons

$$\text{Emissions (lbs/day)} = (EF) \times (VMT) \quad (\text{Eq. 6})$$

Example calculation for NO_x

Basis: From EMFAC for BAAQMD Average, Heavy Heavy-Duty Diesel Trucks
 Total VMT/day: 2,878,000
 NO_x Emissions: 50.48 tons/day

$$EF_{NOx} = (50.48 \text{ tons/day}) \times (2,000 \text{ lbs/ton}) \times (1 \text{ day}/2,878,000 \text{ miles}) = 0.035 \text{ lbs/mile}$$

$$\text{Emissions}_{NOx} \text{ (tons/year)} = (0.035 \text{ lb NO}_x/\text{mile}) \times (10,400 \text{ mi/yr}) \times (1 \text{ ton}/2,000 \text{ lb}) = \underline{0.18 \text{ tons/year}}$$

The emission factor for entrained road PM10 emissions is shown in **Table A-5**. Emission calculations for CO, POC, PM10/PM2.5 and SO₂ are similar to those presented for NO_x. Mobile source criteria pollutant emissions are shown in **Table A-6**.

Summary of Stationary Source Criteria Pollutant Emissions

A summary of criteria pollutant emissions is provided in **Table A-7**. The emissions shown in **Table A-7** include the potential to emit (PTE) pollutants from the new H2U, and do not include emissions from incremental firing of existing sources or reflect emission reductions from the shutdown of any sources that may result from the VIP Amendments.

Toxic Air Contaminants

TAC emissions will occur as products of incomplete combustion from the new H2U reformer furnace and will also be emitted as fugitive POC emissions. The emission estimation methodology and sample calculations are provided below.

Valero expects reductions in TAC emissions due to the shutdown of one train of the existing H2U. The TAC emissions reductions are not quantified in this analysis because the reductions have no regulatory significance, i.e., the reductions are not used in the health risk assessment and are not subject to the offset/banking provisions of the BAAQMD rules and regulations.

Main Stack/Pipestill Furnaces

Emissions of TACs from F-101, F-102, and F-105 will be the same or lower than the emissions evaluated in VIP from F-101, F-102, and the 240 MMBtu/hr Helper Furnace F-102A. Since there will be no increase in TAC emissions from these sources, TACs have not been quantified.

New Hydrogen Plant Reformer Furnace TAC Emissions

TAC emissions from the new H2U are either products of incomplete combustion or ammonia (NH₃) that passes through the SCR unreacted (known as “ammonia slip”). The calculation procedures and sample calculations are provided below.

Emission Estimates for Products of Incomplete Combustion

Emissions of TACs from the new H2U Reformer Furnace, other than NH₃, are derived from source testing of a similar combustion source firing Valero's RFG. The measured mass emission rate of each pollutant is divided by the heat input rate of the tested source to create an EF in units of lb/MMBtu, in accordance with **Equation 7**. For each pollutant, maximum hourly emissions are calculated by multiplying the EF by the maximum heat input capacity of the H2U reformer furnace in accordance with **Equation 2**. Daily emission rate is based on 24 hours of continuous operation at full fire, and annual emissions are calculated assuming continuous operation at the maximum heat input rate for 8,760 hours per year.

$$EF_i \text{ (lbs/MMBtu)} = (\text{measured emission rate}) \div (\text{firing rate of furnace tested}) \quad (\text{Eq. 7})$$

Sample calculation for Arsenic (As)

Basis: Heat input of tested source = 351 MMBtu/hr; measured emission rate of arsenic is 1.09×10^{-5} grams per second (g/s)

$$EF_{As} \text{ (lbs/MMBtu)} = (1.09 \times 10^{-5} \text{ g/s Arsenic}) \times (3,600 \text{ s/hr}) \times (1 \text{ lb}/454 \text{ g}) / (351 \text{ MMBtu/hr}) \\ = \underline{2.5 \times 10^{-7} \text{ lb/MMBtu}}$$

$$\text{Emissions}_{As} \text{ (lbs/hr)} = (2.5 \times 10^{-7} \text{ lb/MMBtu}) \times (980 \text{ MMBtu/hr}) = \underline{2.4 \times 10^{-4} \text{ lbs/hr}}$$

$$\text{Emissions}_{As} \text{ (lbs/yr)} = (2.4 \times 10^{-4} \text{ lbs/hr}) \times (8,760 \text{ hr/yr}) = \underline{2.1 \text{ lbs/yr}}$$

The EFs for each of the TAC characterized in the source test are shown in **Table A-8**. Emission estimates for the TAC are provided in **Tables A-9a and A-9b**.

Ammonia Emissions

Emissions of NH₃ are based on the expected stack discharge concentration, and are calculated using **Equation 1**, and the volumetric flow based on the F-Factor of 8,446 scf/MMBtu derived during a recent Valero source test for a device burning RFG (URS 2002), corrected to the appropriate excess O₂ level. Emissions are calculated in accordance with **Equation 2**.

Basis: ammonia concentration in the stack is 10 ppmv corrected to 3% O₂

$$EF_{NH_3} \text{ (lbs/MMBtu)} = (10 \text{ dscf NH}_3/10^6 \text{ dscf exhaust}) \times (8,446 \text{ dscf/MMBtu}) \times (20.9/(20.9 - 3.0)) \\ \times (17 \text{ lbs/mol} / 385 \text{ dscf/mol}) = \underline{0.0044 \text{ lb NH}_3/\text{MMBtu}}$$

$$\text{Emissions}_{NH_3} \text{ (lbs/hr)} = (0.0044 \text{ lb NH}_3/\text{MMBtu}) \times (980 \text{ MMBtu/hr}) = \underline{4.3 \text{ lbs/hr}}$$

$$\text{Emissions}_{NH_3} \text{ (lbs/yr)} = (4.3 \text{ lbs/hr}) \times (8,760 \text{ hr/yr}) = \underline{37,668 \text{ lbs/yr}}$$

Fugitive TAC Emissions

TAC emissions from fugitive sources are calculated by multiplying the maximum additional POC emissions of 3.0 tons/year by the greatest weight concentration of each compound in the refinery's process streams, as shown in **Equation 8**.

$$\text{Emissions}_i = (\text{mass POC emissions}) \times (\text{weight fraction of species } i) \quad (\text{Eq. 8})$$

Sample calculation for Benzene

Basis: maximum concentration of benzene in any process stream at the Benicia Refinery is 2% (wt)

$$\text{Emissions}_{Benzene} \text{ (lbs/hr)} = (3 \text{ tons/yr}) \times (0.02) \times (2,000 \text{ lbs/ton}) \times (1 \text{ yr}/8,760 \text{ hr}) = \underline{0.014 \text{ lbs/hr}}$$

$$\text{Emissions}_{\text{Benzene}} \text{ (lbs/yr)} = (3 \text{ tons/yr}) \times (0.02) \times (2,000 \text{ lbs/ton}) = \underline{120 \text{ lbs/yr}}$$

Emission estimates for the remainder of the fugitive TAC are provided in **Table A-10**.

Mobile Source TAC

The additional trucks associated with the VIP Amendments will be diesel fueled and will emit diesel particulate matter (DPM), classified as a carcinogenic TAC by the State of California. Truck DPM exhaust emission factors are developed using EMFAC 2007 for the BAAQMD airshed. Assuming a temperature of 60 degrees Fahrenheit (°F), relative humidity of 75 percent, and an average truck speed of 55 miles per hour, DPM emissions from heavy duty diesel trucks are estimated to be 0.341 grams/mile. Emissions are calculated using **Equation 6**.

Emission calculation for DPM

$$\text{Emissions}_{\text{DPM}} \text{ (lbs/year)} = (0.341 \text{ g/mile}) \times (1 \text{ lb/454 g}) \times (10,400 \text{ miles/yr}) = \underline{7.8 \text{ lbs/year}}$$

Greenhouse Gases

GHG emissions occur as a result of the combustion of fossil fuels. The Benicia Refinery’s furnaces, boilers, and heaters directly emit GHGs through the combustion of RFG. The Refinery’s demand for electrical power from the grid results in indirect GHG emissions from off-site power generating facilities. Mobile sources associated with Refinery operations combust liquid fuel, emitting GHGs.

GHGs associated with fuel combustion consist of several different compounds, including CO₂, N₂O, and CH₄. Not all GHGs are considered to affect global warming equally. The differences are approximated using a global warming potential (GWP) factor, relative to CO₂, for which the GWP has been defined as one (1.0). Emissions of each GHG are multiplied by the appropriate GWP factor to determine the equivalent emissions relative to CO₂ (CO₂-e). N₂O has a GWP of 310, and CH₄ has a GWP of 21. GHG emissions are typically expressed in metric tons per year (Tonnes/year) CO₂-e.

The changes to the Benicia Refinery’s GHG emissions as a result of the VIP Amendments were estimated using two independent sources of emission factors. For one analysis, GHG emissions changes from fuel combustion and electrical demand were estimated using emission factors presented in the American Petroleum Institute’s (API) *Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industries* (API 2004). The other estimate of GHG emission changes used emission factors and protocols developed by the California Climate Action Registry (CCAR), a non-profit, voluntary registry for GHG emissions. Under this analysis, emission changes due to fuel combustion were estimated using emission factors presented in the CCAR General Reporting Protocol Version 2.2 (CCAR 2007). Both sources are currently being used to estimate GHG emissions from petroleum refineries, though neither has been widely accepted as the standard.

Fuel Combustion GHG Emissions

As described above, the VIP Amendments will result in an average net reduction in consumption of gaseous fuels of 30 MMBtu/hr (HHV) relative to VIP. Annual emissions of CO₂ and CH₄ from RFG combustion are calculated according to **Equation 9**.

$$\text{Emissions (Tonnes/yr)} = (\text{EF [Tonnes/MMBtu]}) \times (\text{Change in Heat Input [MMBtu/hr]}) \times (8,760 \text{ hr/year}) \tag{Eq. 9}$$

Calculations using API Compendium Emission Factors

The following calculations use GHG emission factors provided in the API *Compendium*. The *Compendium* does not include emission factors for N₂O from fuel combustion.

Calculations for CO₂

Basis: EF = 0.0567 Tonnes CO₂/MMBtu

$$\begin{aligned} \text{Emissions}_{\text{CO}_2} \text{ (Tonnes/yr)} &= (0.0567 \text{ Tonnes/MMBtu}) \times (-30 \text{ MMBtu/hr}) \times (8,760 \text{ hr/yr}) \\ &= \underline{-14,901 \text{ Tonnes/yr}} \end{aligned}$$

Calculations for CH₄

Basis: EF = 2.27 x 10⁻⁷ Tonnes CH₄/MMBtu

$$\begin{aligned} \text{Emissions}_{\text{CO}_2} \text{ (Tonnes/yr)} &= (2.27 \times 10^{-7} \text{ Tonnes/MMBtu}) \times (-30 \text{ MMBtu/hr}) \times (8,760 \text{ hr/yr}) \\ &= \underline{-0.06 \text{ Tonnes/yr}} \end{aligned}$$

Calculations for CO₂-e

$$\begin{aligned} \text{Emissions}_{\text{CO}_2\text{-e}} \text{ (Tonnes/yr)} &= (-14,901 \text{ Tonnes/yr CO}_2) + (-0.06 \text{ Tonnes/yr CH}_4 \times 21) \\ &= -14,902 \text{ Tonnes/yr CO}_2\text{-e} \end{aligned}$$

Calculations using CCAR Emission Factors

The following calculations use GHG emission factors are provided by CCAR.

Calculations for CO₂

Basis: EF = 0.0639 Tonnes CO₂/MMBtu

$$\begin{aligned} \text{Emissions}_{\text{CO}_2} \text{ (Tonnes/yr)} &= (0.0639 \text{ Tonnes/MMBtu}) \times (-30 \text{ MMBtu/hr}) \times (8,760 \text{ hr/yr}) \\ &= \underline{-16,787 \text{ Tonnes/yr}} \end{aligned}$$

Calculations for CH₄

Basis: EF = 5.9 x 10⁻⁶ Tonnes CH₄/MMBtu

$$\begin{aligned} \text{Emissions}_{\text{CO}_2} \text{ (Tonnes/yr)} &= (5.9 \times 10^{-6} \text{ Tonnes/MMBtu}) \times (-30 \text{ MMBtu/hr}) \times (8,760 \text{ hr/yr}) \\ &= \underline{-1.55 \text{ Tonnes/yr}} \end{aligned}$$

Calculations for N₂O

Basis: EF = 1.0 x 10⁻⁷ Tonnes N₂O/MMBtu

$$\begin{aligned} \text{Emissions}_{\text{CO}_2} \text{ (Tonnes/yr)} &= (1.0 \times 10^{-7} \text{ Tonnes/MMBtu}) \times (-30 \text{ MMBtu/hr}) \times (8,760 \text{ hr/yr}) \\ &= \underline{-0.026 \text{ Tonnes/yr}} \end{aligned}$$

Calculations for CO₂-e

$$\begin{aligned} \text{Emissions}_{\text{CO}_2\text{-e}} \text{ (Tonnes/yr)} &= (-16,787 \text{ Tonnes/yr CO}_2) + (-1.55 \text{ Tonnes/yr CH}_4 \times 21) \\ &\quad + (-0.026 \text{ Tonnes/yr N}_2\text{O} \times 310) = -16,828 \text{ Tonnes/yr CO}_2\text{-e} \end{aligned}$$

Incremental emissions of GHGs from fuel combustion as a result of the VIP Amendments, using both Compendium and CCAR emission factors, are presented in **Table A-11**.

Electrical Demand GHG Emissions

The Certified EIR projected that the Benicia Refinery’s electrical demand would average 73 MW following the implementation of VIP. The VIP Amendments will increase the Refinery’s total electrical demand by 5 MW to 78 MW. Indirect emissions of GHGs associated with the usage of electrical power are calculated in accordance with **Equation 10** when using emission factors provided in the *API Compendium*, which are expressed in units of Tonnes/MW-hr, and **Equation 11** when using factors provided by CCAR, which are expressed in units of lbs/MW-hr.

$$\text{Emissions (Tonnes/yr)} = (\text{EF [Tonnes/MW-hr]} \times (\text{Electrical Demand [MW]} \times (8,760 \text{ hr/year}))) \tag{Eq. 10}$$

$$\text{Emissions (Tonnes/yr)} = (\text{EF [lbs/MW-hr]} \times (\text{Electrical Demand [MW]} \times (1 \text{ Tonne}/2,205 \text{ lb}) \times (8,760 \text{ hr/year}))) \tag{Eq. 11}$$

Calculations using API Compendium Emission Factors

Calculations for CO₂

Basis: EF = 0.275 Tonnes CO₂/MW-hr

$$\begin{aligned} \text{Emissions}_{\text{CO}_2} \text{ (Tonnes/yr)} &= (0.275 \text{ Tonnes/MW-hr}) \times (5 \text{ MW}) \times (8,760 \text{ hr/yr}) \\ &= \underline{12,045 \text{ Tonnes/yr}} \end{aligned}$$

Calculations for CH₄

Basis: EF = 3.06 x 10⁻⁶ Tonnes CH₄/MW-hr

$$\begin{aligned} \text{Emissions}_{\text{CO}_2} \text{ (Tonnes/yr)} &= (3.06 \times 10^{-6} \text{ Tonnes/MW-hr}) \times (5 \text{ MW}) \times (8,760 \text{ hr/yr}) \\ &= \underline{0.13 \text{ Tonnes/yr}} \end{aligned}$$

Calculations for N₂O

Basis: EF = 1.68 x 10⁻⁶ Tonnes N₂O/MW-hr

$$\begin{aligned} \text{Emissions}_{\text{CO}_2} \text{ (Tonnes/yr)} &= (1.68 \times 10^{-6} \text{ Tonnes/MW-hr}) \times (5 \text{ MW}) \times (8,760 \text{ hr/yr}) \\ &= \underline{0.07 \text{ Tonnes/yr}} \end{aligned}$$

Calculations for CO₂-e

$$\begin{aligned} \text{Emissions}_{\text{CO}_2\text{-e}} \text{ (Tonnes/yr)} &= (12,045 \text{ Tonnes/yr CO}_2) + (0.13 \text{ Tonnes/yr CH}_4 \times 21) \\ &\quad + (0.07 \text{ Tonnes/yr N}_2\text{O} \times 310) \\ &= 12,071 \text{ Tonnes/yr CO}_2\text{-e} \end{aligned}$$

Calculations using CCAR Emission Factors

Calculations for CO₂

Basis: EF = 489 lbs CO₂/MW-hr

$$\text{Emissions}_{\text{CO}_2} \text{ (Tonnes/yr)} = (489 \text{ lbs/MW-hr}) \times (5 \text{ MW}) \times (8,760 \text{ hr/yr}) \\ \times (1 \text{ Tonne}/2,205 \text{ lb}) = \underline{9,719 \text{ Tonnes/yr}}$$

Calculations for CH₄

Basis: EF = 6.7×10^{-3} lbs CH₄/MW-hr

$$\text{Emissions}_{\text{CO}_2} \text{ (Tonnes/yr)} = (6.7 \times 10^{-3} \text{ lbs/MW-hr}) \times (5 \text{ MW}) \times (8,760 \text{ hr/yr}) \\ \times (1 \text{ Tonne}/2,205 \text{ lb}) = \underline{0.13 \text{ Tonnes/yr}}$$

Calculations for N₂O

Basis: EF = 3.70×10^{-3} lbs N₂O/MW-hr

$$\text{Emissions}_{\text{CO}_2} \text{ (Tonnes/yr)} = (3.70 \times 10^{-3} \text{ lbs/MW-hr}) \times (5 \text{ MW}) \times (8,760 \text{ hr/yr}) \\ = \times (1 \text{ Tonne}/2,205 \text{ lb}) = \underline{0.07 \text{ Tonnes/yr}}$$

Calculations for CO₂-e

$$\text{Emissions}_{\text{CO}_2\text{-e}} \text{ (Tonnes/yr)} = (9,719 \text{ Tonnes/yr CO}_2) + (0.13 \text{ Tonnes/yr CH}_4 \times 21) \\ + (0.07 \text{ Tonnes/yr N}_2\text{O} \times 310) \\ = 9,745 \text{ Tonnes/yr CO}_2\text{-e}$$

Incremental indirect emissions of GHGs due to electrical demand as a result of the VIP Amendments, using both *Compendium* and CCAR emission factors, are presented in **Table A-12**.

Mobile Source GHGs

The VIP Amendments will require up to two (2) truck trips per week on average more than what was analyzed in the Certified EIR. For the purpose of estimating GHG emissions, all transportation within the State of California must be considered. The round-trip distance between the Benicia Refinery and the Buttonwillow landfill is approximately 506 miles.

Emissions of CO₂ are calculated using an emission factor derived from the same EMFAC2007 model run used for criteria pollutant emissions. The emission factor is calculated using **Equation 5**, and emissions are calculated in accordance with **Equation 7**, with appropriate unit conversions. Emissions of CH₄ and N₂O are estimated using **Equation 12**.

$$\text{Emissions (Tonnes/yr)} = (\text{EF [Tonnes/1,000 gal fuel]}) \div (\text{Miles/gal fuel}) \times (\text{VMT/year}) \quad (\text{Eq. 12})$$

Where: VMT = Vehicle miles traveled per year

Calculations using API Compendium Emission Factors

Emission factors and typical fuel efficiency for Heavy Duty trucks are provided in the *Compendium*.

Calculations for CO₂

Basis: EMFAC2007 Modeled CO₂ Emissions = 6,040 tons/day at 2,878,000 VMT/day

$$\text{EF}_{\text{CO}_2} = (6,040 \text{ tons/day}) \times (0.9072 \text{ Tonnes/ton}) \times (1 \text{ day}/2,878,000 \text{ miles}) = 0.0019 \text{ Tonnes/mile}$$

$$\text{Emissions}_{\text{CO}_2} \text{ (Tonnes/year)} = (0.0019 \text{ Tonnes/mile}) \times (506 \text{ mi/trip}) \times (104 \text{ trips/yr}) = \underline{100 \text{ Tonnes/year}}$$

Calculations for N₂O

Basis: EF = 3.0 x 10⁻⁴ Tonnes/1,000 gal; 7 miles/gal fuel efficiency

$$\text{Emissions}_{\text{N}_{20}} \text{ (Tonnes/yr)} = (3.0 \times 10^{-4} \text{ Tonnes/1,000 Gal}) \div (7 \text{ miles/gal}) \times (506 \text{ mi/trip}) \times (104 \text{ trips/yr}) = \underline{0.0023 \text{ Tonnes/yr}}$$

Calculations for CH₄

Basis: EF = 5.7 x 10⁻⁴ Tonnes/1,000 gallons; 7 miles/gallon fuel efficiency

$$\text{Emissions}_{\text{CH}_4} \text{ (Tonnes/yr)} = (5.7 \times 10^{-4} \text{ Tonnes/1,000 gal}) \div (7 \text{ miles/gal}) \times (506 \text{ mi/trip}) \times (104 \text{ trips/yr}) = \underline{0.0043 \text{ Tonnes/yr}}$$

Calculations for CO₂-e

$$\text{Emissions}_{\text{CO}_2\text{-e}} \text{ (Tonnes/yr)} = (100 \text{ Tonnes/yr CO}_2) + (0.0043 \text{ Tonnes/yr CH}_4 \times 21) + (0.0023 \text{ Tonnes/yr N}_2\text{O} \times 310) = \underline{101 \text{ Tonnes/yr CO}_2\text{-e}}$$

Calculations using CCAR Emission Factors

Emission factors are presented by CCAR. For consistency in calculations, typical fuel efficiency for Heavy Duty trucks is the value provided in the *Compendium*.

Calculations for CO₂

CO₂ emissions are calculated as above.

$$\text{Emissions}_{\text{CO}_2} \text{ (Tonnes/year)} = \underline{100 \text{ Tonnes/year}}$$

Calculations for N₂O

Basis: EF = 1.33 x 10⁻⁴ Tonnes/1,000 gal; 7 miles/gal fuel efficiency

$$\text{Emissions}_{\text{N}_{20}} \text{ (Tonnes/yr)} = (1.33 \times 10^{-4} \text{ Tonnes/1,000 Gal}) \div (7 \text{ miles/gal}) \times (506 \text{ mi/trip}) \times (104 \text{ trips/yr}) = \underline{0.001 \text{ Tonnes/yr}}$$

Calculations for CH₄

Basis: EF = 7.5 x 10⁻⁵ Tonnes/1,000 gallons; 7 miles/gallon fuel efficiency

$$\text{Emissions}_{\text{CH}_4} \text{ (Tonnes/yr)} = (7.5 \times 10^{-5} \text{ Tonnes/1,000 gal}) \div (7 \text{ miles/gal}) \times (506 \text{ mi/trip}) \times (104 \text{ trips/yr}) = \underline{0.0006 \text{ Tonnes/yr}}$$

Calculations for CO₂-e

$$\text{Emissions}_{\text{CO}_2\text{-e}} \text{ (Tonnes/yr)} = (100 \text{ Tonnes/yr CO}_2) + (0.0006 \text{ Tonnes/yr CH}_4 \times 21) + (0.001 \text{ Tonnes/yr N}_2\text{O} \times 310) = \underline{101 \text{ Tonnes/yr CO}_2\text{-e}}$$

Incremental GHG emissions from mobile sources associated with the VIP Amendments, using both *Compendium* and CCAR emission factors, are presented in **Table A-13**.

Calculations of VIP Amendments Net GHG Emissions

Calculation using API Compendium Factors

$$\text{Emissions}_{\text{CO}_2\text{-e}} \text{ (Tonnes/yr)} = (-14,902 \text{ Tonnes/yr Combustion}) + (12,071 \text{ Tonnes/yr Electrical}) \\ + (101 \text{ Tonnes/yr Mobile Sources}) = \underline{-2,731 \text{ Tonnes/yr}}$$

Calculation using CCAR Factors

$$\text{Emissions}_{\text{CO}_2\text{-e}} \text{ (Tonnes/yr)} = (-16,828 \text{ Tonnes/yr Combustion}) + (9,745 \text{ Tonnes/yr Electrical}) \\ + (101 \text{ Tonnes/yr Mobile Sources}) = \underline{-6,983 \text{ Tonnes/yr}}$$

Tables

Valero Refining Company
Valero Improvement Project Amendments

**Table A-1
Pipestill Furnace Emissions - Short Term**

Currently Permitted Furnace Capacities (MMBtu/hr)

Fuel	F-101	F-102	F-103	F-102A	Total
Fuel Gas	349.5	169.8	53	240	812.3
CO Flue Gas	179.8	89.4	0	0	269.2
Total	529.3	259.2	53	240	1081.5

Total fired duty of F-101, F-102, F-103, and F-105 will not exceed current permitted levels

Short-Term Main Stack Emission Limits

Pollutants	Limits	Comments
NO _x	150 ppmvd @3% O ₂	Operating Day Average
SO ₂	784 ppmvd @3% O ₂	Operating Day Average
PM10/PM2.5	40 Lbs/hr	Demonstrated by Source Test
POC	N/A	No Short-Term Limits
CO	400 ppmvd @3% O ₂	Operating Day Average

Source: BAAQMD Permit Condition 20820 Part 21

Estimated Short-Term Emissions - New CO Furnace, F-105

Dry Gas Flow: 325,000 dscfm
Total Heat Input 400 MMBtu/hr Both fuels

Pollutants	Concentration or Emission Factor	Emissions Lbs/hr	Comments
NO _x	100 ppmv @0% O ₂	233.0	Proposed BACT
SO ₂	50 ppmv @0% O ₂	162.1	Consent Decree - 7-Day Average
PM10/PM2.5	N/A	38.3	Hourly MSEL - Less F-101/102/103 Emissions
POC	N/A	N/A	No Short-Term Emissions Established
CO	100 ppmv @3% O ₂	165.6	Proposed BACT - 7-Day Average

Estimated Short-Term Emissions - Existing Furnaces, F-101, F-102 and F-103

Totals 681.5 MMBtu/hr FG *Balance of Currently Permitted Heat Input*

Pollutants	Concentration or Emission Factor	Emissions Lbs/hr	Comments
NO _x	50 ppmv @3% O ₂	40.1	Engineering Estimate
SO ₂	45 ppmv S in RFG	4.4	RFG Sulfur Limit
PM10/PM2.5	0.0025 lb/MMBtu	1.7	Basis: Permit Condition for Source S-237
POC	0.0023 lb/MMBtu	1.6	Engineering Estimate
CO	30 ppmv @3% O ₂	14.7	Engineering Estimate

MSEL = Main Stack Emission Limitation per BAAQMD Condition #20820 Parts 8 and 21

Valero Refining Company
Valero Improvement Project Amendments

**Table A-2
Pipestill Furnace Emissions - Annual**

Annual Main Stack Emissions

Pollutants	Annual Emissions TPY	Basis
NO _x	686.1	Calculated
SO ₂	374.4	Calculated
PM10/PM2.5	106.5	MSEL
POC	16.1	Proposed MSEL ¹
CO	288.0	MSEL

Estimated Annual Emissions - New CO Furnace, F-105

Dry Gas Flow: 325,000 dscfm
Total Heat Input 400 MMBtu/hr *Both fuels*

Pollutants	Concentration or Emission Factor	Emissions TPY	Comments
NO _x	50 ppmv @0% O ₂	510.2	Proposed BACT
SO ₂	25 ppmv @0% O ₂	355.0	Consent Decree - 365 Day Average
PM10/PM2.5	N/A	99.0	MSEL - Less F-101/102/103 Emissions
POC	N/A	9.2	Proposed MSEL - Less F-101/102/103 Emissions
CO	N/A	223.8	MSEL - Less F-101/102/103 Emissions

Estimated Annual Emissions - Existing Furnaces, F-101, F-102 and F-103

Totals 681.5 MMBtu/hr FG *Balance of Currently Permitted Heat Input*

Pollutants	Concentration or Emission Factor	Emissions TPY	Comments
NO _x	50 ppmv @3% O ₂	175.9	Engineering Estimate
SO ₂	45 ppmv S in RFG	19.4	RFG Sulfur Limit
PM10/PM2.5	0.0025 lb/MMBtu	7.5	Basis: Permit Condition for Source S-237
POC	0.0023 lb/MMBtu	6.9	Engineering Estimate
CO	30 ppmv @3% O ₂	64.2	Engineering Estimate

MSEL = Main Stack Emission Limitation per BAAQMD Condition #20820 Parts 8 and 21

¹POC VIP Emission Limitation was based on a single source that did not accurately represent the variability of emissions from the process; application to correct limit submitted to BAAQMD in October 2006

Total Estimated Main Stack Annual Emissions

Pollutants	Emissions (Tons/yr)		
	F-105	F-101, F-102, F-103	Total
NO _x	510.2	175.9	686.1
SO ₂	355.0	19.4	374.4
PM10/PM2.5	99.0	7.5	106.5
POC	9.2	6.9	16.1
CO	223.8	64.2	288.0

Valero Refining Company
Valero Improvement Project Amendments

**Table A-3
Hydrogen Plant Reformer Furnace Criteria Pollutant Potential To Emit**

Pollutants	BACT Emission Factor	Unit of Measure	Emission Factor (lb/MMBtu)	Reformer Furnace			Reference
				980 MMBtu/hr			
				Lb/hr	Lb/day	TPY	
NO _x	7	ppmv @ 3% O ₂	0.0082	8.1	194.0	35.4	Proposed BACT
SO ₂	45	ppmv TRS in fuel gas	0.0065	6.4	153.2	28.0	Proposed BACT
PM10/PM2.5	0.0025	lb/MMBtu	0.0025	2.5	58.8	10.7	Permit Condition for Source S-237
POC	0.0023	lb/MMBtu	0.0023	2.3	54.1	9.9	Proposed BACT
CO	30	ppmv @ 3% O ₂	0.0215	21.1	506.1	92.4	Proposed BACT
NH ₃	10	ppmv @ 3% O ₂	0.0044	4.3	102.4	18.7	Proposed by Valero

Higher Heating Value of Fuel Gas (Btu/scf) = 1,150

Valero Refining Company
Valero Improvement Project Amendments

**Table A-4
Vehicle Miles Traveled**

Truck Route	Trucks/Week	Miles R/T	Total Trucks/Yr	Total Mi/Yr
BAAQMD Boundary to Valero	2	100	104	10,400
Totals	2	100	104	10,400

**Table A-5
Motor Vehicle Entrained Paved Road PM10 Emission Factors**

Vehicle Type	On-Road Average Vehicle Weight (tons) ^a	Road Type	Silt Loading (g/m ²) ^b	PM10 Emission Factor (lb/mi) ^c
Off-Site Delivery Truck	2.4	Freeway	0.02	0.0006

- a. Off-site average vehicle weight from Methodology 7.9, Entrained Road Dust (1997)
b. From ARB Emission Inventory Methodology 7.9, Entrained Paved Road Dust (1997)
c. Emission factor [g/mi] = 7.26 (Silt Loading/2)0.65 (Weight/3)1.5, from ARB Emission Inventory Methodology 7.9, Entrained Paved Road Dust

**Table A-6
Mobile Source Criteria Pollutant Emissions**

Pollutant	Model Emissions, Tons/day	Emission Factor lb/mile	Emissions Lb/Day	Emissions Tons/yr
NO _x	50.48	0.035	3.6	0.18
SO ₂	0.06	0.00004	0.00	0.0002
PM10/PM2.5	2.03	0.0020	0.2	0.0103
POC	4.07	0.0028	0.3	0.01
CO	14.58	0.010	1.1	0.1

Basis: 2,878,000
VMT/day

Model run for heavy heavy-duty diesel trucks for calendar year 2010

Emissions [pounds/day] = Emission factor [pounds/mile] x Vehicle miles traveled [miles/day]

Valero Refining Company
Valero Improvement Project Amendments

**Table A-7
VIP Amendments Emission Changes**

Daily Emissions	Emission Changes (lb/day)				
	NO _x	SO ₂	PM10/ PM2.5	POC	CO
<i>Emission Changes in VIP Amendments</i>					
Main Stack	-263	-12,776	12	0	59
New Hydrogen Plant	194.0	153.2	58.8	54.1	506.1
Fugitive Emissions	0	0	0	16	0
Trucks	1	0.00	0.1	0.1	0.3
Total VIP Amendments Emission Changes	-68	-12,623	70	71	565
Annual Emissions	Emission Changes (tons/year)				
	NO _x	SO _x	PM10/ PM2.5	POC	CO
Main Stack Scrubber (change from VIP)	-48	-2,332	2	0.0	11
New Hydrogen Plant	35.4	28.0	10.7	9.9	92.4
Fugitive Emissions	0	0	0	3	0
Trucks	0.2	0.0002	0.01	0.01	0.1
Total VIP Amendments Emission Changes	-12	-2,304	13	13	103

Note: The emissions shown in Table A-7 do not include emissions from incremental firing of other sources or reflect emission reductions from the shutdown of any sources that may result from the VIP Amendments. The emissions shown for the new hydrogen plant are the potential to emit, not the projected actual operations shown in Table 4.

Valero Refining Company
Valero Improvement Project Amendments

**Table A-8
Toxic Emissions Data**

Pollutant	Avg.Emissions g/sec	Lb/hr	Lb/MMBtu
Naphthalene	4.16E-03	3.30E-02	9.40E-05
Benzo(a)Anthracene	3.36E-08	2.66E-07	7.59E-10
Benzo(a)Pyrene	3.36E-08	2.66E-07	7.59E-10
Benzo(b)Fluoranthene	3.36E-08	2.66E-07	7.59E-10
Benzo(k)Fluoranthene	3.36E-08	2.66E-07	7.59E-10
Indeno(1,2,3-cd)Pyrene	3.36E-08	2.66E-07	7.59E-10
Dibenzo(a,h)Anthracene	3.36E-08	2.66E-07	7.59E-10
Arsenic	1.09E-05	8.64E-05	2.46E-07
Cadmium	4.08E-06	3.24E-05	9.22E-08
Chromium (Total)	4.06E-05	3.22E-04	9.17E-07
Copper	4.73E-05	3.75E-04	1.07E-06
Lead	1.20E-05	9.52E-05	2.71E-07
Manganese	2.17E-05	1.72E-04	4.90E-07
Mercury	1.31E-05	1.04E-04	2.96E-07
Zinc	1.22E-04	9.67E-04	2.76E-06
Nickel	8.63E-05	6.84E-04	1.95E-06
Hexavalent Chromium	7.19E-06	5.70E-05	1.62E-07
Formaldehyde	4.47E-04	3.54E-03	1.01E-05
Acetaldehyde	1.04E-04	8.25E-04	2.35E-06
Phenol	1.63E-04	1.29E-03	3.68E-06
Benzene	9.02E-05	7.15E-04	2.04E-06
Toluene	2.48E-04	1.97E-03	5.60E-06
Xylene	1.23E-04	9.75E-04	2.78E-06
NH ₃	3.92E-02	3.11E-01	8.86E-04
H ₂ S	1.00E-02	7.93E-02	2.26E-04

From Source Test on F-4460 Hot Oil Furnace

Testing Performed Jan/Feb 1996

Heat Input of F-4460:

351 MMBtu/hr

Valero Refining Company
Valero Improvement Project Amendments

Table A-9a
Summary of Toxic Air Contaminant Emissions

CAS No	Pollutant	H2U Reformer Furnace		Fugitive Emissions (lb/yr)	Total TAC Emissions (lb/yr)	Chronic Trigger Level (lb/yr) ²	Exceed Trigger? (Yes/No)
		Emission Factor (lb/MMBtu) ¹	Emissions (lb/yr) 980 MMBtu/hr				
75-07-0	Acetaldehyde	2.3E-06	2.0E+01		2.0E+01	6.40E+01	No
7664-41-7	Ammonia ³	4.4E-03	3.7E+04		3.7E+04	7.70E+03	Yes
7440-38-2	Arsenic	2.5E-07	2.1E+00		2.1E+00	1.20E-02	Yes
71-43-2	Benzene	2.0E-06	1.7E+01	1.2E+02	1.4E+02	6.40E+00	Yes
56-55-3	Benzo(a)Anthracene	7.6E-10	6.5E-03		6.5E-03	PAH	N/A
50-32-8	Benzo(a)Pyrene	7.6E-10	6.5E-03		6.5E-03	PAH	N/A
205-99-2	Benzo(b)Fluoranthene	7.6E-10	6.5E-03		6.5E-03	PAH	N/A
205-82-3	Benzo(k)Fluoranthene	7.6E-10	6.5E-03		6.5E-03	PAH	N/A
7440-43-9	Cadmium	9.2E-08	7.9E-01		7.9E-01	4.50E-02	Yes
7440-47-3	Chromium (Total)	9.2E-07	7.9E+00		7.9E+00	N/A	N/A
7440-50-8	Copper	1.1E-06	9.2E+00		9.2E+00	9.30E+01	No
53-70-3	Dibenzo(a,h)Anthracene	7.6E-10	6.5E-03		6.5E-03	PAH	N/A
100-41-4	Ethylbenzene			1.2E+02	1.2E+02	7.70E+04	No
50-00-0	Formaldehyde	1.0E-05	8.7E+01		8.7E+01	3.00E+01	Yes
18540-29-9	Hexavalent Chromium	1.6E-07	1.4E+00		1.4E+00	1.30E-03	Yes
7783-06-4	Hydrogen Sulfide	2.3E-04	1.9E+03		1.9E+03	3.90E+02	Yes
193-39-5	Indeno(1,2,3-cd)Pyrene	7.6E-10	6.5E-03		6.5E-03	PAH	N/A
7439-92-1	Lead	2.7E-07	2.3E+00		2.3E+00	5.40E+00	No
7439-96-5	Manganese	4.9E-07	4.2E+00		4.2E+00	7.70E+00	No
7439-97-6	Mercury	3.0E-07	2.5E+00		2.5E+00	5.60E-01	Yes
91-20-3	Naphthalene	9.4E-05	8.1E+02		8.1E+02	PAH	N/A
7440-02-0	Nickel	1.9E-06	1.7E+01		1.7E+01	7.30E-01	Yes
108-95-2	Phenol	3.7E-06	3.2E+01		3.2E+01	7.70E+03	No
108-88-3	Toluene	5.6E-06	4.8E+01	3.0E+02	3.5E+02	1.20E+04	No
108-38-3	Xylene	2.8E-06	2.4E+01	3.6E+02	3.8E+02	4.90E+01	Yes
7440-66-6	Zinc	2.8E-06	2.4E+01		2.4E+01	1.40E+03	No
Total TAC Emissions					4.1E+04		

1. Emission factors developed from source test conducted on F-4460 in 1996, except ammonia
2. Trigger Level presented in BAAQMD Table 2-5
3. Ammonia emissions based on BACT
4. Heat input capacity of this unit is 614 MMBtu/hr. The figure used in the calculation is the actual 2006 annual average firing rate.

Table A-9b
Polycyclic Aromatic Hydrocarbon Equivalence - H2U Furnace

CAS No	PAH Name	Emissions (lb/yr)	PEF	B(a)P Equivalent
56-55-3	Benzo(a)Anthracene	6.5E-03	0.1	6.5E-04
50-32-8	Benzo(a)Pyrene	6.5E-03	1	6.5E-03
205-99-2	Benzo(b)Fluoranthene	6.5E-03	0.1	6.5E-04
205-82-3	Benzo(k)Fluoranthene	6.5E-03	0.1	6.5E-04
53-70-3	Dibenzo(a,h)Anthracene	6.5E-03	0.1	6.5E-04
193-39-5	Indeno(1,2,3-cd)Pyrene	6.5E-03	1.05	6.8E-03
Benzo(a)Pyrene Equivalent				1.6E-02
PAH Chronic Trigger Level (Benzo(a)Pyrene Equivalent)				1.10E-02
Exceed Trigger Level?				Yes

**Table A-11
Incremental Change to Greenhouse Gas
Emissions**

Change in Refinery Fuel Gas Consumption

-30	MMBtu / hr
-----	------------

Combustion Emission Factors

Parameter	API Compendium		CCAR	
	Tonnes/MMBtu	Reference	Tonnes/MMBtu	Reference
CO ₂	5.67E-02	<i>API pg 4-17¹</i>	6.21E-02	<i>GRP2.2 Table C5²</i>
CH ₄	2.27E-07	<i>API pg 4-8</i>	5.90E-06	<i>Table C5, nat gas</i>
N ₂ O	Not Specified	N/A	1.00E-07	<i>Table C5, nat gas</i>

¹Assumes lowest EF value for RFG, HHV > 9.9 MMBtu/hr

²Emission factor for still gas

Change to Combustion GHG Emissions

Parameter	API Compendium	CCAR
	Tonnes/year	Tonnes/year
CO ₂	-14,901	-16,317
CH ₄	-5.97E-02	-1.55E+00
N ₂ O	N/A	-2.63E-02
CO₂-e	-14,902	-16,357

References

GRP2.2 = General Reporting Protocol version 2.2, California Climate Action Registry, March 2007

API = American Petroleum Institute, Compendium of Greenhouse Gas Emission Methodologies for the Oil and Gas Industries, February 2004.

Table A-12
Incremental Change to Greenhouse Gas Emissions
Electrical Demand

Electricity Demand Change	
5	MW
43,800	MW-hr / yr

Electrical Generation Emission Factors

Parameter	API Compendium		CCAR	
	Emission Factor (tonnes / MW-hr)	Reference	Emission Factor (lbs / MW-hr)	Reference
CO2	0.275	<i>API pg B-13</i>	49.119	<i>EGRID, PG&E</i>
CH4	3.04E-06	<i>API pg B-13</i>	6.70E-03	<i>GRP2.1 Table C2</i>
N2O	1.68E-06	<i>API pg B-13</i>	3.70E-03	<i>GRP2.1 Table C2</i>

Electrical Generation Emissions

Parameter	API Compendium	CCAR
	Emissions (Tonnes/yr)	Emissions (Tonnes/yr)
CO2	12,045	976
CH4	0.13	0.13
N2O	0.07	0.07
Total CO2-e	12,071	1,001

References

GRP2.2 = General Reporting Protocol version 2.2, California Climate Action Registry, March 2007

API = American Petroleum Institute, Compendium of Greenhouse Gas Emission Methodologies for the Oil and Gas Industries, February 2004.

EGRID = Emissions & Generation Resource Integrated Database, EGRID2006 version 2.1

**Table A-13
Incremental Change to Greenhouse Gas Emissions
Mobile Sources**

VIP Amendments Operations

Truck Route	Trucks/Week	Miles R/T	Total Mi/Week	Total Mi/Yr
Valero to Buttonwillow	2	506	1,012	52,624

CO₂ Emission Factor

Fleet Vehicle Miles Traveled/Day	2,878,000
CO ₂ Emissions, Tons/Day	6,040
CO ₂ Emissions, Tonnes/Day	5,479
Emission Factor, Tonnes/Mile	0.00190

Reference: EMFAC2007 for Heavy-duty diesel trucks

N₂O and CH₄ Emission Factors

Pollutant	API Compendium		CCAR	
	Tonnes/1,000 Gal Fuel	Tonnes/Mile	Tonnes/1,000 Gal Fuel	Tonnes/Mile
N ₂ O	3.00E-04	4.29E-08	1.33E-04	1.90E-08
CH ₄	5.70E-04	8.14E-08	7.35E-05	1.05E-08
Reference	<i>API Tbl 4-9</i>		<i>GRP2.2 Table C4</i>	

Heavy Duty Truck Fuel Economy (*API Tbl 4-10*): 7 miles/gallon

Pollutant	API Compendium	CCAR
	Tonnes/Year CO ₂ -e	Tonnes/Year CO ₂ -e
CO ₂	100	100
N ₂ O	0.7	0.3
CH ₄	0.1	0.01
Total CO₂-e	101	101

References

GRP2.2 = General Reporting Protocol version 2.2, California Climate Action Registry, March 2007

API = American Petroleum Institute, Compendium of Greenhouse Gas Emission Methodologies for the Oil and Gas Industries, February 2004.

EMFAC2007 = California Air Resources Board Emission FACTors model for vehicle emissions

Appendix C

AERMET Meteorological Processing

Prepared for:
Valero Refining Company – California
Benicia Refinery

AERMET Meteorological Processing

ENSR Corporation
September 2007
Document No.: 06993-023-300-D

Prepared for:
**Valero Refining Company – California
Benicia Refinery**

AERMET Meteorological Processing



Prepared By



Reviewed By

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List of Abbreviations and Acronyms

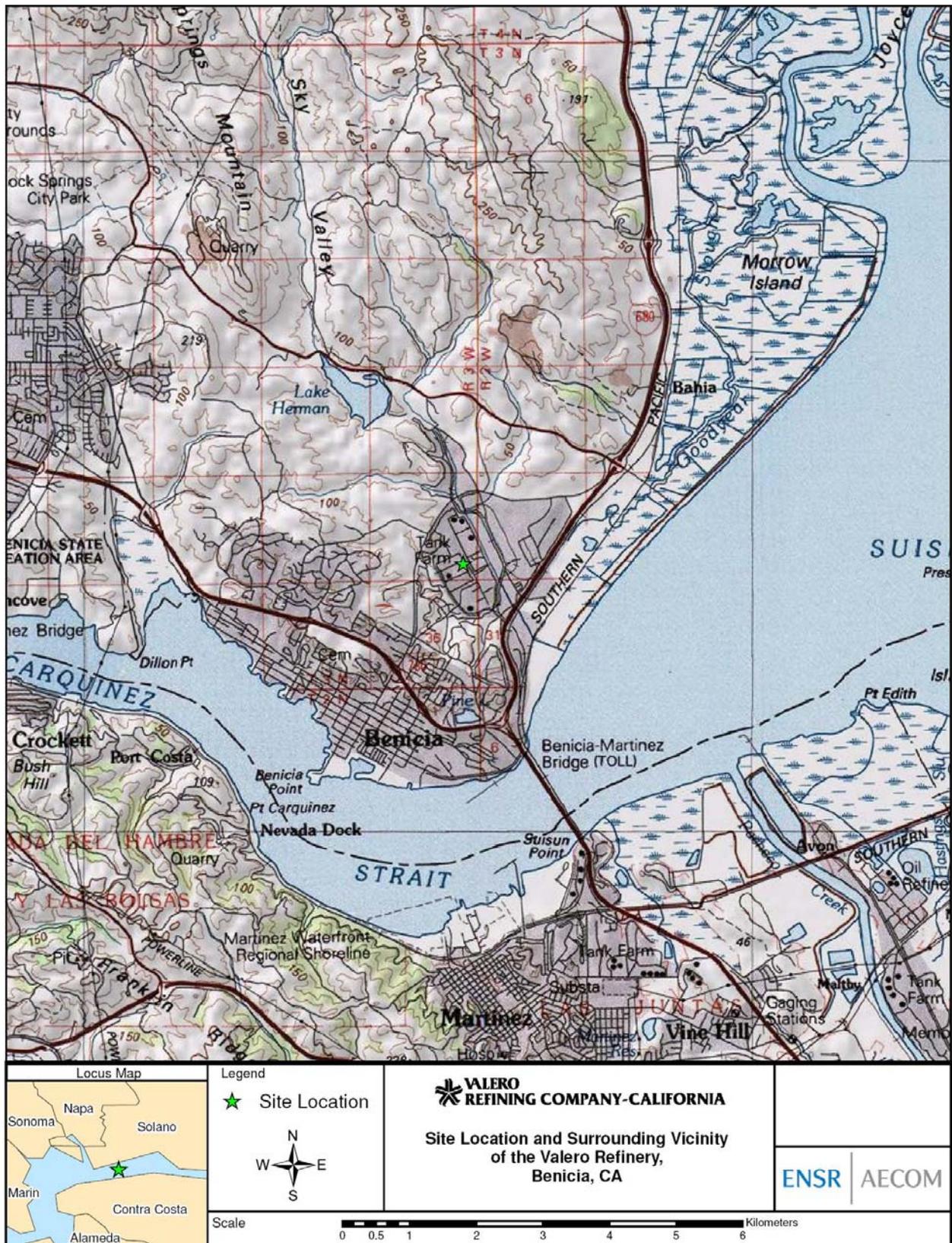
AAQS	Ambient Air Quality Standards
AIG	AERMOD Implementation Guide
BAAQMD	Bay Area Air Quality Management District
B_o	Bowen ratio
km	kilometers
NWS	National Weather Service
r	Albedo
USEPA	U.S. Environmental Protection Agency
z_o	surface roughness

1.0 Introduction

This appendix describes the meteorological processing that was performed to prepare the data for input to AERMOD in support of the ambient air quality modeling analysis for the Valero Refining Company – California (Valero). This analysis was performed for Valero's Use Permit application for the project known as the Valero Improvement Project (VIP) Amendments. The processing followed the guidance provided in the U.S. Environmental Protection Agency (USEPA) AERMOD Implementation Guide (AIG) (USEPA 2005a).

Figure 1-1 presents the facility location on a topographic map.

Figure 1-1 Location of the Valero Refinery



2.0 Meteorological Data Processing

2.1 Dispersion Environment

The application of the dispersion model requires characterization of the local dispersion environment (within three kilometers [km]) as either urban or rural, based on an USEPA-recommended procedure (Auer, 1978) that characterizes an area by prevalent land use. This land use approach classifies an area according to 12 land use types. In this scheme, areas of industrial, commercial, and compact residential land use are designated urban. According to the USEPA Guideline on Air Quality Models (USEPA 2005b), if more than 50 percent of an area within a three-km radius of the proposed facility is classified as rural, then rural dispersion assumptions are to be used in the dispersion modeling analysis. Conversely, if more than 50 percent of the area is urban, urban dispersion is assumed.

As shown in **Figure 2-1**, the land-use within 3 km of the Refinery is primarily rural, which is consistent with the dispersion coefficients used in the original VIP modeling. AERMOD does not require any specification for rural applications since rural dispersion is the default dispersion mode.

2.2 Availability of Onsite Meteorological Data

The AERMOD model requires a sequential hourly record of dispersion meteorology representative of the region of the sources to be modeled. The USEPA and Bay Area Air Quality Management District (BAAQMD) modeling guidelines recommended that, if available, refined modeling should be conducted with one year of onsite meteorological data. Two meteorological towers are operated at the Refinery that measure and record wind speed, wind direction and temperature data. The location of the “Admin” and “Warehouse” Met Towers are shown below in **Figures 2-2** and **2-3**, respectively. The 2005 data was used because this is the most recent data available from BAAQMD, and BAAQMD has identified this year to be complete for dispersion modeling purposes (i.e., data capture greater than or equal to 90 percent). The onsite data sets were supplemented with National Weather Service (NWS) data from Buchanan Field Airport in Concord, California, to provide cloud cover and cloud ceiling height data also required for the modeling. Concurrent upper air data from Metropolitan Oakland International Airport in Oakland, California, was used, as required, for the dispersion modeling.

Given some observed differences in wind directions between the Admin and Warehouse Met Towers (see **Figures 2-4** and **2-5**, respectively), both tower data sets were used in the modeling and the higher of the modeled concentrations from either set was used to demonstrate compliance with the California and National Ambient Air Quality Standards (AAQS).

Figure 2-1 Land Use Within 3 Kilometers of the Valero Refinery

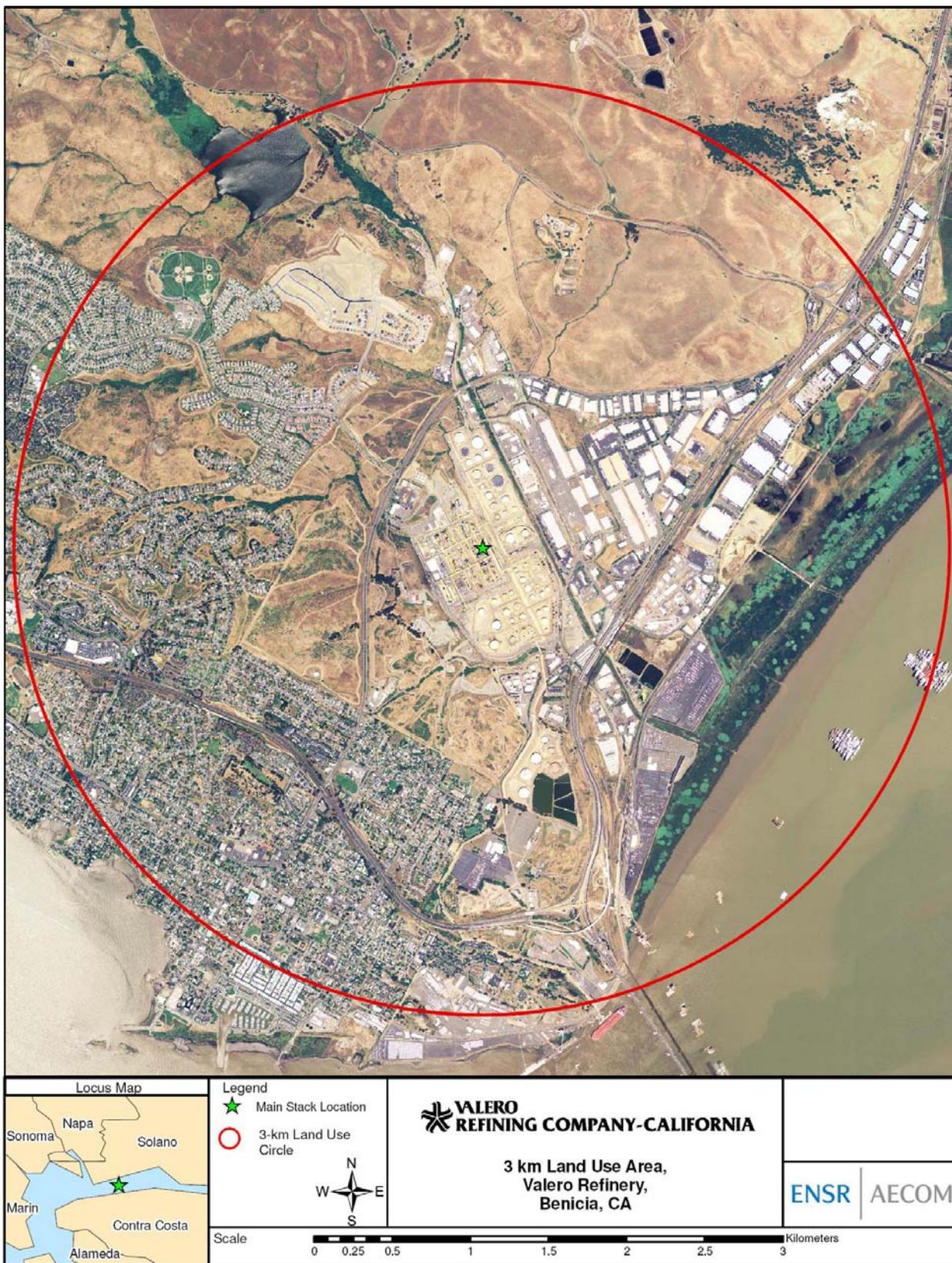


Figure 2-2 Three-Kilometer Land-use Circle Around the Admin Met Tower



Figure 2-3 Three-Kilometer Land-use Circle Around the Warehouse Met Tower

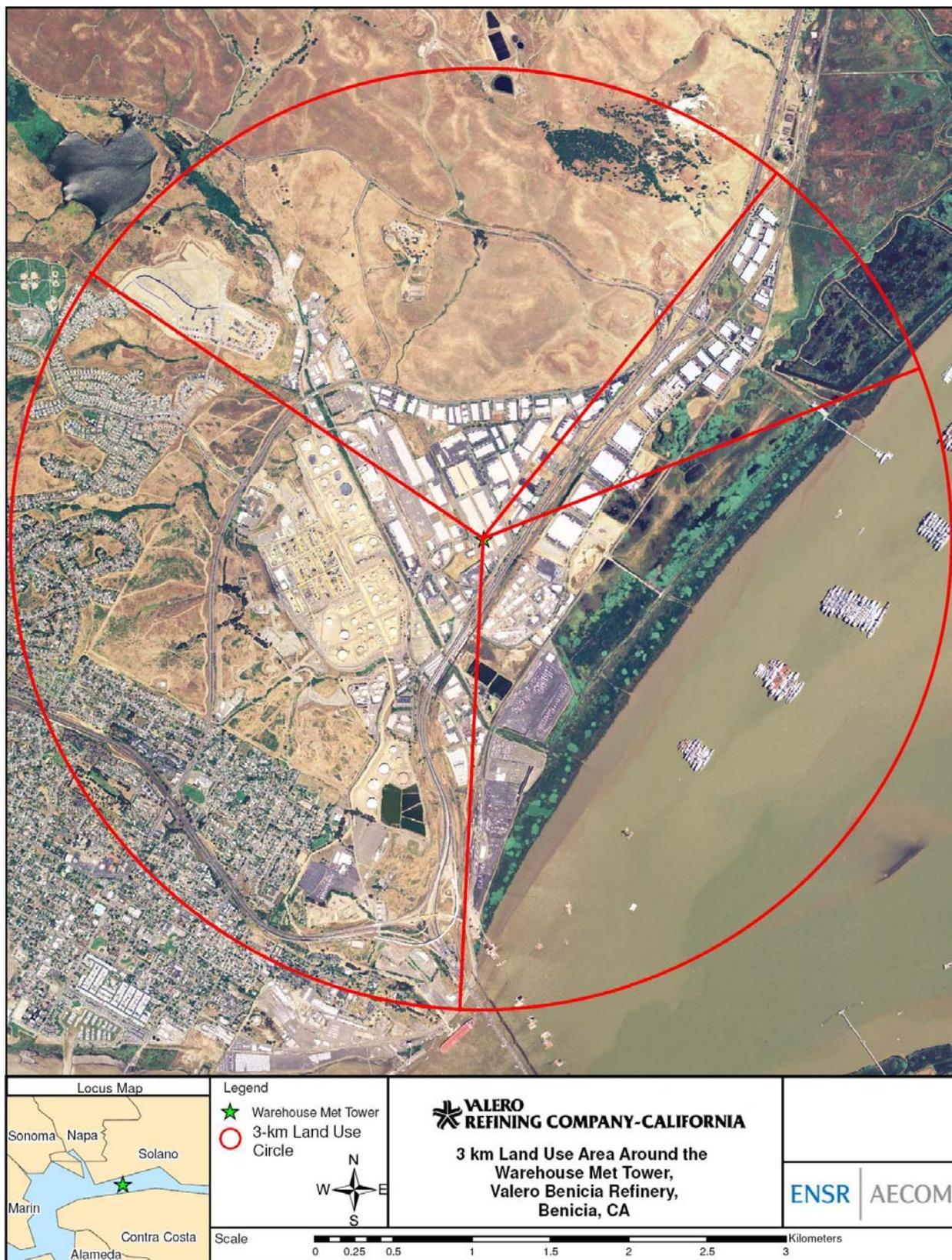
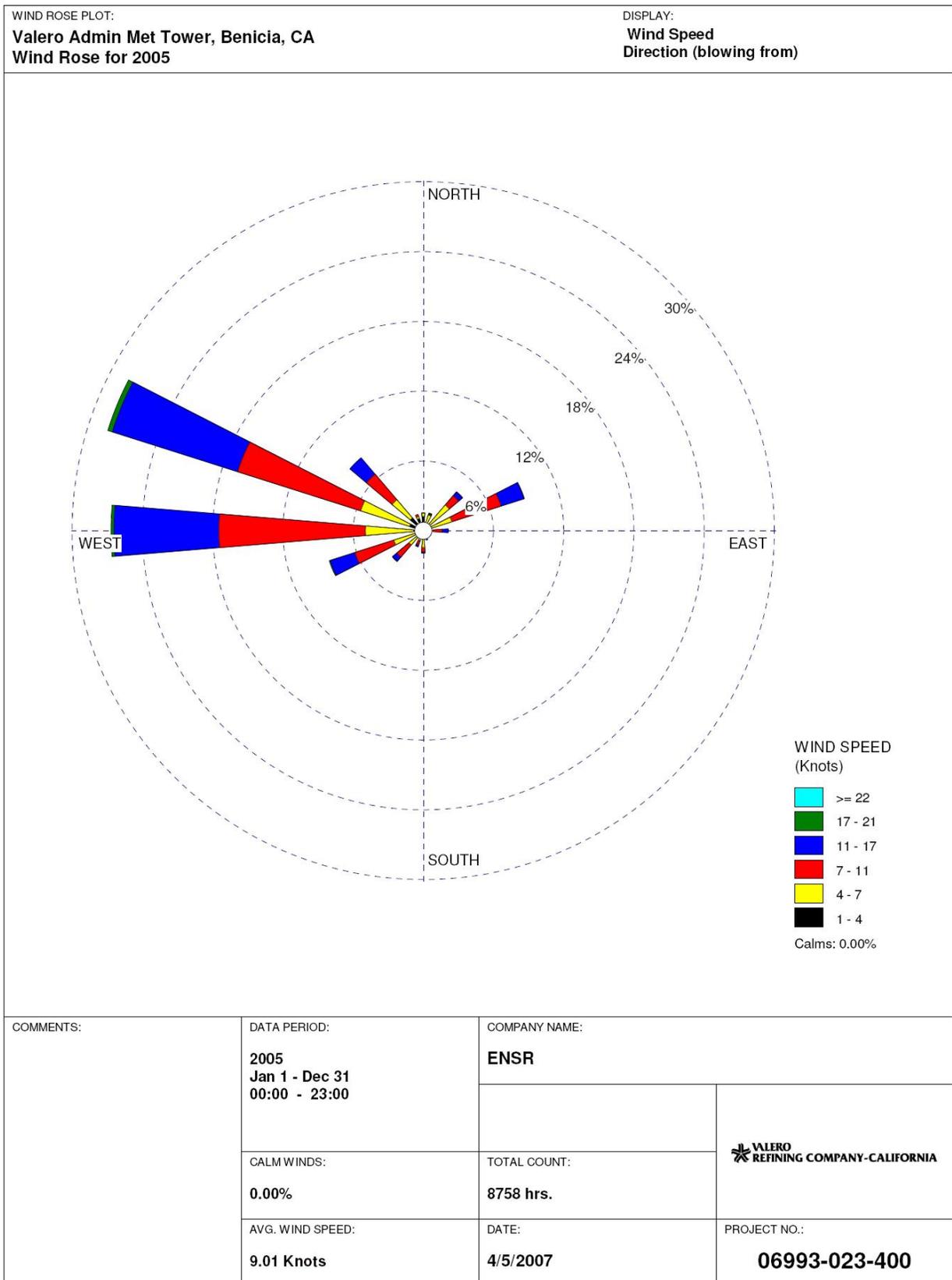
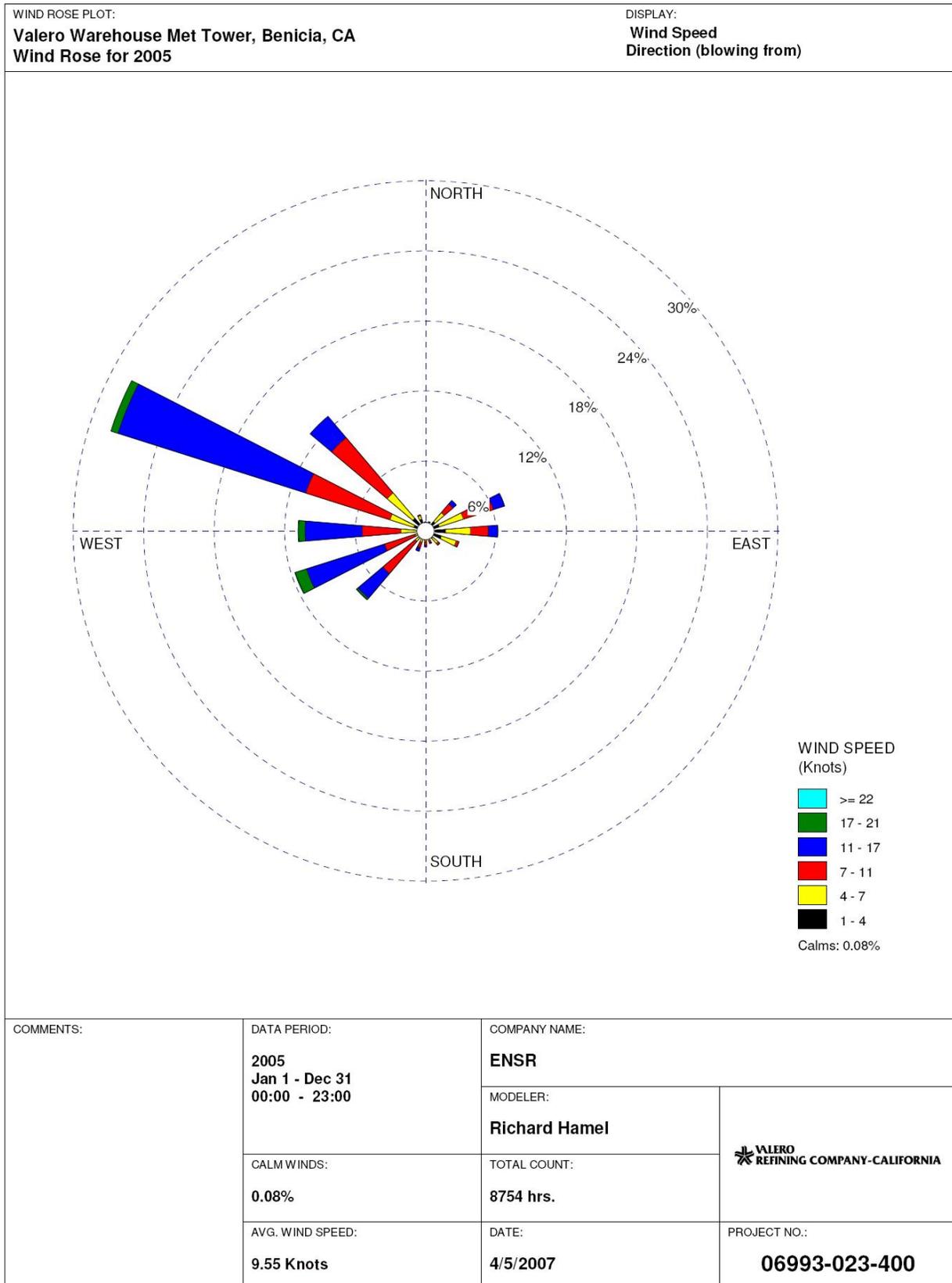


Figure 2-4 Wind Rose (2005) for the Admin Met Tower



WRPLOT View - Lakes Environmental Software

Figure 2-5 Wind Rose (2005) for the Warehouse Met Tower



WRPLOT View - Lakes Environmental Software

2.3 Meteorological Data Processing with AERMET

One year (2005) of wind speed, wind direction and temperature data from each of two on-site meteorological towers (Admin and Warehouse Met Towers), NWS cloud data from Buchanan Field Airport in Concord, California, and concurrent upper air data from Metropolitan Oakland International Airport in Oakland, California, obtained from BAAQMD, were processed with AERMET (Version 06341). Concurrent Buchanan Field Airport cloud cover data exceeds 90 percent and, therefore, meets the USEPA's minimum data capture requirement for use in air quality modeling.

AERMET was run to create two meteorological data files required for input to AERMOD:

- **SURFACE:** a file with boundary layer parameters such as sensible heat flux, surface friction velocity, convective velocity scale, vertical potential temperature gradient in the 500-meter layer above the planetary boundary layer, and convective and mechanical mixing heights. Also provided are values of Monin-Obukhov length, surface roughness, albedo, Bowen ratio, wind speed, wind direction, temperature, and heights at which measurements were taken.
- **PROFILE:** a file containing multi-level meteorological data with wind speed, wind direction, temperature, and sigma-theta and sigma-w when such data are available. For this application involving on-site tower data, the profile file will contain a single level of wind data (23.3 meters for the Admin Met Tower and 24.7 meters for the Warehouse Met Tower) and the temperature data only.

AERMET requires specification of site characteristics including surface roughness (z_0), Albedo (r), and Bowen ratio (B_0) that are developed according to the guidance provided by USEPA in the AERMET User's Guide (USEPA 1998) and the AIG (USEPA 2005a).

The AIG recommends that the surface characteristics should be determined based on the land use within 3 km of the site where the surface meteorological data were collected. The land-use has been delineated within three km of the two on-site meteorological towers. The primary source of information used to characterize the land-use was aerial photographs (year 2005; http://archive.casil.ucdavis.edu/casil/remote_sensing/naip_2005/). **Figures 2-2** and **2-3** show the aerial photographs covering the 3 km radius area about the Valero Admin and Warehouse towers respectively. The photographs were reviewed for the land-use types specified in the AERMET User's Guide as listed in **Tables 2-1** and **2-2**.

Based on a review of the aerial photography, the 3 km area surrounding the meteorological sites consist of a mix of urban, swamp, grassland, and water. Monthly values (based on seasonal variability) of the site characteristics are required by AERMET based on weighted land use for the 3 km area. As recommended by the AIG, the 3 km area was broken down into sectors; 3 sectors for Admin Met Tower and 4 sectors for the Warehouse Met Tower, based upon visual observation of the land-use about the meteorological sites as shown on aerial photographs (see **Figures 2-4** and **2-5**). **Tables 2-1** and **2-2** summarize the land-use categories and percentages developed for each sector at each site.

Table 2-1 Surface Characteristics to be Used as Input to AERMET for Admin Met Tower

Land-Use Type	Fractional Land-Use		
	Sector 1 307-68 deg.	Sector 2 68-161 deg.	Sector 3 16-307 deg.
Water	0.05	0.05	0
Deciduous	0	0	0
Coniferous	0	0	0
Swamp	0.05	0.2	0
Cultivated Land	0	0	0
Grassland	0.8	0.1	0.35
Urban (Default)	0.1	0.6	0.6
Urban (Paved) ¹	0	0.05	0
Desert Shrubland	0	0	0

1. Only applies to surface roughness; see footnotes in surface characteristic spreadsheet on CD-ROM for details.

Table 2-2 Surface Characteristics to be Used as Input to AERMET for Warehouse Met Tower

Land-Use Type	Fractional Land-Use			
	Sector 1 304-39 deg.	Sector 2 39-69 deg.	Sector 3 69-183 deg.	Sector 4 183-304 deg.
Water	0	0	0.65	0
Deciduous	0.05	0	0	0
Coniferous	0	0	0	0
Swamp	0	0.4	0.2	0
Cultivated Land	0	0	0	0
Grassland	0.8	0.25	0	0.4
Urban (Default)	0.1	0.35	0.1	0.55
Urban (Paved) ¹	0.05	0	0.05	0.05
Desert Shrubland	0	0	0	0

1. Only applies to surface roughness; see footnotes in surface characteristic spreadsheet on CD-ROM for details.

The seasonal values of the site characteristics (z_o , r , and B_o) for the areas of the meteorological towers were developed based on the recommended values for the various land-use types in the AERMET User's Guide and computed as area-weighted values using the land-use percentages listed in **Tables 2-1** and **2-2**. For the purpose of defining seasonal values, months were assigned to seasons as follows based on climatology of the area: Summer – June, July, August, September,; Fall – October, November, December, January, February, March; Spring –April, May. The proposed seasonal values of B_o , r and z_o for use in AERMET are provided in **Tables 2-3** through **2-5** for the Admin Met Tower and **Tables 2-6** through **2-8** for the Warehouse Met Tower, respectively. Representative climatological precipitation data for Martinez Water Plant¹ were used to determine the monthly Bowen ratio. In order to determine whether the rainfall for a given month of meteorological data was average, abnormally wet, or abnormally dry, the following process was used:

- The month being considered is compared to the average rainfall for that month over at least a 30-year period (in this case 1970-2005).
- If the month had more than twice the average rainfall for that month over the climatological period, it was classified "wet" for calculating the Bowen ratio for that month.
- If the month had less than half the average rainfall for that month over the climatological period, the month was classified "dry" for use in calculating the Bowen Ratio.
- Otherwise, the month is considered "average" and no adjustment is made.

The winter season is defined as any month that had an observed snow cover on more than 50 percent of the days, which would yield a higher albedo. Since there was no snow cover during the processing period, which is typical of this climate, none of the months were classified as winter. Winter surface characteristics are provided in **Tables 2-3** through **2-5** for informational purposes only and were not used in the analysis. The season definitions and Bowen ratio determinations are consistent with recommendations provide in Appendix F of the AERMET *User's Guide*. A spreadsheet with the computation of the weighted values of these surface characteristics is included in the computer modeling archive CD-ROM.

The base elevation of the Admin Met Tower is 54.9 meters (180 feet) above sea level. The base elevation of the Warehouse Met Tower is 15.2 meters (49.9 feet) above sea level.

¹ <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca5378>

Table 2-3 Seasonal Bowen Ratio Used as Input to AERMET for Admin Met Tower

Land-Use Type	Bowen Ratio Values from AERMET User's Guide											
	Average				Dry				Wet			
	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter
Water	0.1	0.1	0.1	1.5	0.1	0.1	0.1	2.0	0.1	0.1	0.1	0.3
Deciduous	0.7	0.3	1.0	1.5	1.5	0.6	2.0	2.0	0.3	0.2	0.4	0.5
Coniferous	0.7	0.3	0.8	1.5	1.5	0.6	1.5	2.0	0.3	0.2	0.3	0.3
Swamp	0.1	0.1	0.1	1.5	0.2	0.2	0.2	2.0	0.1	0.1	0.1	0.5
Cultivated Land	0.3	0.5	0.7	1.5	1.0	1.5	2.0	2.0	0.2	0.3	0.4	0.5
Grassland	0.4	0.8	1.0	1.5	1.0	2.0	2.0	2.0	0.3	0.4	0.5	0.5
Urban	1.0	2.0	2.0	1.5	2.0	4.0	4.0	2.0	0.5	1.0	1.0	0.5
Desert Shrubland	3.0	4.0	6.0	6.0	5.0	6.0	10.0	10.0	1.0	1.5	2.0	2.0
Seasonal Weighted Geometric Mean												
Sector 1	0.38	0.71	0.85	1.50	0.88	1.64	1.64	2.00	0.28	0.38	0.46	0.49
Sector 2	0.51	0.86	0.88	1.50	1.01	1.70	1.70	2.00	0.32	0.51	0.52	0.49
Sector 3	0.73	1.45	1.57	1.50	1.57	3.14	3.14	2.00	0.42	0.73	0.78	0.50

Table 2-4 Seasonal Albedo Used as Input to AERMET for Admin Met Tower

Land-Use Type	Albedo Values from AERMET User's Guide			
	Spring	Summer	Autumn	Winter
Water	0.12	0.10	0.14	0.20
Deciduous	0.12	0.12	0.12	0.50
Coniferous	0.12	0.12	0.12	0.35
Swamp	0.12	0.14	0.16	0.30
Cultivated Land	0.14	0.20	0.18	0.60
Grassland	0.18	0.18	0.20	0.60
Urban	0.14	0.16	0.18	0.35
Desert Shrubland	0.30	0.28	0.28	0.45
Seasonal Weighted Average				
Sector 1	0.17	0.17	0.19	0.54
Sector 2	0.14	0.16	0.18	0.36
Sector 3	0.15	0.17	0.19	0.44

Table 2-5 Seasonal Surface Roughness Used as Input to AERMET for Admin Met Tower

Land-Use Type	Surface Roughness Values from AERMET User's Guide			
	Spring	Summer	Autumn	Winter
Water	0.00	0.00	0.00	0.00
Deciduous	1.00	1.30	0.80	0.50
Coniferous	1.30	1.30	1.30	1.30
Swamp	0.20	0.20	0.20	0.05
Cultivated Land	0.03	0.20	0.05	0.01
Grassland	0.05	0.10	0.01	0.00
Urban	1.00	1.00	1.00	1.00
Desert Shrubland	0.30	0.30	0.30	0.15
Seasonal Weighted Average				
Sector 1	0.15	0.19	0.12	0.10
Sector 2	0.65	0.65	0.64	0.61
Sector 3	0.62	0.64	0.61	0.60

Table 2-6 Seasonal Bowen Ratio Used as Input to AERMET for Warehouse Met Tower

Land-Use Type	Bowen Ratio Values from AERMET User's Guide											
	Average				Dry				Wet			
	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter
Water	0.1	0.1	0.1	1.5	0.1	0.1	0.1	2.0	0.1	0.1	0.1	0.3
Deciduous	0.7	0.3	1.0	1.5	1.5	0.6	2.0	2.0	0.3	0.2	0.4	0.5
Coniferous	0.7	0.3	0.8	1.5	1.5	0.6	1.5	2.0	0.3	0.2	0.3	0.3
Swamp	0.1	0.1	0.1	1.5	0.2	0.2	0.2	2.0	0.1	0.1	0.1	0.5
Cultivated Land	0.3	0.5	0.7	1.5	1.0	1.5	2.0	2.0	0.2	0.3	0.4	0.5
Grassland	0.4	0.8	1.0	1.5	1.0	2.0	2.0	2.0	0.3	0.4	0.5	0.5
Urban	1.0	2.0	2.0	1.5	2.0	4.0	4.0	2.0	0.5	1.0	1.0	0.5
Desert Shrubland	3.0	4.0	6.0	6.0	5.0	6.0	10.0	10.0	1.0	1.5	2.0	2.0
Seasonal Weighted Geometric Mean												
Sector 1	0.47	0.87	1.11	1.50	1.13	2.09	2.22	2.00	0.32	0.44	0.55	0.50
Sector 2	0.32	0.48	0.51	1.50	0.67	1.01	1.01	2.00	0.23	0.32	0.33	0.50
Sector 3	0.14	0.16	0.16	1.50	0.18	0.20	0.20	2.00	0.13	0.14	0.14	0.36
Sector 4	0.69	1.39	1.52	1.50	1.52	3.03	3.03	2.00	0.41	0.69	0.76	0.50

Table 2-7 Seasonal Albedo Used as Input to AERMET for Warehouse Met Tower

Land-Use Type	Albedo Values from AERMET User's Guide			
	Spring	Summer	Autumn	Winter
Water	0.12	0.10	0.14	0.20
Deciduous	0.12	0.12	0.12	0.50
Coniferous	0.12	0.12	0.12	0.35
Swamp	0.12	0.14	0.16	0.30
Cultivated Land	0.14	0.20	0.18	0.60
Grassland	0.18	0.18	0.20	0.60
Urban	0.14	0.16	0.18	0.35
Desert Shrubland	0.30	0.28	0.28	0.45
Seasonal Weighted Average				
Sector 1	0.17	0.17	0.19	0.56
Sector 2	0.14	0.16	0.18	0.39
Sector 3	0.12	0.12	0.15	0.24
Sector 4	0.16	0.17	0.19	0.45

Table 2-8 Seasonal Surface Roughness Used as Input to AERMET for Warehouse Met Tower

Land-Use Type	Surface Roughness Values from AERMET User's Guide			
	Spring	Summer	Autumn	Winter
Water	0.00	0.00	0.00	0.00
Deciduous	1.00	1.30	0.80	0.50
Coniferous	1.30	1.30	1.30	1.30
Swamp	0.20	0.20	0.20	0.05
Cultivated Land	0.03	0.20	0.05	0.01
Grassland	0.05	0.10	0.01	0.00
Urban	1.00	1.00	1.00	1.00
Desert Shrubland	0.30	0.30	0.30	0.15
Seasonal Weighted Average				
Sector 1	0.21	0.25	0.17	0.17
Sector 2	0.44	0.46	0.43	0.37
Sector 3	0.14	0.14	0.14	0.11
Sector 4	0.57	0.59	0.56	0.55

3.0 References

- Auer, A. H. 1978. Correlation of Land Use and Cover with Meteorological Anomalies. J. Appl. Meteor., Vol 17, pp 636-643.
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- U.S. Environmental Protection Agency (USEPA). 2005b. Guideline on Air Quality Models (Revised). Codified in the Appendix W to 40 CFR Part 51. OAQPS, Research Triangle Park, North Carolina. November.
- U.S. Environmental Protection Agency (USEPA). 1998. AERMET Users Guide (http://www.epa.gov/scram001/metobsdata_procaccprogs.htm#aermet).

Appendix D
Biological Survey Memo

EDAW Inc
150 Chestnut Street, San Francisco, California 94111
T 415.955.2800 F 415.788.4875 www.edaw.com

Memorandum

Date: *Revised August 2, 2007*

To: Elizabeth Copley, ENSR
Timothy Burchfield, ENSR

From: Charles Battaglia, EDAW
Marylee Guinon, EDAW

Subject: Results of Biological Survey for Valero Refinery Project

Distribution: Electronic

At your request, EDAW conducted a reconnaissance-level survey of specific sites within the Valero Benicia Refinery (Benicia Refinery) in order to assess general biological resources and the potential for special-status plant and wildlife species to occur. The site specific survey was undertaken to update information presented in the Certified Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project dated 2002 (Certified EIR), with additional information that represents minor technical changes or additions to the Certified EIR (VIP Amendments). There are three additional areas, located within the Benicia Refinery Boundaries that had not been previously surveyed as part of the Certified EIR for biological resources that we have been asked to assess. Each of the three sites were surveyed on foot and one site was reviewed via aerial photographs.

The refinery is located on the northeast side of Benicia, California, between Interstates 680 and 780. The western and northern sides of the refinery are bordered by rolling hills composed of annual grassland and scattered shrubs, the eastern side is bordered by Sulphur Springs Creek, beyond which is industrial development and eventually salt-marsh habitat associated with the Carquinez Strait and San Pablo Bay, and the southern side is bordered by residential development. Due to the developed nature and the day-to-day operations of the refinery, the property and its boundaries are highly disturbed and provide minimal habitat for special-status plants and wildlife. However, Sulphur Springs Creek does provide at least marginally suitable wildlife habitat.

This memo presents the methods and results of the investigation.

Methods

Pre-field Investigation

Prior to our field investigation, information on special-status plant and wildlife species with potential to occur on at the Benicia Refinery was compiled by performing database searches of the California Department of Fish and Game's (CDFG) California Natural Diversity Database (CNDDDB 2006), as well as the California Native Plant Society's (CNPS) Electronic Inventory of Rare and Endangered Vascular Plants (CNPS 2006). Three U.S. Geological Survey (USGS) 7.5-minute quadrangles (Benicia, Mare Island, and Vine Hill) were used as the basis for the searches. The quadrangles cover the Benicia Refinery and the surrounding area. Other sources of information referenced during this investigation include the CDFG's State and Federally Listed Endangered, Threatened, and Rare Plants of California (CDFG 2006), and the U.S. Fish and Wildlife Service's Endangered and

Threatened Species (USFWS 2006). Additionally, EDAW reviewed the biological resources section of the Certified Environmental Impact Report for information regarding previous biological surveys conducted at the Benicia Refinery (ESA 2002).

The Certified EIR included a focused list of special-status species with the potential to occur in or near the Benicia Refinery (EIR Table 4.3-1). Table 4.3-1 is included as **Appendix A** to this memorandum.

Field Surveys

Biological field surveys at the project site were conducted on two separate dates. The sites include an area adjacent to the proposed new Hydrogen Unit, the Relocated Employee Parking area, and the Fire House location. The three sites are illustrated in Figure 1.

On January 18, 2007, EDAW biologist Charles Battaglia conducted a reconnaissance-level survey for general biological resources and potential special-status plant and wildlife species and their habitat at two sites within the Benicia Refinery. Also present was an ENSR representative and a Valero employee. The two sites Mr. Battaglia visited included an area to the northeast of the proposed location for the new Hydrogen Unit and the proposed location for the Relocated Employee Parking area. Due to security and safety requirements, the survey was limited to access from designated safe areas within the refinery, and at specific sites outside of refinery operations. It should be noted that this survey was conducted during winter. The new Hydrogen Unit is proposed to be located within an existing parking lot. The existing parking area would be removed to facilitate construction of the new Hydrogen Unit at this proposed location. The Relocated Employee Parking site is a gently sloped area located to the northeast of the existing parking lot.

On April 5, 2007 EDAW biologist Marylee Guinon conducted a follow-up reconnaissance-level site visit of the location proposed for the new Hydrogen Unit and the proposed Relocated Employee Parking site. Ms. Guinon also visited the area proposed for the Relocated Fire House, which is potentially planned for location on the edge of a graveled parking lot in the southern central portion of the refinery.

This memorandum contains the results of the reconnaissance level evaluations conducted for the Benicia Valero Refinery area and summary of our findings.

Results

As described in the Certified EIR the majority of the Benicia Refinery is thoroughly developed and contains few biological attributes. ESA indicated in the Certified EIR that habitat types within the vicinity of the Refinery included non-native grassland, freshwater emergent wetland, riparian, and estuarine open water; however, ESA indicated that the term “habitat” should be used very guardedly – since the patches observed and recorded are too small to support a full suite of associated species. Mr. Battaglia’s and Ms. Guinon’s observations of habitats and species were generally consistent with the findings of the Certified EIR. As described above, Table 4.3-1 in the Certified EIR contained a focused list of the terrestrial plants and animals with the potential to occur in or near the Benicia Refinery. Table 4.3-1 is attached as **Appendix A** to this memorandum.

New Hydrogen Unit

The new Hydrogen Unit is proposed to be located within an area currently occupied by an employee parking lot, a fire house, and a training building. Due to the heavily developed and disturbed nature of this area, no suitable habitat for special-status plant or wildlife species is present.

To the north of the proposed new Hydrogen Unit location, EDAW biologists observed a drainage ditch that is approximately 6 feet wide and several hundred feet long that appears to have been constructed to capture the minimal runoff from an adjacent berm. The drainage ditch extends west

through an approximately eight-inch culvert and continues for several hundred feet down the slope where it drains into a tributary to Sulphur Springs Creek. No special-status species or habitat was observed in the constructed drainage ditch. However, the Sulphur Springs tributary to which the ditch drains contained cattail (*Typha sp.*), rush (*Juncus sp.*), and willow (*Salix sp.*) species. Wildlife detected or observed at this site included Pacific tree frog (*Hyla regilla*) and house finch (*Carpodacus mexicanus*).

The drainage ditch could be considered an unvegetated water and, as such may fall under the jurisdiction of the U.S. Army Corps of Engineers (USACE) who regulate waters of the U.S. and wetlands under Section 404 of the Clean Water Act. The project will avoid the drainage ditch during construction and operation of the VIP Amendments. During construction of the Hydrogen Unit, the following avoidance measures as described in the Project Description shall be provided:

- To ensure complete avoidance of the drainage ditch and the Sulphur Springs Creek tributary, silt fencing shall be erected around the construction zone;
- No fueling or maintenance of construction equipment or vehicles shall occur within 50 feet of the drainage ditch or the Sulphur Springs Creek tributary.

Based on this analysis, avoidance of the drainage ditch and the Sulphur Springs Creek tributary can be achieved and no further action is necessary at this site for special-status species and their habitat.

Relocated Employee Parking:

The area designated as Relocated Employee Parking Lot will be a two-level lot terraced into the gentle sloping area located on currently unused Valero property north of the process block. This area consists of ice plant (*Mesembryanthemum crystallinum L.*) and various annual grasses. During the survey, no suitable habitat for any of the special-status plant or animal species documented to occur in the region was observed on the site.

Based on this analysis and as discussed in the Project Description, no further action is necessary at the relocated employee parking site for special-status species and their habitat.

Relocated Fire House:

Based on the reconnaissance-level site visit conducted by Ms. Guinon and on aerial photography obtained on Google Earth, the location of fire house is in the corner of a gravel parking lot immediately adjacent to grassland and trees or shrubs. As discussed in the VIP Amendments Project Description, all construction activities are to occur within the gravel parking lot; therefore, no wildlife or plant species would be affected and no further action is necessary.

Summary

In summary, EDAW concludes the following:

New Hydrogen Unit:

As described in the Project Description, no further action is necessary based on Valero's avoidance measures for the drainage ditch and Sulphur Springs Creek.

Relocated Employee Parking:

As described in the Project Description, no further action is necessary at this site due to the absence of suitable habitat for special-status species.

Fire House:

As described in the Project Description, no further action is necessary as all construction activities are to take place within the existing gravel areas.

Yours sincerely,



Charles F. Battaglia
charles.battaglia@edaw.com



Marylee Guinon
Principal, EDAW

References

CDFG (California Department of Fish and Game). 2006 [July]. State and Federally Listed Endangered, Threatened, and Rare Plants of California. Department of Fish and Game, Habitat Conservation Division, Wildlife & Habitat Data Analysis Branch. Sacramento, CA.

CNDDDB (California Natural Diversity Data Base). 2006 [September] and 2007 [March]. Results of electronic record searches. California Department of Fish and Game, Wildlife and Habitat Data Analysis Branch. Sacramento, CA.

CNPS (California Native Plant Society). 2006. [v7-06c 7-11-06]. Electronic Inventory of Rare and Endangered Vascular Plants of California. Sacramento, CA (Available: <http://cnps.web.aplus.net/cgi-bin/inv/inventory.cgi>)

ESA (Environmental Science Associates). 2002. Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project. San Francisco, CA.

USFWS (U.S. Fish and Wildlife Service). 2006 [May]. Federal Endangered and Threatened Online Species List. (http://www.fws.gov/sacramento/es/spp_list.htm).



Legend

 Project Site

1:12,000 4/2/07
1 inch equals 1,000 feet

0 1,000 2,000 Feet

This document provided for the sole use of the Valero Energy Corporation. This document not intended for detail design work.

Figure 1
Location of the Project Site
Valero Improvement Project
Benecia, Solano County, California

EDAW | AECOM
EDAW Natural Resources - Walnut Creek
2099 Mt. Diablo Blvd. Suite 204
Walnut Creek, CA 94596
925.279.0580 www.edaw.com

Appendix A

**TABLE 4.3-1
 FOCUSED LIST OF SPECIAL STATUS SPECIES WITH
 POTENTIAL TO OCCUR IN OR NEAR THE VALERO REFINERY**

Common Name Scientific Name	Listing Status¹ USFWS/ CDFG/CNPS	General Habitat	Potential to Occur
Federal or State Threatened and Endangered Species			
<i>Amphibians</i>			
California red-legged frog <i>Rana aurora draytonii</i>	FT/CSC	Breeds in stock ponds, pools, and slow moving streams with emergent vegetation; adjacent upland habitats are often used outside the breeding season.	Moderate. Potential habitat exists on-site (Tank Farm Ponds).
<i>Birds</i>			
California black rail <i>Laterallus jamaicensis coturniculus</i>	FSC/CT	Nests and forages in tidal emergent wetland with pickleweed.	Absent. Nearest occupied/suitable habitat at near Lake Herman Rd and Hwy 680.
California clapper rail <i>Rallus longirostris obsoletus</i>	FE/CE	Nests and forages in emergent wetlands with pickleweed, cordgrass, and bulrush.	Absent. No suitable habitat.
<i>Mammals</i>			
Salt marsh harvest mouse <i>Reithrodontomys raviventris raviventris</i>	FE/CE	Saline emergent marshlands with dense pickleweed.	Absent. Nearest suitable/occupied habitat at Goodyear Slough.
<i>Plants</i>			
Soft bird's beak <i>Cordylanthus mollis</i> ssp. <i>mollis</i>	FE/CR/List 1B	Soft-haired bird's beak is found in heavy clay soils of either coastal salt or brackish marshes of northern San Francisco Bay.	Absent. Nearest occurrence Southampton Marsh. Habitat not present in refinery.
Other Species Of Concern			
<i>Invertebrates</i>			
Curved-foot hygrotus diving beetle <i>Hygrotus curvipes</i>	FSC/--	Found in a variety of aquatic habitats, including vernal pools, stock ponds, and ditches, often in alkaline conditions.	Moderate. Suitable habitat exists at Tank Farm Ponds.
San Francisco lacewing <i>Nothochrysa californica</i>	FSC/--	Grasslands and a variety of habitats.	Absent. Suitable habitat does not occur at or near the refinery.
<i>Amphibians</i>			
California tiger salamander <i>Ambystoma californiense</i>	FC/CSC	Wintering sites occur in grasslands occupied by burrowing mammals; breed in ponds, vernal pools, and slow-moving or receding streams.	Moderate. Suitable habitat exists at Tank Farm Ponds.

See notes at end of table for explanation of status codes.

TABLE 4.3-1 (Continued)
FOCUSED LIST OF SPECIAL STATUS SPECIES WITH
POTENTIAL TO OCCUR IN OR NEAR THE VALERO REFINERY

Common Name <i>Scientific Name</i>	Listing Status¹ USFWS/ CDFG/CNPS	General Habitat	Potential to Occur
Other Species Of Concern (cont.)			
<i>Reptiles</i>			
Western pond turtle <i>Clemmys marmorata</i>	FSC/CSC	Freshwater ponds and slow streams edged with sandy soils for laying eggs.	Moderate. Suitable habitat exists at Tank Farm Ponds.
<i>Birds</i>			
Tricolored blackbird <i>Agelaius tricolor</i>	FSC/CSC	Nests in freshwater marshes with dense stands of cattails or bulrushes, occasionally in willows, thistles, mustard, blackberry brambles, and dense shrubs and grains.	Moderate. Nesting habitat available is available at Tank Farm ponds. Colony at Lake Herman.
Short eared owl <i>Asio flammeus</i>	FSC/--	Nests and forages in grasslands and marshes. Nests in on dry ground in depression concealed by vegetation.	Absent. Suitable habitat does not occur at or near the refinery.
Burrowing owl <i>Athene cucularia</i>	FSC/CSC	Nests and forages in low-growing grasslands that support burrowing mammals.	Absent. Suitable habitat does not occur at or near the refinery.
Northern harrier (nesting) <i>Circus cyaneus</i>	--/CSC	Nests in coastal freshwater and saltwater marshes, nest and forages in grasslands.	Absent. Suitable habitat does not occur at or near the refinery.
White-tailed kite (nesting) <i>Elanus leucurus</i>	DFG fully protected—CA Fish & Game Code, Section 3511	Nests near wet meadows and open grasslands dense oak, willow or other large tree stands.	Absent. Suitable habitat does not occur at or near the refinery.
California horned lark <i>Eremophila alpestris</i>	--/CSC	Nests and forages in barren dirt areas, shores, and gravel areas.	Absent. Suitable habitat does not occur at or near the refinery.
Saltmarsh common yellowthroat <i>Geothlypis trichas sinuosa</i>	FSC/CSC	Breeds in moist saltmarsh habitats with dense, low cover.	Absent. Suitable habitat does not occur at or near the refinery.
Loggerhead shrike <i>Lanius ludovicianus</i>	FSC/CSC	Scrub, open woodlands, and grasslands.	Absent. Suitable habitat does not occur at or near the refinery.
Suisun Song Sparrow <i>Melospiza melodia maxillaris</i>	FSC/CSC	Endemic to Suisun Bay. Inhabits brackish marshes, perching and nesting in stands of bulrush along tidal channels, distribution ditches and permanent ponds where brackish conditions exist and foraging in bulrush and on exposed tidal mudflats.	Moderate. Habitat (fragmented) along Sulphur Springs Creek. Recorded at Southampton Marsh and Goodyear Slough.

See notes at end of table for explanation of status codes.

TABLE 4.3-1 (Continued)
FOCUSED LIST OF SPECIAL STATUS SPECIES WITH
POTENTIAL TO OCCUR IN OR NEAR THE VALERO REFINERY

Common Name <i>Scientific Name</i>	Listing Status USFWS/ CDFG/CNPS	General Habitat	Potential to Occur
Other Species Of Concern (cont.)			
<i>Mammals</i>			
Salt marsh wandering shrew <i>Sorex vagrans halicoetes</i>	FSC/CSC	Salt marsh habitat 6-8 feet above sea level, with abundant pickleweed and driftwood.	Moderate. Suitable habitat exists adjacent to the refinery. Nearest CNDDDB location is San Pablo Creek Marsh.
<i>Plants</i>			
Congdon's tarplant <i>Hemizonia parryi</i> ssp. <i>congdonii</i>	FSC/--/List 1B	Valley and foothill grassland (alkaline soils)	Absent. Habitat does not occur; nearest observation NW of Benicia.
Suisun marsh aster <i>Aster lentus</i>	FSC/--/List 1B	Occurs along levees of rivers and sloughs in Suisun and Napa marshes and around Delta islands.	Absent. Habitat does not occur; nearest observation at mouth of Goodyear Slough
Carquinez goldenbush <i>Isocoma arguta</i>	FSC/--/List 1B	Found along the Carquinez Straits in Solano and Contra Costa counties in alkaline soils, flats, and on lower hills.	Absent. Suitable habitat does not occur at or near the refinery.
Delta tule pea <i>Lathyrus jepsonii</i> var. <i>jepsonii</i>	FSC/--/List 1B	Natural edges of estuarine marshes, sloughs, and rivers in the Sacramento – San Joaquin Delta.	Absent. Suitable habitat does not occur at or near the refinery.
Mason's lilaeopsis <i>Lilaeopsis masonii</i>	FSC/CR/List 1B	Brackish and freshwater marshes.	Absent. Suitable habitat does not occur at or near the refinery.

Status Codes:

FEDERAL: (U.S. Fish and Wildlife Service)

- FE = Listed as Endangered (in danger of extinction) by the Federal Government.
- FT = Listed as Threatened (likely to become Endangered within the foreseeable future) by the Federal Government.
- FSC = Federal Species of Concern. May be Endangered or Threatened, but not enough biological information has been gathered to support listing at this time.

STATE: (California Department of Fish and Game)

- CE/CT = Listed as Endangered/Threatened by the State of California
- CSC = California Species of Special Concern
- CR = California Rare Plant Species

CALIFORNIA NATIVE PLANT SOCIETY (CNPS)

- List 1B: Plants rare, threatened, or endangered in California and elsewhere

SOURCES: USFWS; CNDDDB, 2001; CNPS 2001.

Appendix E
Amendment to VIP Water Study

October 5, 2007

Mr. Todd Lopez
Environmental Manager
Valero Benicia Refinery
3400 East Second Street
Benicia, California 94510

Subject: Supplement to the Water Study for the Valero Improvement Project, October 2002, Revision 1

Dear Mr. Lopez:

Glaze Regulatory Consulting (GRC) was retained as a subcontractor to ENSR Corporation in support of the Valero Refining Company – California (Valero) Benicia Refinery and their development of a use permit application for amendments to the Valero Improvement Project (VIP) (VIP Amendments). Specific tasks assigned to GRC included:

1. Review previously prepared VIP project documents related to Benicia Refinery water demand, including the City of Benicia Water Study prepared by Environmental Science Associates (ESA), October 2002 (Water Study), and the Certified Environmental Impact Report (EIR), State Clearinghouse #002042122, completed in March 2003 and certified in April 2003 for VIP (Certified EIR).
2. Review current forecasts for water demands associated with the VIP Amendments.
3. Review past refinery water demand data for 2004, 2005, and 2006.
4. Prepare a Supplement to the Water Study detailing incremental water demand changes associated with the proposed VIP Amendments.

This report serves as the Supplement to the Water Study and summarizes information and conclusions from these tasks under the following headings:

- Certified EIR and Water Study
- City of Benicia Water Supply Contracts
- City of Benicia 2005 Urban Water Management Plan (UWMP)
- VIP Amendments Supplemental Analysis

Certified EIR and Water Study

In April 2003, the City of Benicia (City) certified an EIR for a refinery modernization project titled VIP at the Benicia Refinery. The project encompassed a variety of process unit modifications. The Certified EIR includes a comprehensive review of the available water supply to the City for various uses, including delivery of raw water for the Benicia Refinery.

The EIR's water demand impacts analysis relied substantially on data and conclusions from a Water Study to review the project in a manner consistent with California Senate Bill 610 (SB 610) passed by the legislature in 2000. This Water Study was conducted with concurrence of Valero and the City.

The Water Study concluded that because the City's water supply in the single-dry and multiple-dry years is not sufficient to meet demand even without the added demand of the VIP, it must be concluded that current supply is not sufficient to meet existing or any projected future demands of the Benicia Refinery.

The Report also described several options that were being considered by the City to increase supply, and that "If one or more of these sources were to be secured, Benicia's firm supply would be sufficient to meet the current and projected demand in most years."

Based in part on the Water Study, the Certified EIR concluded that the project would increase demand for raw, untreated water from the City in excess of the baseline refinery demand anticipated in the 2001 Urban Water Management Plan (UWMP). Further, that in the future, the City's overall water demand may exceed available supplies from current sources in dry years. As a result, the Certified EIR concluded that this impact would be significant; however, it also found that this impact could be rendered insignificant if the following mitigation measures were implemented:

Mitigation Measure 4.14-1a: The City will continue to move forward with obtaining the future water supplies as identified in the Water Study, the UWMP, and the 1996 Water System Master Plan.

Mitigation Measure 4.14-1b: The City and Valero will continue to implement General Plan Program 2.36A to pursue reuse of reclaimed wastewater where feasible, and the Valero Refinery will accept and use reclaimed water from a City reclamation project.

Mitigation Measure 4.14-1c: Drought Contingency. If a "water shortage" (as defined below) occurs, then Valero shall take the steps necessary to reduce water consumption at the refinery by an amount equal to or greater than the amount of raw water that is being consumed due to implementation of the VIP during the period the water shortage. This reduction shall be in addition to any amount of reduction required by Condition WATER RES-2, approved by the California Energy Commission on October 31, 2001, for the Valero Cogeneration Project. Upon notification that a water shortage exists for any given year, Valero shall provide prompt documentation to the City of: the amount of water expected to be consumed by the VIP during the year of the shortage; a description of the steps planned to reduce consumption; the amounts to be saved by the steps; and the timing of implementation. Valero shall notify the City as the steps are implemented and will provide an annual report at the end of the year, verifying the amounts of water saved by the steps taken.

For purposes of this mitigation, "water shortage" means that all of the following conditions have occurred:

- a) The City is unable to secure, pursuant to Supplemental Water Rights Application 30681, rights to the amount of water projected to accommodate City demand for the year of the water shortage, as shown in Table 4.14-3 of the Certified EIR, plus the amount of water needed for the VIP;
- b) The City is unable to secure other water entitlements to the amount of water projected to accommodate City demand for the year of the water shortage, as shown in Table 4.14-3 of the Certified EIR, plus the amount of water needed for the VIP;
- c) Valero has not secured a separate water entitlement, valid for the year of the water shortage, adequate for the amount of water needed for the VIP;
- d) The City has not implemented the wastewater reuse project; and
- e) The City has announced a water alert, as defined by Benicia Municipal Code Title 13, Chapter 13.35, section 13.35.060(B), and has ordered implementation of conservation stage two pursuant to the City Code.

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Benicia – Valero Water Supply Contracts

Following the certification of the VIP EIR by the Benicia City Council, on June 4, 2003, Valero and various organizations entered into a Settlement Agreement regarding water supplies to the Benicia Refinery. The Settlement Agreement provided that “Valero shall continue to participate in the planning and development of the City’s wastewater reuse project, consistent with its commitment to that project dated October 11, 2002”

Pursuant to the Settlement Agreement, Valero’s commitment in this planning and development process continues “as long as the reuse project continues to be economically, regulatorily, and technically feasible.” “Economically feasible” is defined in the Settlement Agreement to mean “approximately \$15 million of financial support for the water reuse project so long as Valero is anticipated to receive, as agreed by Valero and the City, at least one million gallons of useable water per day from the water reuse project.”

To evaluate whether the wastewater reuse would be economically, regulatorily, and technically feasible, the People Using Resources Efficiently (PURE) Committee was formed. Valero has participated with PURE for the last four years to evaluate the wastewater reuse project. However, the Benicia City Council agreed on June 5, 2007 to terminate further work on the wastewater reuse project (the PURE Project) once the Preliminary Design Review and administrative draft CEQA report documents were prepared.

Also following the certification of the VIP EIR, the City of Benicia entered into a Settlement Agreement with the Department of Water Resources to provide an additional 10,500 acre-feet of firm contracted water supply per year. This in essence implemented Certified EIR Mitigation Measure 4.14-1a.

This increased supply was subsequently included in the City’s Urban Water Management Plan (UWMP) completed and approved by the Benicia City Council in December 2005. As detailed in the City’s 2005 UWMP, this increased supply provides an adequate water supply for both the City of Benicia (through its projected build out) and the Benicia Refinery (assuming a projected increased demand rate) through the year 2030.

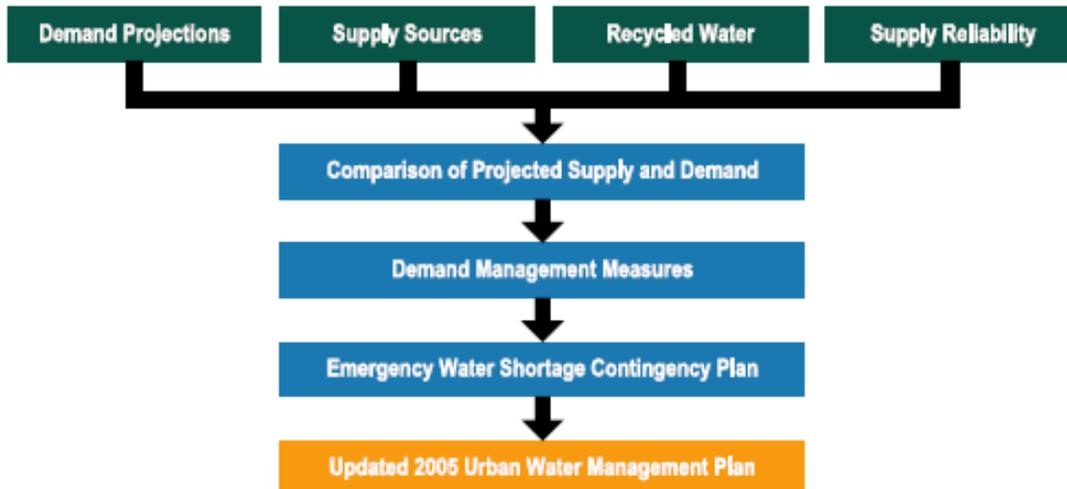
Valero is now submitting a use permit application for amendments to the Use Permit issued for the VIP (PLN 2002-00022) by taking into account new information which was not known and could not have been known with the exercise of due diligence at the time the VIP EIR was certified in 2003. The VIP Amendments have been primarily designed to further reduce environmental impacts of the original project through implementation of additional energy efficiency, air pollution control, and flare minimization measures.

City of Benicia 2005 UWMP

In 1983, the California Legislature enacted the Urban Water Management Planning Act. This Act requires water suppliers serving more than 3,000 customers or water suppliers providing more than 3,000 acre-feet per year of water to prepare an urban water management plan to promote water conservation and efficient water use.

The City provides treated water to a population of over 25,000 people and is required to submit an updated UWMP by December 31st in years ending in zero or five. The UWMP must address all the elements in Figure 1.

Figure 1 Overview of Major Plan Elements



Tables displayed in Appendix A from the 2005 UWMP (Tables 3-2, 6-1, 7-2, 7-3, and 7-4) provide summaries of water demand as well as projected evaluations of surpluses through the year 2030. As indicated in Table 7-4 of Appendix A, even with the projected 2,240 acre-feet per year from recycled water backed out, the UWMP's worst-case scenario shows a surplus of 3,783 (6023-2240) acre-feet per year.

The City's "supply and demand" evaluations presented in the 2005 UWMP included this increased water. As indicated in the discussion below, this increased supply results in forecasted surpluses of 5,000 to 7,000 acre-feet per year even during multiple dry years through the year 2030.

The 2005 UWMP also includes a projection of 2,240 acre-feet per year of water availability for the Benicia Refinery from recycled water (i.e., wastewater reuse project).

Accordingly, the wastewater reuse project is not going forward. However, removing the 2,240 acre-feet still results in a greater than 3,000 acre-feet per year surplus even under multiple dry year scenario calculations.

Importantly, consistent with CEQA Guidelines, the Certified EIR established "significance criteria" with regard to water supply/demand considerations for VIP. Specifically the project's impact would be considered significant if it would:

"Result in City water use in excess of water supplies available in normal, dry, and multiple dry years with water from all existing entitlements and sources, or if the project would require new or expanded water entitlements or resources."

With the new long-term, firm water supply provided by the 2003 Water Rights Settlement Agreement, which has been incorporated into the 2005 UWMP, and in essence is an implementation of Mitigation Measure 4-14-1.a, impacts due to increased water demand from the VIP would not now be considered significant. Moreover, as indicated below, this finding is also true regarding to the currently proposed VIP Amendments.

Accordingly, as concluded by the UWMP, the City of Benicia has sufficient water to supply Valero's requirements even during multiple dry year scenarios.

VIP Amendments Supplemental Analysis

The VIP Amendments are not expected to incrementally increase water demand over what was previously authorized in the Certified EIR.

Table 1 displays the projected water demand associated with the original VIP project components analyzed in the Certified EIR and the VIP Amendments.

Table 1 VIP Amendments Water Demand Projections Compared to Certified EIR

Operating Unit	Gallons Per Day (1)		
	Certified EIR	Incremental Increase	New Total Water Usage
VIP Amendments			
Main Stack Scrubber	172,800	175,600	348,400
Hydrogen Production	21,600	-38,900	-17,300
New Desalter (will use recycle water)	---	--	--
Sulfur Recovery Cooling Water	14,400	-14,400	--
Coker Modifications	7,200	--	7,200
Steam Condensate Recovery Project		-21,500 (2)	-21,500 (2)
VIP Amendments Subtotal	216,000	100,800	316,800
Cumulative Projects			
NRU Catalyst Regeneration Facility Project	---	-100,800	-100,800
TOTAL	216,000	0	216,000

Notes:

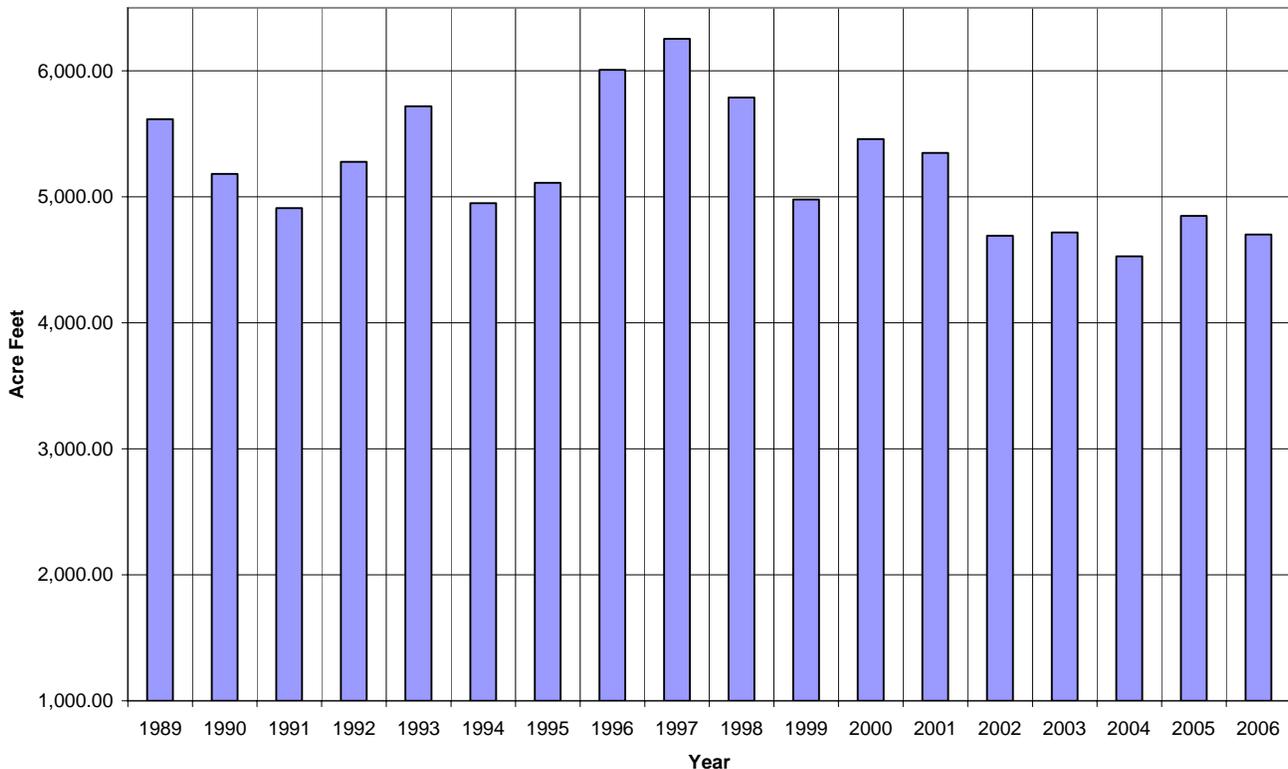
1. Acre feet/year = 893 gallons/day = 0.62 gallons/minute
2. The Steam Condensate Recovery Project will reduce water consumption by over 21,500 gallons/day, however, the minimum project objectives were assumed in this analysis.

In planning for construction and operation of the Benicia Refinery, the City of Benicia and Humble Oil Company (the original owner) entered into an initial water supply contract in 1967. In the ensuing years this contract was amended several times to allow for ownership changes, as well as rate and supply adjustments. City staff have notified Valero of their intent to commence negotiations for future water supply in 2007.

Valero would reasonably expect that water supply negotiations would be based on the 2005 UWMP. As indicated in Table 6-1 from the UWMP (displayed in Appendix A), the anticipated refinery water demand is 4,675-5,800 acre-feet per year from the years 2005-2030, respectively. Since the VIP Amendments produces no net increase in water demand above the currently authorized amount, the worst-case "multiple dry years" calculations still results in water supply surpluses, even after City buildout.

As indicated in the Benicia Refinery water demand graph for 1989-2006 below, refinery consumption has been as high as 6,255 acre-feet per year (in 1997). Projects associated with the VIP Amendments are not expected to increase water usage above what is currently used.

Figure 2 Valero Water Use Histogram for Benicia Refinery (1986-2006)



Conclusions

Based on the supporting background information related to the Water Supply contracts for the City and no net increase in water needs of the VIP Amendments, the following conclusions can be made with regards to the sufficiency of available water supply.

- The long-term, firm water supply provided by the 2003 Water Rights Settlement Agreement between the California Department of Water Resources and the cities of Vacaville, Fairfield and Benicia satisfies Mitigation Measure 14-4.1a of the Certified VIP EIR regarding increased water demand.
- According to the City of Benicia's 2005 UWMP, the City has sufficient water in secured long-term, firm contracts to supply water needs for the VIP Amendments even during multiple dry year scenarios. This conclusion remains valid without considering any supplies from recycled water.
- With the new long-term, firm water supply provided by the 2003 Water Rights Settlement Agreement, which has been incorporated into the 2005 UWMP, and in essence is an implementation of Mitigation Measure 4-14-1.a, impacts water demand from the VIP Amendments would not now be considered significant considering there is no net increase over what is currently permitted for VIP.

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Please feel free to contact me at (707) 643-0729 if you have any questions.

Sincerely



Daniel E. Glaze
Glaze Regulatory Consulting

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Appendix A
Tables from 2005 UWMP

Component/Year	2005	2010	2015	2020	2025	2030
Treated Water Use						
Single-Family Residential	3,401	3,411	3,420	3,430	3,430	3,430
Multi-family Residential	555	573	590	607	607	607
Commercial	1,181	1,223	1,264	1,306	1,306	1,306
Industrial	163	200	236	272	272	272
Irrigation	182	193	204	215	215	215
Other	159	159	160	160	160	160
Total Treated Water Use	5,642	5,758	5,874	5,990	5,990	5,990
Other Components of Demand						
Unaccounted-for Water	564	576	587	599	599	599
Operations and Emergency Water	1,016	1,036	1,057	1,138	1,138	1,138
Valero Untreated Water ⁽¹⁾	4,675	5,050	5,425	5,800	5,800	5,800
Total Demand including Treated Water Use and Other Components						
<i>Total Demand</i>	<i>11,897</i>	<i>12,420</i>	<i>12,944</i>	<i>13,527</i>	<i>13,527</i>	<i>13,527</i>

⁽¹⁾ Valero untreated water will be supplied by raw surface water and by recycled water when it becomes available in 2010.

Source	Normal Year		Single Dry Year		Multiple Dry Years⁽¹⁾ (4-Year Period)	
	Reliability (%)	Amount (AF/year)	Reliability (%)	Amount (AF/year)	Reliability (%)	Amount (AF/year)
Lake Herman	100	500	0	0	0	0
State Water Project	90	14,468 ⁽²⁾	61 ⁽³⁾	9,806	44 ⁽³⁾	7,073
Water Rights Settlement	72	7,560	72	7,560	70	7,350
Vallejo Agreement (Solano Project Water)	99	1,089	98	1,078	92	1,012
Mojave Exchange	0	0	0	0	100	1,875
Recycled Water ⁽⁴⁾	100	2,240	100	2,240	100	2,240
<i>Total</i>		<i>25,357</i>		<i>20,684</i>		<i>19,550</i>

⁽¹⁾ The City defines a multiple dry year period as 4 consecutive dry years. The City's wholesaler (SCWA) uses a 6-year period. If the City uses a period of 6 consecutive dry years, this reduces the SWP reliability to 39%, and the total supply to 18,746 AF/year, which is more than the buildout demand (see Section 7).

⁽²⁾ The 100% supply contract amount for SWP water is 16,075 acre-feet per year for purposes of this UWMP, which conservatively assumes that Rio Vista and Dixon build facilities to take SWP water by 2016. This amount would be available only during wet or very wet years. During a normal year, 90% of the contract amount is anticipated to be available.

⁽³⁾ Even if the City were to only get 9 percent of its SWP amount, which is the worst case single dry year on record, it would be an additional cutback of 5,626 AF per year, which could still be accommodated with its planned supply.

⁽⁴⁾ Recycled water is a future supply and will be available after 2010. Section 5 describes the recycled water supply.

Table 7-2 Normal Year Comparison of Supply and Demand Projections, AF/ year						
	2005	2010	2015	2020	2025	2030
Supply	21,670	25,357	25,357	25,357	25,357	25,357
Demand	11,897	12,440	12,984	13,527	13,527	13,527
<i>Surplus of Supply (Difference between Supply and Demand)</i>	<i>9,773</i>	<i>12,917</i>	<i>12,373</i>	<i>11,830</i>	<i>11,830</i>	<i>11,830</i>

Table 7-3 Single Dry Year Comparison of Supply and Demand Projections, AF/year						
	2005	2010	2015	2020	2025	2030
Supply	18,937	20,684	20,684	20,684	20,684	20,684
Demand	11,897	12,440	12,984	13,527	13,527	13,527
<i>Surplus of Supply (Difference between Supply and Demand)</i>	<i>7,040</i>	<i>8,244</i>	<i>7,700</i>	<i>7,157</i>	<i>7,157</i>	<i>7,157</i>

Table 7-4 Multiple Dry Years Comparison of Supply and Demand Projections, AF/ year						
	2005	2010	2015	2020	2025	2030
Supply	17,354	19,550	19,550	19,550	19,550	19,550
Demand	11,897	12,440	12,984	13,527	13,527	13,527
<i>Surplus of Supply (Difference between Supply and Demand)</i>	<i>5,457</i>	<i>7,110</i>	<i>6,566</i>	<i>6,023</i>	<i>6,023</i>	<i>6,023</i>